Do People Have Children When They Become Rich? Evidence from Lottery Winners in Taiwan

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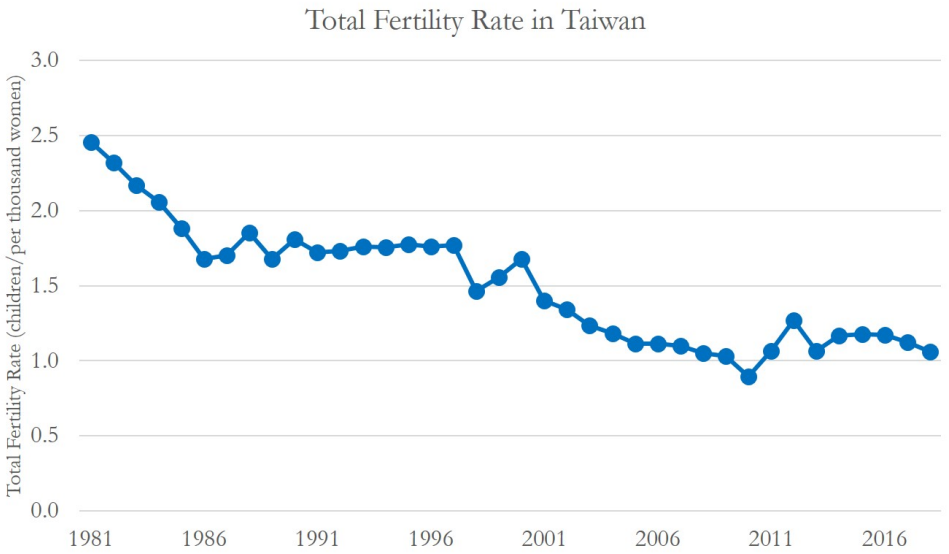
Motivation

Low Fertility Rate

- During the past fifty years, fertility rates in developed countries have declined dramatically
- Low fertility rate leads to the growth of an aging population, workforce shortages, and reductions in tax revenue.
- Many countries initiated child-related cash transfer policies to encourage childbearing.
  - On average, the public spending of child-related cash benefits accounts for 1.1% of GDP in OECD countries.
- The rationale behind these policies is that people do not have enough income to afford the expense of raising children, so the government needs to subsidize them.

Motivation

Total Fertility Rate in Taiwan



Motivation

- However, previous studies have not reached a consensus on whether more household income could induce fertility.
  - Becker (1960) suggests children are normal goods.
  - There is a trade-off between the demand for quantity and quality of children
  - It is possible that parents spend their income on raising quality of children
- Empirically, there is an endogenous problem between income and fertility.
  - Reverse Causality
  - Income effect confounds with substitution effect
    - Both working and raising children are time-consuming activities
    - A sudden increase in wage income can increase the relative price of having children
    - Higher wage income would result in someone wanting to work more and to demand less children
- Cross-sectional evidence even suggests there is negative relationship between income and fertility

Previous Literature

- Several recent studies overcome endogeneity using income/wealth shocks caused by:
  - Natural disasters (Ager and Herz, 2019; Alam and Pörtner, 2018)
  - Husband's job displacement (Huttunen and Kellokumpu, 2016)
  - Coal boom (Black et al., 2013)
  - Housing price appreciation (Lovenheim and Mumford, 2013)
- Some limitations
  - Unclear change in income/wealth for individuals
  - These income/wealth shocks affect fertility via other channels.
  - Only includes individuals who were married.

This Paper

- We use an exogenous income/wealth change induced by winning large lottery prizes to examine the causal effect of income/wealth on fertility
- Contribution:
  - Lottery prizes only affect household financial resources
  - Clear change in household income/wealth
  - More general population

Data

- Our data is provided by the Fiscal Information Agency (FIA)
- Sample period: 2004 to 2018
  - Lottery winners: people who won lottery during 2007 to 2012
- Income registry file
  - Records 10 income categories
  - Information about lottery/competition income
  - From this information, we can know an individual's annual lottery income
- Personal information file
  - Individual characteristics: gender, year of birth, father ID, mother ID, location of birth, age, year of marriage, and spouse's ID

Data

- Individual wealth data (Lien and Tseng et al. 2019)
- We construct this dataset using the following FIA raw data:
  1. Wealth registry file
     - Financial assets: listed and unlisted stocks
     - Non-financial assets: houses, land, and car
  - Adjust value of real estate and stock to market price

Data

2 Income registry file

- Estimating the value of other financial assets: deposits, bonds, and short-term bills
- Use interest income from income registry and a capitalization method (Saez and Zucman, 2016)

3 Records on mortgage interest expense

- Estimating the value of debt: home mortgage
- Use mortgage interest expense and a capitalization method (Saez and Zucman, 2016)

Sample Selection

1. Includes both single individuals and couples
   - Use the marital status at one year before the winning year
   - 43% Couple / 27% Individual Male / 31% Individual Female
2. Individuals with age 20 to 45
3. Exclude households whose members were dead during the sample period
4. Track these households from 3 years before to 6 years after winning the lottery

Lottery Games in Taiwan

- Public Welfare Lottery
- Taiwan Receipt Lottery
- Sports Lottery
  - We exclude this lottery since Sport Lottery winners do not win it by "luck" and it might be related to their professional ability.

Public Welfare Lottery

- Computer-Drawn games

Public Welfare Lottery

- Scratch-Card Games

Taiwan Receipt Lottery

Taiwan Receipt Lottery

108年 9-10月 統一發票開獎		
特別獎	41482012	與左欄號碼相同者獎金1,000萬元
特獎	58837976	與左欄號碼相同者獎金200萬元
頭獎	20379435 47430762 36193504	頭獎 與頭獎號碼完全相同者獎金20萬元 二獎 與頭獎末7碼相同者各得獎金4萬元 三獎 與頭獎末6碼相同者各得獎金1萬元 四獎 與頭獎末5碼相同者各得獎金4千元 五獎 與頭獎末4碼相同者各得獎金1千元 六獎 與頭獎末3碼相同者各得獎金2百元
增開六獎	693 043 425	末3碼與增開六獎號碼相同者各得獎金2百元
正確資訊請以財政部提供為準 中央社祝您幸運中獎		

- Our identification strategy is a difference-in-differences (DID) design
- This method compares the differential trend in fertility between a treatment group and a comparison group before and after receiving a large windfall gain
- Treatment Group:
  - Households who earn more than 1,000,000 NT$ (i.e. around 33,000 US$) by winning lotteries in a given year
- Control group:
  - Households who earn less than 10,000 NT$ (i.e. around 330 US$) from winning lotteries during sample period

- The control group earn little money from winning lotteries
- It is presumed to remove any shocks, other than receiving a large windfall gain, that might affect the fertility decision of a treatment group

Empirical Specification

DID Design

- We estimate the effect of large windfall gains on an households' fertility decision using the following regression:

$$B_{it} = \alpha_0 + \alpha_1 Treated_i + \alpha_2 Post_t + \beta^{DD} Lottery_{it} + \nu_i + \lambda_t + X_{it}\psi + \varepsilon_{it}$$

  - B_{it} represents a dummy variable indicating whether household i have any new child in the year t
    - We focus on one year before winning the lottery or one year after winning it
  - $Treated_i$ is a dummy variable indicating a household i belong to treatment group (i.e. $Treated_i = 1$)
  - $Post_t$ denotes that a household i is observed in the period after lottery-winning year (i.e. $Post_t = 1$)
  - Year fixed effects λ_t: capture common macroeconomic effects that affect the fertility decision of both treatment and control group
  - Household fixed effects ν_i: control for any unobservable time-invariant differences between households

Empirical Specification

DID Design

- The key variable $Lottery_{it}$ is a dummy variable
  - Represented by the interaction between $Treated_i$ and $Post_t$ (i.e. $Treated_i \times Post_t$)
  - Indicates that a household i receive a large windfall gain by winning lotteries
  - $Lottery_{it} = 1$ means that a household i is belong to treatment group and observed after the lottery-winning year
- Its coefficient β^{DD} is the standard DID estimator
- β^{DD} measures the differential trend in fertility behavior among treatment group, relative to control group, after winning the lottery prize

- We can attribute the difference in the evolution of fertility between the two groups to the impact of receiving windfall gains
  - Treatment and control group's fertility should follow a common trend in the absence of receiving the windfall gains
  - This assumption ensures that our results do not come from different pre-trends in fertility between the treatment and control groups

Treatment v.s. Control Group

Raw Data

	Treatment Group (N = 1,256)	Control Group (N = 591,692)	Difference (Control - Treatment)
Household characteristics			
Family type			
Couple	0.408	0.382	-0.026*
Individual Male	0.369	0.291	-0.078***
Individual Female	0.224	0.327	0.104***
Average age within household	32.616	31.318	-1.298***
	[5.951]	[6.457]	[0.182]
Average amount of lottery prize	20,942,004	4,520	-20,937,484***
	[83,481,207]	[1,613]	[108,485]
Median amount of lottery prize	3,814,362	4,000	
Place of Residence			
Taipei City	0.114	0.116	0.002
Other municipality	0.596	0.579	-0.017
Other county	0.291	0.305	0.014
Married	0.408	0.382	-0.026*
Average household earnings	494,919	494,494	-425
	[599,467]	[746,166]	[21,069]
Average household wealth	3,864,104	3,346,125	-517,979
	[10,381,928]	[15,301,423]	[431,966]
Median household wealth	276,996	107,619	
Outcomes variables			
# of boy(s) ever born	0.456	0.397	-0.060***
	[0.725]	[0.674]	[0.019]
# of girl(s) ever born	0.381	0.366	-0.015
	[0.685]	[0.666]	[0.019]
Give birth 1 year before windfall	0.037	0.043	0.006
Give birth 2 year before windfall	0.047	0.043	-0.004
Give birth 3 year before windfall	0.048	0.045	-0.003

Treatment v.s. Control Group

After Re-weighting

	Treatment Group (N = 1,256)	Control Group (N = 591,692)	Difference (Control Treatment)
Household characteristics			
Family type			
Couple	0.408	0.408	0.000
Individual Male	0.369	0.369	0.000
Individual Female	0.224	0.224	0.000
Average age within household	32.616	32.533	-0.083
	[5.951]	[5.980]	-0.169
Average amount of lottery prize	20,942,004	4,522	-20,937,482***
	[83,481,207]	[1,613]	[108,485]
Median amount of lottery prize	3,814,362	4,000	
Place of Residence			
Taipei City	0.114	0.118	0.005
Other municipality	0.596	0.579	-0.017
Other county	0.291	0.303	0.012
Married	0.408	0.408	0.000
Average household earnings	494,919	527,977	33,058
	[599,467]	[761,812]	[21,510]
Average household wealth	3,864,104	3,669,767	-194,337
	[10,381,928]	[15,795,741]	[445,907]
Median household wealth	276,996	226,919	
Outcomes variables			
# of boy(s) ever born	0.456	0.422	-0.034*
	[0.725]	-0.687	-0.019
# of boy(s) ever born	0.381	0.390	0.008
	[0.685]	-0.679	-0.019
Give birth 1 year before windfall	0.037	0.046	0.009
Give birth 2 year before windfall	0.047	0.046	-0.001
Give birth 3 year before windfall	0.048	0.048	0.001

Table 3: Effect of a Large Windfall Gain on Fertility

Dependent Variable:	Give Birth				
	(1)	(2)	(3)	(4)	(5)
Lottery	0.027***	0.027***	0.026***	0.026***	0.026***
	[0.008]	[0.009]	[0.009]	[0.009]	[0.009]
Baseline mean			0.044		
# of households			592,948		
# of households-years			1,185,896		
Control Weighting	√	√	√	√	√
Basic DID Controls	√	√	√	√	√
Year Fixed Effect		√	√	√	√
Control Setting 1			√	√	√
Control Setting 2				√	√
Household FE					√

- Our preferred specification suggests that receiving a large windfall gain (i.e. on average, 20 million NT$) leads to a 2.6 percentage points increase in the likelihood of having new children
  - Note that the baseline probability of having new kids is 4.4 percent for a treatment group in our sample
  - This estimate is a sizable increase amounting to around 59% of the pre-treatment average

DID Results

Summary

- In order to calculate the wealth elasticity of fertility, we need to know the change in wealth induced by windfall gain
  - Average amount of lottery prizes won by a treatment group is 20 million NT$
  - Pre-treatment mean of wealth is 3.8 million NT$
  - Therefore, on average, wealth of treatment group increase by 526% due to winning lotteries
- The implied wealth elasticity of having children is around 0.11

Placebo Tests

- Randomly assign lottery prize to the households in whole sample or control group
- Use these randomly assigned amount of lottery earnings to define "treatment" status

Placebo Tests

Table 4: Placebo Tests

Dependent Variable:	Give Birth				
	(1)	(2)	(3)	(4)	(5)
Panel A: Random assigned Lottery Prize within All Samples					
Lottery	0.007	0.007	0.007	0.007	0.007
	[0.008]	[0.008]	[0.008]	[0.008]	[0.012]
Baseline mean			0.041		
# of households			592,948		
# of observations			1,185,896		
Panel B: Random assigned Lottery Prize within Control Group					
Lottery	0.001	0.001	0.001	0.001	0.001
	[0.008]	[0.008]	[0.008]	[0.008]	[0.011]
Baseline mean			0.041		
# of households			591,692		
# of observations			1,183,384		
Basic DID controls	√	√	√	√	√
Year fixed effect		√	√	√	√
Household characteristics			√	√	√
Previous lottery prizes				√	√
Household fixed effect					√

Robustness Checks

1. Use different cutoff for control group
2. Use propensity score matching to select control group
3. Use logit or probit model
4. Re-weighting sample to match characteristics of whole population in Taiwan

Robustness Checks

Table 5: Robustness Checks

Dependent Variable:	Give Birth						
	(1) Cut at 3K	(2) Cut at 5K	(3) PSM	(4) Mahalaaobis	(5) logit (PA Model)	(6) probit (PA Model)	(7) Population Weighting
Lottery	0.032***	0.026***	0.019**	0.022*	0.560***	0.262***	0.029***
	[0.012]	[0.009]	[0.009]	[0.011]	[0.187]	[0.087]	[0.009]
dy/dx					0.025***	0.025***	
					[0.008]	[0.008]	
# of households	15,450	486,454	25,810	2,504	592,948	592,948	592,948
# of observations	30,900	972,908	51,620	5,008	1,185,896	1,185,896	1,185,896

Change Fertility Timing or Increase Total Fertility?

Event-Study Analysis

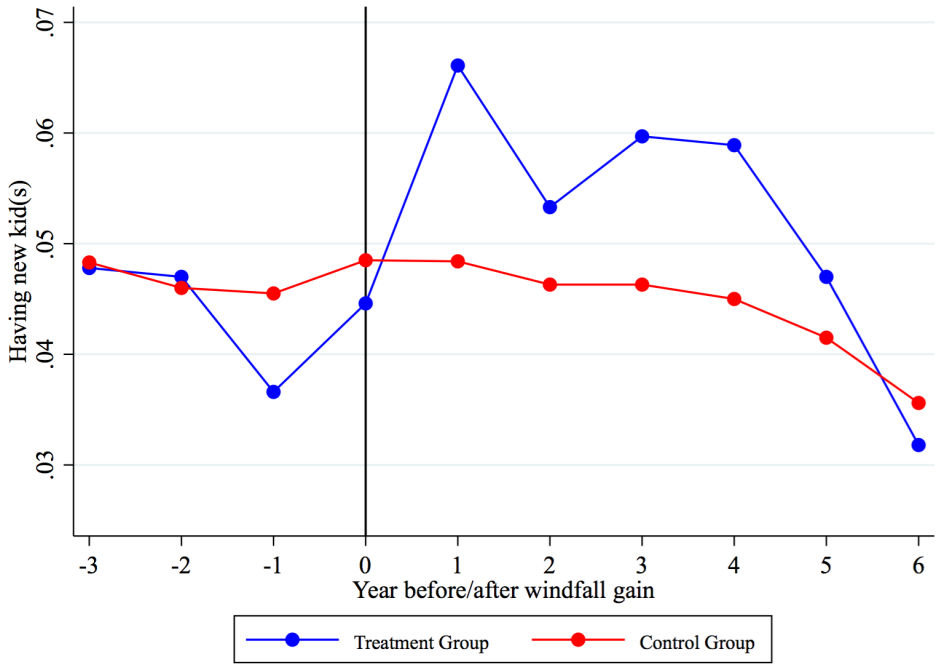
- We implement an event-study analysis to examine the change in number of children between treatment and control group after winning the lotteries
- We estimate the following regression:

$$y_{it} = \gamma_0 + \gamma_1 \mathit{Treated} + \sum_t \beta_t \mathit{Treated} \times \mathit{After}_t + \delta_t + \nu_i + X_{it}\psi + \varepsilon_{it}$$

  - Outcome variable y_{it}:
    1. Whether household i gives births in the year t
    2. Cumulative number of children for household i in the year t
  - We use After_t, where $t = -3, -2, 0, 1, 2, 3, 4, 5, 6$, to denote dummy variables for the year before and after winning lottery.
  - For example, After_1 represents a dummy for the first year after winning lottery.
  - Note that we use one year before lottery-winning year as the baseline year (i.e. $t = -1$).

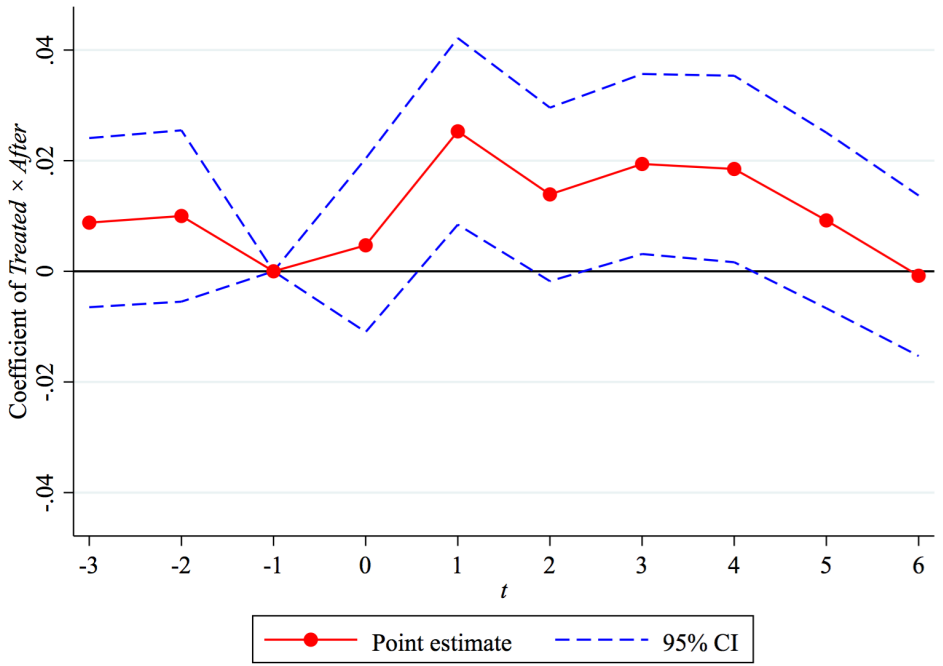
Increase in Total Fertility?

Raw Data: Give Birth



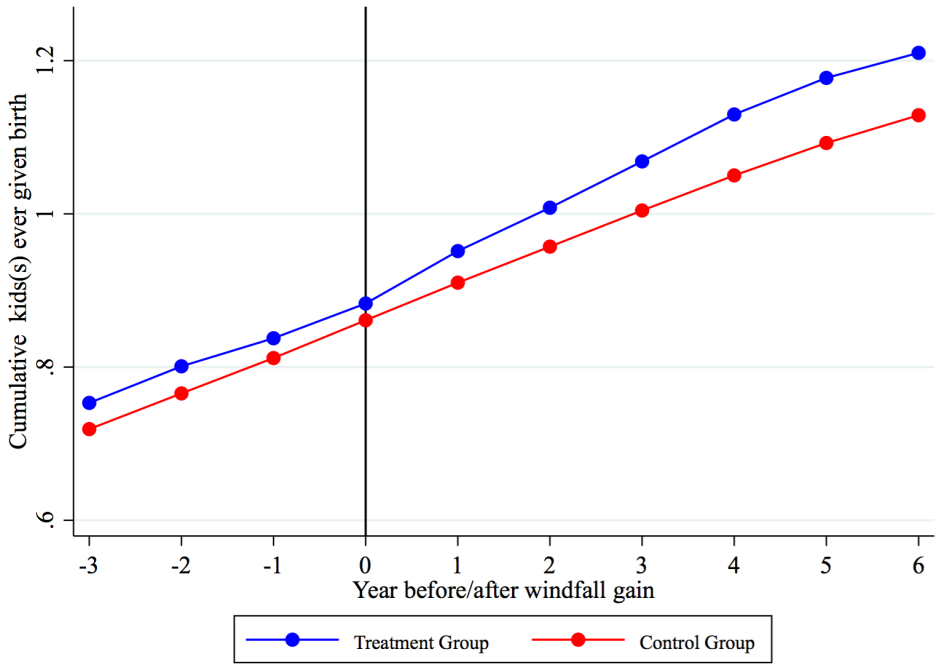
Increase in Total Fertility?

Event-Study Analysis: Give Birth



Increase in Total Fertility?

Raw Data: Cumulative Number of Children



Increase in Total Fertility?

Event-Study Analysis: Cumulative Number of Children

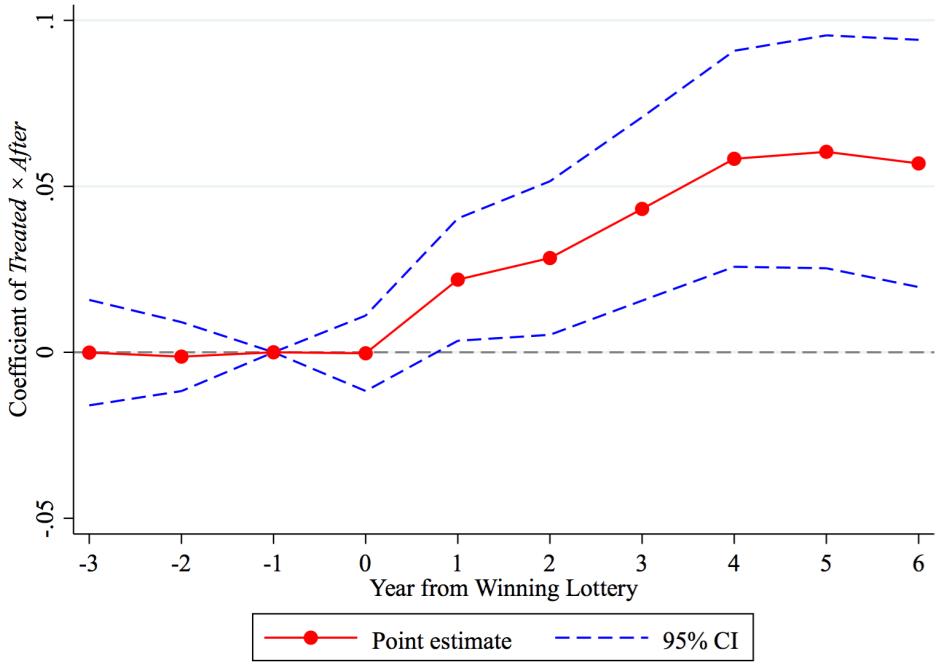
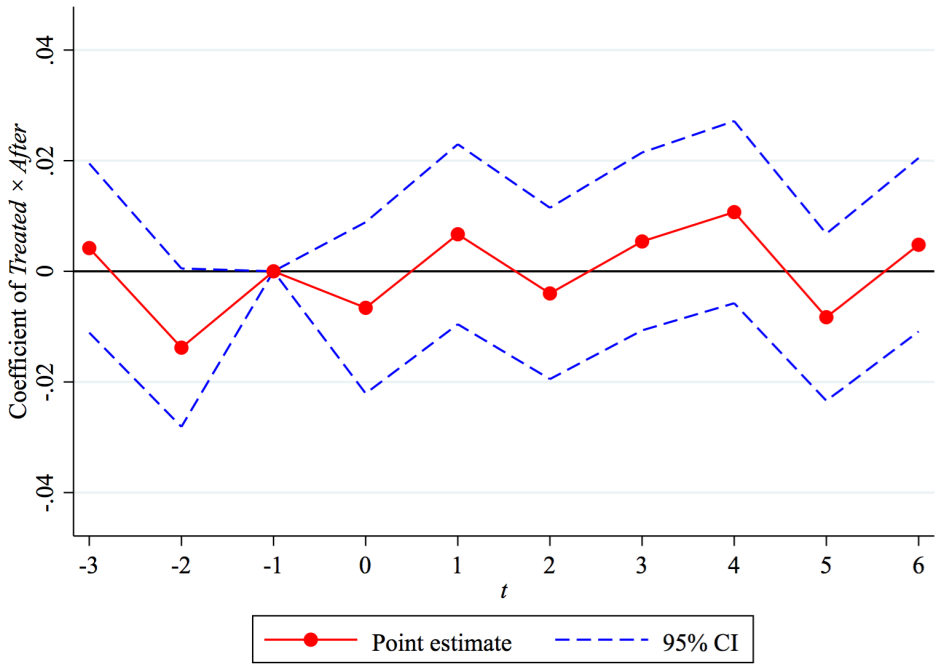


Table 6: Subgroup Analysis: By Average Age within Household

Dependent Variable:	Give Birth				
	Average Age within Household				
	(1) 20 to 25	(2) 25 to 30	(3) 30 to 35	(4) 35 to 40	(5) 40 to 45
Lottery	0.026	0.032	0.035*	0.034**	-0.002
	[0.025]	[0.023]	[0.020]	[0.014]	[0.009]
Base Line Mean	0.011	0.056	0.06	0.019	0.012
# of households	84,384	128,744	149,330	134,459	96,031
# of observations	168,768	257,488	298,660	268,918	192,062

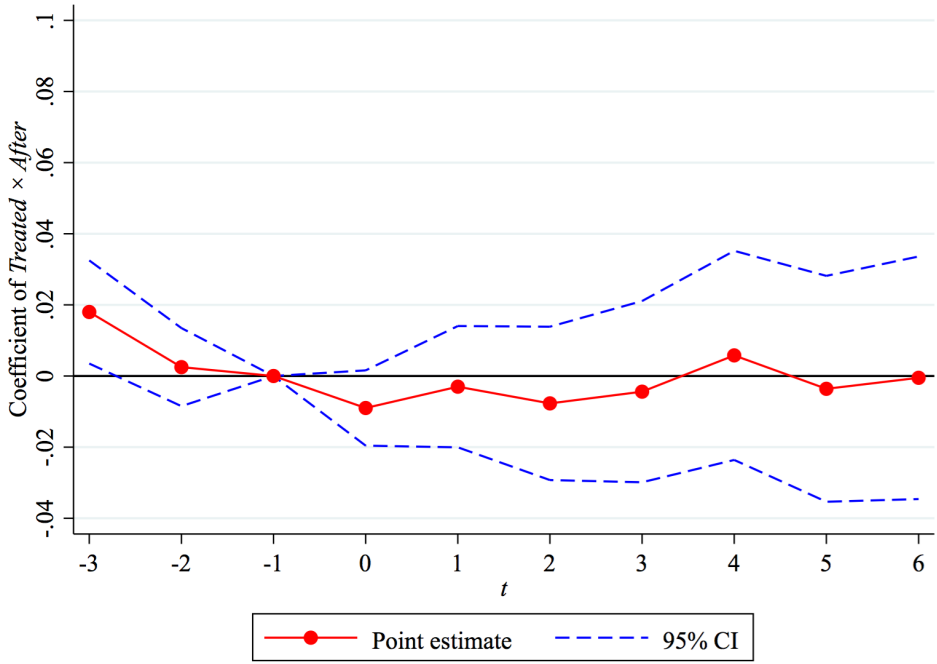
Placebo Test 1

Give Birth



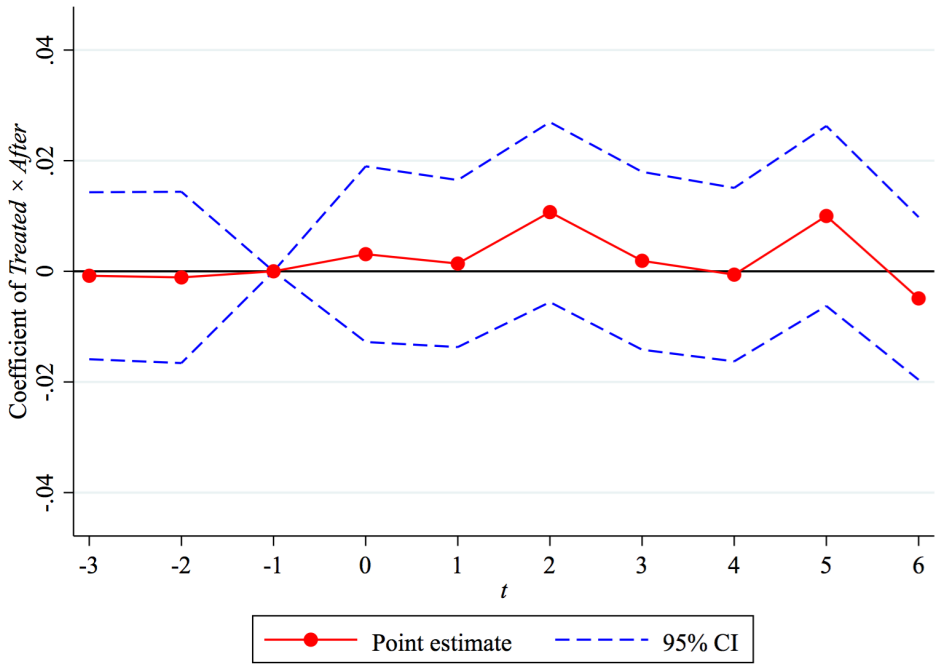
Placebo Test 1

Cumulative Number of Children



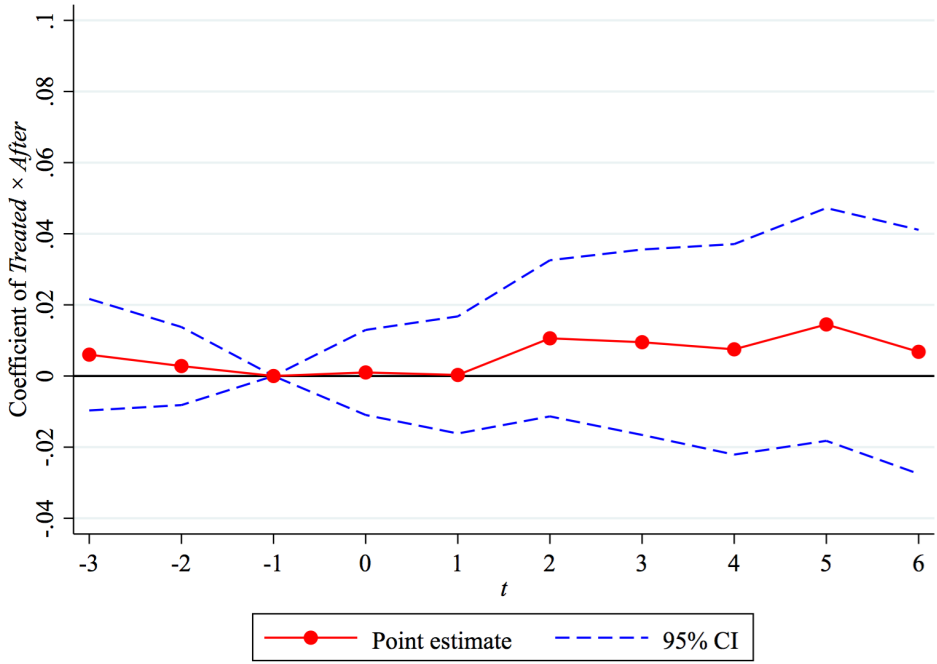
Placebo Test 2

Give Birth



Placebo Test 2

Cumulative Number of Children



Subgroup Analysis

By Financial Resources

Table 7: Subgroup Analysis: By Amount of Lottery Prize, Income, and Wealth

Dependent Variable:	Give Birth					
	Amount of Lottery Prize		Income		Wealth	
	(1) Prize <5M	(2) Prize >5M	(3) Low Income	(4) High Income	(5) Wealth <5M	(6) Wealth >5M
Lottery	0.012	0.045***	0.047***	0.009	0.031***	0.01
	[0.012]	[0.013]	[0.012]	[0.012]	[0.010]	[0.018]
Base Line Mean	0.044	0.027	0.017	0.053	0.035	0.042
# of households	592,402	592,238	296,473	296,475	485,005	107,943
# of observations	1,184,804	1,184,476	592,946	592,950	970,010	215,886

Subgroup Analysis

By Financial Resources

- Fertility responses only exist when a household receives a "sufficiently large" ($>$ 5 Million) windfall gain.
- Low-income and low-wealth households are more sensitive to positive wealth shock
  - A lack of financial resources (i.e. liquidity constraints) could explain why some households decide not to have a child.

Subgroup Analysis

By Households Characteristics

Table 8: Subgroup Analysis: By Cumulative Number of Children and Family Types

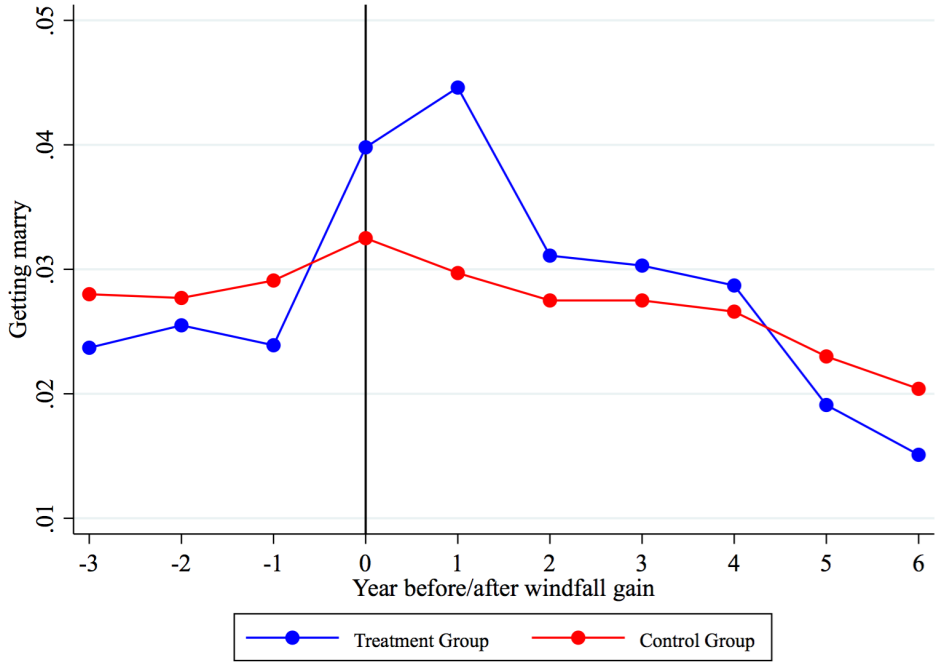
Dependent Variable:	Give Birth					
	Childbearing Status		Family Types			
	(1) Without Child	(2) With Child	(3) Unmarried	(4) Single Male	(5) Single Female	(6) Couple
Lottery	0.026**	0.030**	0.031***	0.033***	0.026**	0.019
	[0.010]	[0.014]	[0.008]	[0.011]	[0.013]	[0.017]
Base Line Mean	0.000	0.080	0.001	0.002	0.000	0.088
# of households	345,651	247,297	366,637	172,679	193,958	226,311
# of observations	691,302	494,594	733,274	345,358	387,916	452,622

Subgroup Analysis

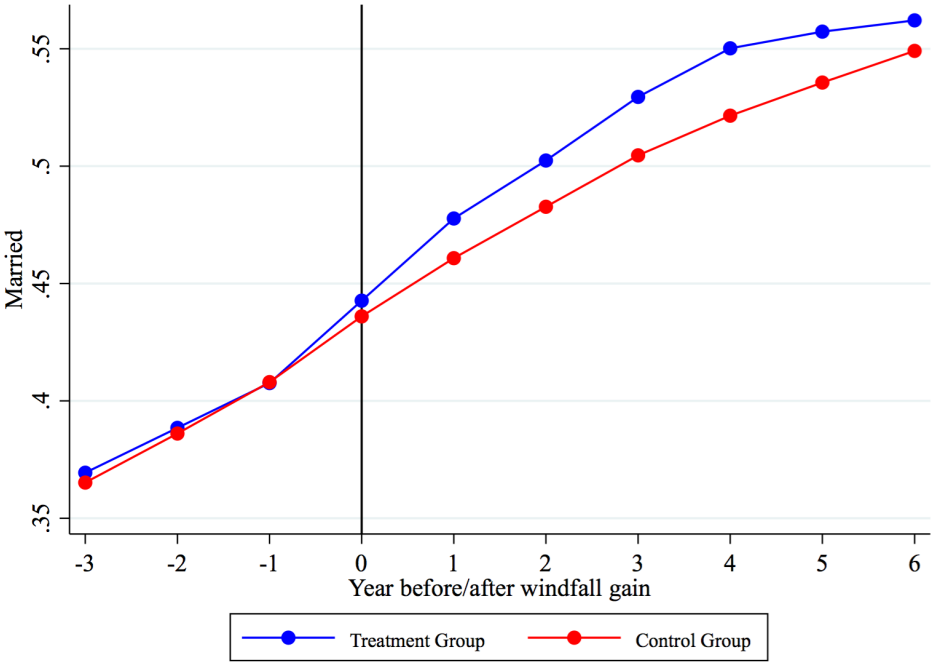
By Households Characteristics

- A large windfall gain affects both extensive and intensive margins of fertility.
  - The probability of having children for childless households increases by 2.6 percentage points.
  - For those who already have children, their probability of having another child also increases by around 3 percentage points after a positive wealth shock.
- Most fertility responses are driven by individuals who were single.

The Trend in Likelihood of Getting Married



The Trend in Share of Married People



Discussion and Conclusion

- Households' fertility decision is sensitive to income/wealth change
  - Children are normal goods
  - Large windfall gain (permanent change in wealth/income) is likely to increase the total fertility
- The estimated wealth elasticity of having children is around 0.11
  - Close to previous literature' results ranging from 0.13 to 0.18
- Only "sufficiently generous" ($>$ 5 Million NT$) cash transfer can encourage people to have children
  - Most of the policies might not take effect
- Such cash transfer program should target on economically disadvantaged households