The Effect of Financial Resources on Fertility: Evidence from Administrative Data on Lottery Winners

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Abstract

This study examines how financial resources affect fertility decisions by analyzing administrative data on lottery winners in Taiwan. Implementing a triple-differences design, we find that winning 5 million NT$ increases fertility by 0.06 children, with an implied wealth elasticity of 0.15. The effect primarily operates through childless individuals having their first child, while winners with existing children show smaller fertility responses but increase investments in child quality, such as purchasing homes in neighborhoods with better educational resources and funding overseas education. Additionally, about 29% of the fertility effect stems from increased marriage rates, particularly among male winners.

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1 Introduction

Global fertility rates have significantly declined over the past few decades (OECD, 2019b), raising concerns about aging populations and economic impacts (Bloom et al., 2010; Caldwell, Caldwell and McDonald, 2006; Sleebos, 2003). In response, many countries have implemented programs that provide financial incentives for having children. On average, public spending on these pro-natality incentives accounts for 1.1% of GDP in OECD countries (OECD, 2019a). The rationale behind these policies lies in the premise that people often do not accumulate sufficient wealth to afford the costs of raising children. Therefore, the enhancement of individual financial resources should theoretically increase the desire for more children. A seminal paper by Becker (1960) incorporated fertility decisions into an economic model, suggesting children are "normal goods," implying higher income should lead to increased fertility. However, cross-sectional evidence generally contradicts this prediction, indicating a negative relationship between income and fertility (Jones, Schoonbroodt and Tertilt, 2011; Gauthier, 2007; Jones and Tertilt, 2008). The gap between theory and cross-sectional evidence is due to the fact that identifying the causal effect of lifetime income on fertility suffers from various challenges. These include potential reverse causality, as children can reduce maternal income (Kleven, Landais and Søgaard, 2019; Sieppi and Pehkonen, 2019; Cortes and Pan, 2020; de Quinto, Hospido and Sanz, 2021; Berniell et al., 2021), and an individual's income and fertility decisions are often interdependent (Francesconi, 2002; Del Boca, 2002; Huttunen and Kellokumpu, 2016).

The ideal way to estimate the causal impact of financial resources is based on the fertility responses to randomly assigned changes in the lifetime income of individuals. Following this idea, we examine the fertility impact of large and unexpected wealth shocks induced by winning a lottery prize. Specifically, we exploit the richness of long panels of administrative data on more than 0.4 million lottery winners in Taiwan. This unique dataset enables us to track the same individuals over time, allowing us to investigate the effects of cash windfalls on fertility over a period of six years after lottery wins. Our empirical strategy is a triple-differences design that hinges on three variations: 1) observation times (pre- and post-winning); 2) the timing of the lottery win (current v.s. future winners); and 3) the amount of prizes (a continuous measure). Since future winners are individuals who will receive prizes in later years, their current fertility behavior should be unaffected by their future windfalls, making them serve as a control group to account for other factors that could affect fertility behavior. Additionally, we leverage the variation in prize amounts to estimate the per-dollar effect of the lottery winnings. Therefore, this design identifies the causal effects of lottery wins by comparing fertility trends between current and future winners who win different amounts of prizes.

We obtain three key findings. First, our results show that a 5 million NT$ ($\approx$ 165,000 US$) lottery windfall can significantly increase fertility. On average, winners would have an additional 0.06 children within six years of winning, indicating a roughly 20% increase relative to the baseline mean. The implied wealth elasticity of fertility is around 0.15, which is close to the estimates from previous research utilizing other resource shocks (Daysal et al., 2021; Ager and Herz, 2020; Alam and Pörtner, 2018; Huttunen and Kellokumpu, 2016; Lovenheim and Mumford, 2013; Black et al., 2013; Lindo, 2010). We further find that while larger prizes lead to greater fertility responses, the marginal effect of each additional dollar diminishes for extremely large winnings. Additionally, the fertility effect is more pronounced for individuals with lower pre-existing wealth levels, suggesting that financial constraints might play a role in reproductive decisions as individuals tend to have children only when they have accumulated sufficient resources to meet the anticipated costs of raising children.

Second, we find that receiving large cash windfalls increases fertility primarily by inducing childless individuals to have their first child (the extensive margin). By contrast, lottery wins have a smaller impact on subsequent births for those who already have children (the intensive margin). This aligns with Becker (1960)'s supposition that income elasticity for the quantity of children should be small when parents face a quality-quantity trade-off. Parents may choose to invest the lottery prizes in the human capital of their existing children rather than having additional offspring. To investigate this hypothesis, we focus on the sample of individuals who had children prior to winning the lottery and examine how they spend their winnings on investments in child quality. Our results reveal that lottery-winning parents are more likely to purchase homes in neighborhoods with a higher proportion of students attending prestigious universities. This suggests that these parents use their winnings to relocate to areas associated with better educational outcomes. Moreover, we observed that winning lottery prizes significantly increased the likelihood of sending children to study abroad, an option typically associated with higher costs and perceived as higher-quality education.

Lastly, given that fertility and marriage decisions are often interrelated (Upchurch, Lillard and Panis, 2002; Baizán, Aassve and Billari, 2003; Aassve et al., 2006; Marchetta and Sahn, 2016), especially in East Asian societies where people typically marry before having children (Myong, Park and Yi, 2021), we also investigate how cash windfalls affect people's decision to get married. Our results suggest that a 5 million NT$ windfall increases marriage rates by 3.8 percentage points. Notably, these effects are exclusively concentrated on single males, with no discernible impact on females' marriage decisions. To quantify how much of the fertility response is explained by changes in marriage, we implemented a causal mediation analysis (Hsia et al., 2021; Breivik and Costa-Ramón, 2022), which decomposes the total effect into direct and indirect components via the intermediate effect on marriage. Our findings reveal that approximately 29% of the overall fertility effect can be attributed to increased marriage rates. These results shed light on a mechanism whereby windfalls influence fertility decisions in part by making people more likely to get married (Malthus, 1798; Becker, 1960; Ahn and Mira, 2002).

Our paper contributes to the existing literature in several ways. Firstly, we provide new evidence on the causal effect of family resources on fertility decisions by utilizing a different source of wealth shocks — lottery-induced cash windfalls. Recent studies have employed plausibly-exogenous changes to family wealth or income to investigate this issue, such as utilizing variation from job displacement (Lindo, 2010; Del Bono, Weber and Winter-Ebmer, 2012; Huttunen and Kellokumpu, 2016; Halla, Schmieder and Weber, 2020), housing price (Lovenheim and Mumford, 2013; Dettling and Kearney, 2014; Atalay, Li and Whelan, 2017; Iwata and Naoi, 2017; Daysal et al., 2021; Affuso, Istiak and Swofford, 2022), natural resource shocks (Black et al., 2013; Brueckner and Schwandt, 2015; Alam and Pörtner, 2018; Kearney and Wilson, 2018; Ager and Herz, 2020; Hailemariam, 2024), and macroeconomic environment (Ananat, Gassman-Pines and Gibson-Davis, 2013; Schaller, 2016; Autor, Dorn and Hanson, 2019). For instance, Lovenheim and Mumford (2013) and Daysal et al. (2021) found that a 12,000 US$ increase in home value leads to a 2.11% and 2.35% higher fertility rate in the US and Denmark, respectively. Consistently, Lindo (2010) observed that a negative income shock from a husband losing his job significantly reduces total fertility.

Our study advances this body of work in several ways. First, lottery winnings provide a cleaner identification of income/wealth effects, with less concern about the influence of other mechanisms. For instance, as Daysal et al. (2021) noted, housing wealth can affect fertility through two main mechanisms with opposite effects: an increase in housing prices may encourage households to have more children due to a positive wealth effect, but it may also increase the cost of raising children (i.e., price effect) since housing is a major input to childbearing expenses, potentially discouraging fertility (Dettling and Kearney, 2014).[1] Similarly, job displacement not only affects income but also increases future uncertainty and alters time availability, complicating the analysis of income effects on fertility decisions (Huttunen and Kellokumpu, 2016).[2] Since lottery winnings do not directly affect the cost of

[1]For example, Liu, Liu and Wang (2023) examine the impact of home value on fertility in the context of China and identify a negative response. They argue that in developing countries, the relative importance of wealth and price effects may differ substantially from developed economies. The positive wealth effect is limited due to inadequate credit markets restricting home equity extraction. Meanwhile, the negative price effect may be more pronounced as homeowners are more likely to enlarge houses for newborns locally rather than moving, due to restricted labor mobility and relatively worse housing conditions. Consequently, they suggest that the fertility effect of a housing boom may be less positive or even negative in developing and emerging economies.

[2]Huttunen and Kellokumpu (2016) shows that when women lose their jobs, it has a stronger negative impact on fertility compared to when men lose their jobs, even though male job displacement leads to a

childbearing or time availability, the estimated effects from our study can be more confidently attributed to the pure income/wealth effect. Moreover, Taiwan's high lottery participation rate allows our estimated sample to be fairly representative.[3] Our estimated sample closely resembles the population in various characteristics (e.g., age, place of residence, income, and wealth). Finally, our study leverages registry data, which enables us to track fertility decisions and related outcomes (e.g., marriage, home buying, and college attendance) for many years following the wealth shocks. This comprehensive dataset allows us to analyze these interrelated outcomes within a unified empirical framework.

This study also contributes to the emerging literature on how lottery-induced wealth shocks affect fertility (Bleakley and Ferrie, 2016; Bulman, Goodman and Isen, 2022; Cesarini et al., 2023). Two contemporary studies using lottery data from the US (Bulman, Goodman and Isen, 2022) and Sweden (Cesarini et al., 2023) offer particularly relevant comparisons to this paper. Bulman, Goodman and Isen (2022) examine multiple outcomes, including home buying, marriage, and fertility. However, their study places greater emphasis on the effects of lottery winnings on home ownership and finds negligible impact on fertility. Similarly, Cesarini et al. (2023) examines how lottery winnings influence marital status and fertility but focuses more on marital outcomes. They find that a lottery win of approximately 100,000 US$ significantly increased cumulative fertility by 0.021 children within five years, aligning with our estimates.[4]

Our study advances this stream of literature in several important ways. First, we examine

greater reduction in family income. This suggests that the negative effect of job displacement on fertility may not be solely driven by income effects.

[3] This study examines two major lottery systems in Taiwan. The first is the Public Welfare Lottery, which has high participation rates — approximately 68% of adults (aged 18 and above) have purchased tickets at least once (Hsiao, 2013). The second is the Taiwan Receipt Lottery, where participation occurs automatically through everyday purchases when consumers receive invoices containing lottery numbers. For detailed descriptions of both systems, see Section 2 and Online Appendix A.

[4] Another relevant study is Cesarini et al. (2016), which uses the same Swedish lottery dataset as Cesarini et al. (2023). However, Cesarini et al. (2016) primarily focused on the effects of wealth shocks on child development, examining factors such as hospitalizations, drug prescriptions, and cognitive and non-cognitive skills. Their main text contained minimal discussion on the impact of lottery wins on fertility decisions (with results presented in the Online Appendix). Consequently, our primary point of comparison is Cesarini et al. (2023), which provides a more comprehensive analysis of the relationship between lottery winnings and fertility outcomes.

the effects of wealth on both fertility decisions and parental investments in children's human capital within a unified empirical framework. Our results suggest that the impact of lottery wealth on fertility is influenced by parents' considerations of the quantity-quality trade-off in children. Specifically, we observe that lottery winners with existing children tend to have fewer post-win children compared to childless winners, likely because they allocate windfall gains to child quality investments, such as purchasing homes in neighborhoods with better educational resources or funding overseas education. Relatedly, Bleakley and Ferrie (2016) examine how wealth impacts fertility and children's human capital using a land lottery that took place in Georgia in the early 19th century. They found that land lottery winners had slightly higher post-lottery fertility than losers. However, given the historical context, direct comparisons with research using modern data are challenging. For instance, they found no evidence of improved children's outcomes, possibly because winners invested in farmland, increasing children's opportunity cost of schooling through enhanced farm labor productivity.[5] Our study extends this work by examining how wealth shocks affect fertility decisions and child investments in a modern context. In our setting, confounding factors present in the 19th century, such as increased child labor value, are largely absent.

Second, our findings highlight the importance of considering the range of wealth shocks when comparing results across studies. We demonstrate that the marginal effect of lottery wealth on fertility decreases as the prize amount increases, suggesting that studies including extremely large windfalls might report smaller per-dollar effects compared to those focusing on more moderate wealth increases. While we find consistent positive effects on fertility across different prize ranges, the wealth elasticity of fertility decreases with larger prize amounts. This pattern may help explain some of the variation in estimated effects across

[5] Bleakley and Ferrie (2016) discussed this possibility in their analysis of Case 2 in Figure II (see page 1474). They suggest that if families used lottery winnings to buy more land, it could alter the optimal amount of schooling for their children. The opportunity cost of a child's time might increase if their labor became more productive on the family farm in a way that was imperfectly substitutable for hired labor. Conversely, a larger farm might also be a more complex enterprise, potentially increasing the returns to having an educated child. These competing effects could potentially explain the lack of observed impact on children's human capital in their historical context.

different studies.

Third, we provide a systematic comparison of lottery effects on fertility across different contexts, specifically focusing on the research using contemporary individual-level data (Bulman, Goodman and Isen, 2022; Cesarini et al., 2023). Building on the analysis from Daysal et al. (2021), we highlight two factors that might contribute to the varying impacts of cash windfalls on fertility: 1) the net price of having children and credit constraints; 2) the marriage and fertility relationship. For example, in Taiwan and Sweden, we observe substantial increases in fertility following cash windfalls, with approximately 20% to 40% of the fertility effect attributed to changes in marital status, primarily among male winners. Conversely, while lottery wins in the US did increase marriage probabilities, they did not significantly impact overall fertility, indicating an absence of the marriage mediation effect observed in Taiwan and Sweden.

The remainder of this paper is organized as follows. In Section 2, we discuss our data and the sample selection process. Section 3 presents our empirical strategy. Section 4 presents the main results and carries out robustness checks. Section 5 shows the heterogeneous effect of lottery wins. Section 6 illustrates the effect of cash windfalls on other related outcomes. Section 7 compares our results with the findings from previous studies, whilst section 8 provides concluding remarks and some future research recommendations.

2 Data and Sample

2.1 Data

We base our analysis on several administrative records: 1) Income registry file 2) Wealth registry file 3) Household registry file, and 4) College enrollment file, provided by Taiwan's Fiscal Information Agency (FIA). All files contain individual identifiers (i.e., scrambled personal ID), which allows us to merge them at the individual level.

Our lottery data is derived from the income registry file, which records all payments made to individuals on an annual basis. This file encompasses both third-party reported income sources and self-reported information. Third-party reported sources include wage income, interest income, pension income, and crucially for our study, lottery income. Self-reported information covers rental income, business income, and agricultural income.

Our data includes all lottery prizes above 2,000 NT$ (approximately 66 US$). For prizes above this amount, the awarding institutions are required to withhold a 20% tax and report the winnings to the FIA. During our study period, the Taiwanese government operated three main types of lotteries: the Public Welfare Lottery, the Taiwan Receipt Lottery, and the Taiwan Sports Lottery. We excluded Sports Lottery winners from our analysis because winning in sports betting may depend on the player's experience and judgment, rather than being purely based on chance.

The Public Welfare Lottery is highly popular in Taiwan, with approximately 68% of adults (aged 18 and above) having purchased a ticket at least once, according to the Social Intention Survey of Public Welfare Lotteries (Hsiao, 2013). Similarly, the Taiwan Receipt Lottery is also highly prevalent, as consumers automatically participate through everyday purchases when they receive invoices containing lottery numbers. While businesses with monthly revenue below 200,000 NT$ are exempt from issuing receipts, approximately 70% of businesses participate in the receipt system.[6] Essential service providers, including utility and telecommunications companies, consistently issue receipts due to their higher revenue levels, ensuring widespread receipt collection in daily transactions. Government data indicates that about 70% of winning receipts are redeemed (FIA, 2023), suggesting that most people retain their receipts and regularly check for winning numbers. For those interested in more details about the Public Welfare Lottery and Taiwan Receipt Lottery, please refer to the additional information in the Online Appendix A.

For each lottery winner, the income registry file provides the following information: the individual ID, the redemption amount, and the ID of the bank where the prize was redeemed.

[6] See https://www.fia.gov.tw/singlehtml/43?cntId=c881194d85ce4fc99561c898796f7ef6.

We utilize the bank ID to identify and exclude Sports Lottery winners, as each lottery game uses specific banks for prize redemption. When winners redeem their prizes, our data shows the total redemption amount. If someone redeems multiple prizes at the same time, we can only see their combined value, not the amount of each individual prize. Using this redemption information, we construct annual lottery income for each individual. Similar to other studies that obtain lottery winning records from tax return data (Golosov et al., 2024; Bulman et al., 2021; Bulman, Goodman and Isen, 2022), we don't have information on individual lottery ticket purchases or expenditures.

To measure individuals' financial resources, following Lien et al. (2021) and Chu, Kan and Lin (2019), we utilize the income registry file and wealth registry file to construct individual-level wealth data. The details for constructing this wealth dataset are discussed in the Online Appendix B. The data on demographics originate from the household registry file, which is yearly-based and contains the individual's gender, year of birth, location of birth, place of residence, year of marriage, spouse's ID, mother's ID, and father's ID. We use birth year and parents' IDs to construct the fertility outcome measure, i.e., the number of children that an individual has in a given year.[7] Using the marriage year and spouse's ID, we obtain the marital outcome of whether an individual is married or not.

We also utilize the wealth registry file to define home ownership. This file includes the location of houses, allowing us to connect home ownership with neighborhood quality. We define neighborhoods at the village level.[8] To measure the education quality of a neighborhood, we calculate the likelihood of the college-age population in the village attending top-ranking colleges, including top 1, top 5, and top 10.[9] Previous studies highlight significant variations in the likelihood of attending top universities and educational performance

[7]We have the record on birth father and mother, regardless of whether the parents are married when the children were born, as long as the biological father is identified and reported to the government. We do not have information on the biological father of an unmarried mother's child if the father was absent and unknown when at the child's birth.

[8]Taiwan has around 7,800 villages, with an average population of 3,000 per village. The village level roughly corresponds to the census tract level in the US.

[9]Taiwan has around 140 colleges. For top 1, top 5, and top 10 colleges, their enrollment accounts for roughly 1%, 3%, and 5% of the college-age population, respectively.

across different regions in Taiwan (Luoh, 2002, 2018; Chen and Liu, 2008). These disparities persist even when controlling for parental education and family income (Luoh, 2002). Therefore, the likelihood of attending top universities in the village serves as a reasonable proxy that reflects the educational opportunities of the neighborhood.

The college enrollment file includes two sources: 1) third-party reported college enrollment records from all domestic colleges in Taiwan and 2) self-reported college enrollment as listed as a deduction item on income tax returns. The second source includes both college attendance at domestic and overseas colleges. We use these data to define college attendance outcomes. The third-party reported data on domestic college enrollment are more comprehensive and cover the whole population, including those who do not file a tax return. However, self-reporting on college enrollment, which is our primary source for overseas study, only covers people who file a tax return. Based on our definition, around 1.5% of college-aged people in our sample are categorized as studying abroad, which is quite close to the government statistics.[10]

2.2 Sample

We impose several restrictions to construct the estimation sample. First, individuals must be aged 20–44—the primary childbearing years—at the time of winning. Second, we exclude individuals who died during the study period, thus creating a balanced panel. Third, to maintain comparability with two concurrent lottery studies (e.g., Bulman, Goodman and Isen (2022) and Cesarini et al. (2023)),[11] we exclude winners who won an extremely large prize above 50 million NT$ ($\approx$ 1,670,000 US$). In robustness checks, we use alternative cut-offs from 10 million to 150 million NT$ for the maximum prize amount.

Fourth, we limit the sample to those who first won lottery prizes of at least 5,000 NT$ in

[10] According to statistics from the Ministry of Education (MOE), Taiwan, around 57 thousand students are currently studying abroad, accounting for roughly 1.5% of the population of college students.

[11] Bulman, Goodman and Isen (2022) exclude prizes above 500,000 US$. Cesarini et al. (2023), while they do not exclude large prizes, the maximum prize in their analysis is 50,000 SEK per month for 50 years—leading to a roughly 1,800,000 US$ total prizes given a 2% discount rate.

the study period. This restriction makes our estimation sample representative of the broader population, based on observable characteristics, and allows us to control for previous lottery winning times. Finally, we track these individuals over 10 years, from 3 years before to 6 years after winning. The sample period is from 2004 to 2018. The final sample contains over 406,922 lottery winners across a wide range of windfall amounts. Table C1 in the Online Appendix C displays the distribution of lottery prizes. The amount of lottery wins is on a post-tax basis and adjusted to 2016 NT$ using the Consumer Price Index (CPI).

Table 1 compares individual characteristics across samples defined by different minimum prize thresholds (2,000, 5,000, and 50,000 NT$) and contrasts these with the general Taiwanese population aged 20–44 during the sample period.[12] These characteristics are measured in the year before the lottery win, and all monetary values are adjusted to 2016 NT$ using the CPI. Our main analysis focuses on winners whose first win exceeds 5,000 NT$. With this threshold, we find that the gender distribution in our sample closely mirrors that of the general population. Specifically, this restriction results in a sample comprising 52% female participants, very close to the 50% observed in the broader population. In robustness checks, we test different minimum prize thresholds: 2,000 NT$ (the smallest observable prize) and 50,000 NT$. Our main results remain similar across these different thresholds.

Overall, lottery winners in this main sample are broadly similar to the general Taiwanese population aged 20–44, with some slight differences. Most income and wealth-related variables are comparable between winners and the general population. Winners are slightly older on average (31.9 vs. 31.4 years), with correspondingly higher rates of marriage (46% vs. 41%) and more children (0.88 vs. 0.82). In our robustness checks, we employ post-stratification weights to match our lottery sample with the general population across these characteristics. Our main findings remain unchanged with this reweighted sample.

[12] We utilize all individuals aged 20–44 from 2007–2012 to construct population data. The sample size is around 11 million observations. For each individual, we randomly assign one year between 2007–2012 as a placebo "winning year." We then use their individual characteristics from the year prior to this randomly assigned placebo winning year in our analysis.

3 Identification Strategy

In this section, we introduce our identification strategies that establish causal inferences about how the receipt of lottery prizes affects people's fertility behaviors. Before formally introducing our regression model, we first explain the basic intuition behind our research design.

Intuition of Research Design. The intuition behind our identification strategy can be understood through three steps. To begin with, one natural starting point is a first-differences design that utilizes changes in fertility behavior before and after lottery wins. This approach relies on the assumption of no other time-varying factors affecting fertility decisions except lottery wins. Figure 1a illustrates this idea by plotting the evolution of total children ever born for winners of prizes exceeding 1 million NT$ (solid line, circle symbol). The y-axis shows the average cumulative number of children in the year relative to the base year (one year before winning) for these lottery winners. The x-axis represents event time relative to the winning year (denoting 0 in the x-axis), spanning from 3 years before to 6 years after winning. We observe a modest acceleration in fertility trend after winning compared to the pre-winning period, with these lottery winners having 0.317 more children on average six years after winning compared to the base year.

However, the first-differences estimate may be confounded by time-varying factors beyond lottery winnings that affect fertility decisions, such as changes in economic conditions or shifts in attitudes toward childbearing. To address these concerns, inspired by Golosov et al. (2024), we then incorporate a control group consisting of future lottery winners—individuals who won substantial prizes in later years. Figure 1b adds future winners who won over 1 million NT$ (dashed line, square symbol). For these future winners, we define their "placebo" winning year as six years before their actual winning year. Three key insights emerge from this comparison. First, pre-winning fertility trends of current and future winners are virtually identical, suggesting that future winners' fertility trends could serve as a plausible counterfactual for current winners in the absence of lottery wins. Despite not receiving any lottery prizes during this period, future winners also experienced an average increase of 0.254 children in their cumulative fertility from the base year to six years after their placebo winning year. Second, following the receipt of lottery prizes by current winners, fertility trends begin to diverge between current and future winners. Third, the effect persists for at least 6 years after winning. In our sample, lottery winners who won over 1 million NT$, on average, received 4.7 million NT$. Hence, when considering the fertility rates of future winners over the same period, a simple difference-in-differences (DID) estimator—calculated as the difference in fertility changes between current and future winners (0.317 v.s. 0.254)—indicates that winning the lottery of roughly 5 million NT$ increases fertility by 0.063 children.

While this simple DID estimate provides a transparent illustration of our identification strategy, it has two limitations. First, the binary treatment definition masks rich variation in prize amounts. Second, comparing our estimates with existing literature is challenging since prior studies typically report per-dollar effects of wealth shocks (Lovenheim and Mumford, 2013; Daysal et al., 2021; Bulman, Goodman and Isen, 2022; Cesarini et al., 2023). To address these limitations, our main specification further exploits the variations in prize amounts, which is essentially a triple-differences (DDD) design that leverages three sources of variation: 1) observation times (pre- and post-winning); 2) the timing of the lottery win (current v.s. future winners); and 3) the amount of prizes (a continuous measure).[13] This design can also be viewed as a DID estimate that varies across the distribution of winnings, as we compare the difference in outcomes before and after the lottery win between current winners and future winners while allowing this effect to vary with the size of the prize won.

Empirical Specification. To formalize this triple-differences design, we implement an event-study specification that traces the dynamic effects of lottery wins on fertility outcomes.

[13] While the typical DDD design usually relies on dichotomous variation, it's worth noting that a triple-differences design can incorporate continuous variables as one of the variations (in our study, this is the prize amount). This approach is also evident in studies by Hoynes, Schanzenbach and Almond (2016) and Reddig (2024), where one of the variations is continuous.

Specifically, we estimate the following regression model:

$$\begin{aligned}
B_{it} = \alpha_0 Prize_i + \alpha_1 Current_{i,\ell} + \alpha_2 Prize_i \times Current_{i,\ell} + \sum_{s \neq -1} \kappa_s \cdot \mathbf{I}[t = \ell + s] \\
+ \sum_{s \neq -1} \lambda_s \cdot Prize_i \times \mathbf{I}[t = \ell + s] + \sum_{s \neq -1} \beta_s \cdot Current_{i,\ell} \times \mathbf{I}[t = \ell + s] \\
+ \sum_{s \neq -1} \gamma_s \cdot Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + s] + a_{it} + \theta_t + \boldsymbol{X_i}\psi + \varepsilon_{it}
\end{aligned} \tag{1}$$

The outcome of interest, represented by B_{it}, is the cumulative number of children that an individual i ever has at observation year t. $Prize_i$ denotes the amount of individual i's first lottery win, measured in units of 5 million NT\$ ($\approx$ 165,000 US\$). $Current_{i,\ell}$ is a dummy variable equal to 1 if individual i is a current winner who first won lottery prizes during 2007–2012 (year ℓ), and equal to 0 if the individual is a future winner who first won lottery prizes during 2013–2018 (year $\ell + 6$). For future winners, ℓ is a "placebo" winning year determined by subtracting 6 from their actual first winning year. Event time dummies $\mathbf{I}[t = \ell + s]$ indicate whether the observation year t is s years before or after the (placebo) lottery winning year ℓ, where $s = -3, -2, 0, 1, 2, 3, 4, 5, 6$. For instance, $\mathbf{I}[t = \ell + 1]$ equals one if the observation is from the first year after the lottery-winning year. Our sample comprises a balanced panel of individuals observed annually from three years pre-winning ($s = -3$) to six years post-winning ($s = 6$). We normalize the event time dummy coefficients at the baseline year ($s = -1$) to zero.

We fully interact $Current_{i,\ell}$ with prize amount $Prize_i$ and event time dummies $\mathbf{I}[t = \ell + s]$. Our specification includes two key sets of interaction terms that control for potential confounding trends. First, the interaction terms $Prize_i \times \mathbf{I}[t = \ell + s]$ account for differential fertility trends between winners of larger versus smaller prizes. These controls are crucial because our data, similar to studies using tax return data (Golosov et al., 2024; Bulman et al., 2021), lacks information on lottery ticket purchases and expenditures that could help us control for potential non-randomness in winning amounts. For example, urban residents might have better access to lottery retailers and purchase more tickets than rural residents, potentially leading to systematic differences in winning amounts.

Table C2 in Online Appendix C examines whether lottery prize amounts are correlated with winners' pre-lottery characteristics. While we find no significant correlation between prize amounts and most pre-lottery characteristics—including employment status, earnings, wealth, and previous fertility outcomes—the results show that certain demographic characteristics are associated with prize amounts. Specifically, males and urban residents tend to win slightly larger prizes. However, these correlations are modest in magnitude: among current winners, males win on average only 13,126 NT$ more than females, and urban residents win merely 4,465 NT$ more than non-urban residents. Similar patterns emerge among future winners, where male winners receive 29,391 NT$ more than female winners, and the urban-rural difference is 8,833 NT$. The fact that both current and future winners exhibit similar patterns in how prize amounts correlate with individual characteristics supports our use of future winners as a control group to account for potential differences in fertility trends between winners of larger versus smaller prizes.

Second, the interaction terms $Current_{i,\ell} \times \mathbf{I}[t = \ell + s]$ control for differential fertility trends between current and future winners. Table C3 in the Online Appendix C compares the characteristics between these two groups and reveals that while most characteristics are comparable, current winners are, on average, older than future winners—a pattern also documented in Golosov et al. (2024). This age gap leads to corresponding differences in life-cycle variables such as marriage rates and cumulative number of children. Including these interaction terms helps isolate the causal effect of lottery wins by accounting for any underlying differences in fertility patterns between current and future winners. Additionally, we conduct a robustness check in Section 4.2 by reweighting future winners to match the age distribution of current winners, and our main results remain unchanged.

The key identification variables in regression (1) are the third-level interactions: event time dummies $\mathbf{I}[t = \ell + s]$ interacted with current winner dummy $Current_{i,\ell}$ and prize amount $Prize_i$. Its coefficients γ_s measure the effect of a 5 million NT$ windfall on the outcome of interest. Since age is a crucial factor influencing an individual's fertility behavior, we include age fixed effects (a_{it}) for the lottery winner in all specifications. These effects control for underlying life-cycle fertility trends in a non-parametric way. We also include year fixed effects (θ_t) to account for macroeconomic impacts and general fertility patterns in Taiwan. Our models incorporate several pre-determined covariates ($\boldsymbol{X}_i$) measured in the year before lottery winning, including the frequency of lottery prize redemptions before an individual's first significant win. While we cannot directly observe ticket purchases, this redemption frequency serves as a proxy for lottery participation intensity, as frequent players are more likely to have multiple redemptions.[14] The error term in our model is represented by ε_{it}. As we follow individuals over time, we cluster standard errors at the individual level in all regressions to account for potential serial correlation.

4 The Effect of Cash Windfalls on Fertility

4.1 Main Results

In this section, we discuss the main results. Figure 2 shows the estimated γ_s of our DDD regression (Equation (1)), i.e., the effect of a 5 million NT$ windfall on cumulative fertility. First, we find that the estimated coefficients in the pre-winning period ($s = -3, -2$) are very small and statistically insignificant, thereby suggesting that pre-trends run parallel. Consistent with the graphical evidence in Figure 1, the estimated γ_s indicates that the receipt of a large cash windfall can stimulate fertility immediately, and the effects persist for at least 6 years.

[14]The other covariates include: dummy variables for the winner's city/county of residence; a dummy variable indicating the winner's marital status; a dummy variable indicating employment status of the winner or their spouse; average household earnings per capita; average household income per capita; average household wealth per capita; number of children in the year prior to winning. Note that we define the "lottery winning year" as the year when an individual first won a prize of at least 5,000 NT$. Winners may have had smaller wins (below 5,000 NT$) before this.

Since our primary focus is on the total number of children, we use the estimate from the sixth year after the lottery win ($s = 6$) to capture the effect of lottery winnings on fertility. Table 2 presents the DDD estimates accordingly. We begin by reporting the estimate from a basic model without any controls (Column (1)). We then progressively introduce fixed effects for the winner's age, year-fixed effects, individual characteristics prior to the win, number of children prior to the win, and past lottery redemption history (Columns (2) to (6)). The stability of the estimates across various specifications is reassuring and provides robustness to our results.

Our preferred specification is Column (6) in Table 2, which includes all covariates. It indicates that winning a prize of 5 million NT$ leads to a significant increase in the number of births by 0.063. This means that for every 100 winners of 5 million NT$, 6 more children were born by the sixth year following the win compared to what would have occurred without receiving a major prize. This represents a 20% increase over the baseline change in the number of children born between s=-1 and s=6 for the comparison group (i.e., future winners).

To evaluate the sensitivity of fertility behaviors to wealth changes, we calculate the elasticity of fertility with respect to wealth. For consistency, we use the wealth change of future winners (the comparison group) between one year before and six years after the lottery-winning year as our baseline wealth change. This approach mirrors our method for measuring fertility changes, where we consider the cumulative number of births over the same period. The change in household wealth between $s = -1$ and $s = 6$ for future winners is approximately 3.88 million NT$. We use this figure as the potential wealth accumulation for treated individuals had they not received a cash windfall. Consequently, winning a 5 million NT$ prize represents a 128% increase in potential wealth accumulation for current winners (the treatment group). Based on these calculations, our results suggest a wealth elasticity of fertility of about 0.15. This result aligns with the estimates from previous studies utilizing various income or wealth shocks.[15]

In the Online Appendix D, we also utilize an alternative approach to compute wealth elasticity by comparing lottery wealth to lifetime income flows (from the age of lottery win to retirement age). This method yields a slightly larger elasticity of fertility with respect to the wealth of approximately 0.18–0.37 (see Figure D1). To sum up, our results demonstrate a positive effect of cash windfalls on fertility. The positive income/wealth effect is consistent with the central proposition made by the neoclassical economic theory of fertility, in that children are normal goods, as proposed by Gary Becker (Becker, 1960, 1965).

4.2 Falsification Tests and Robustness Checks

In this section, we first implement a series of falsification tests for our preferred specification (i.e., Column (6) in Table 2). Specifically, we randomly permute lottery prizes and attach them to each winner. Then, we use these "pseudo" prizes to define variable $Prize$ and estimate Equation (1). We repeat the above procedures 1,000 times to obtain the distribution of pseudo estimates. Figure 3a compares the real estimate (bold line with circle symbol) with these fake ones (thin lines, gray in color). The result suggests that the real estimates of γ_s are much larger than the pseudo ones in the post-winning period. As we mainly focus on the estimated coefficient of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$, which summarizes the effect of a lottery win on total fertility, Figure 3b illustrates real estimates (vertical line) and the distribution of pseudo ones (histogram) for γ_6. The result suggests that the real γ_6 estimate is exceptionally larger than any fake one. Specifically, the permutation p-value is 0.003. In sum, the placebo test confirms that significant estimates in our main results are unlikely to be chance findings.

In the Online Appendix E, we conducted several robustness checks, including adjusting

[15] For example, Lovenheim and Mumford (2013) use shock in housing values in the US and find wealth elasticity in relation to the fertility of 0.13. Atalay, Li and Whelan (2017) use shock in housing values in Australia and concludes a wealth elasticity of fertility of 0.24. Ang et al. (2024) use housing values shock driven by home mortgage policy in China and identifies a wealth elasticity of 0.18. Whittington, Alm and Peters (1990) use income shock triggered by income tax cuts in the US and find an income elasticity in relation to the fertility ranges from 0.13 to 0.25.

the range of lottery win amounts, reweighting the sample to match general population characteristics, controlling for male and female age fixed effects, incorporating individual fixed effects, and using a sample of one-time winners only. All these checks are consistent with our main findings. Moreover, to address concerns raised by recent studies (De Chaisemartin and d'Haultfoeuille, 2020; Callaway and Sant' Anna, 2021; Goodman-Bacon, 2021; Baker, Larcker and Wang, 2022; Sun and Abraham, 2021) about potential bias in conventional difference-in-differences estimates due to heterogeneous treatment effects across cohorts, we estimated the lottery effect separately for each winning year cohort (2007–2012) and then averaged these estimates, weighted by cohort size. This approach avoids comparing observations from different treatment timings and mitigates potential bias from a staggered difference-in-differences design. Additionally, in the Online Appendix F, we follow the research design in Golosov et al. (2024) that combines a staggered difference-in-differences design and instrumental variables approach to estimate the effect of lottery wealth on fertility. The results from these checks align closely with our main findings, further confirming the robustness of our estimates.

5 Heterogeneous Effects

5.1 By Age Groups

Our main results could reflect either shifts in fertility timing or changes in total lifetime fertility. To explore this distinction, we examine heterogeneous responses by age groups in Figure 4. Young winners are defined as those aged 20–29 when they won the lottery prize (see Figure 4a). Middle-aged winners are those aged 30–44 at the time of winning (see Figure 4b).

Figures 4a and 4b present the estimated effect of winning a 5 million NT$ prize on fertility for young and middle-aged lottery winners. Both age groups exhibit significant increases in fertility, with young winners having 0.1 more children and middle-aged winners having 0.05

more children by the sixth year after winning the lottery. The larger effect for young winners aligns with expectations given declining fertility rates with age. Middle-aged winners average 36 years old prior to winning and reach 43 by the end of the sample period, when fertility rates are typically low. Despite this biological constraint, their fertility continues to increase through the sixth year, suggesting the lottery windfall raises their lifetime fertility.

In Figure C1 of Online Appendix C, we replicate the core analysis focusing on four lottery-winning cohorts who won their first prize between 2007 and 2010. This sample selection enables us to follow winners for up to eight years after winning. The effect of lottery wins on fertility remains positive and statistically significant ($p < 0.05$) throughout the extended period. This persistence suggests lottery wins might lead to permanent increases in total fertility rather than merely shifting the timing of childbearing.

5.2 By Prize Amounts

To calculate a per-dollar effect and provide concise estimates, our main analysis uses a continuous measure of lottery winnings with a linear functional form. We also exclude prizes exceeding 50 million NT$ to facilitate comparisons with other lottery win studies. In this section, we relax both restrictions by categorizing prizes into bins and including extremely large wins. This analysis serves two purposes: First, it enables us to explore the threshold level of resources needed to impact fertility decisions. Second, it allows us to examine effects across different prize ranges without imposing functional form assumptions. To implement this analysis, we modify our original equation by replacing the continuous measure of lottery wins ($Prize$) with a series of binary indicators $\mathbf{I}[Size = k]$ representing different prize ranges: 1) 10 to 50 thousand NT$; 2) 50 to 500 thousand NT$; 3) 500 thousand to 5 million NT$; 4) 5 to 50 million NT$; and 5) 50 million NT$ or more. We use winners of 5 to 10 thousand NT$ as the reference group.

Table 3 presents the estimated coefficients of $Current_{i,\ell} \times \mathbf{I}[Size = k] \times \mathbf{I}[t = \ell + 6]$. We focus on the estimates from the sixth year after the lottery win ($s = 6$) to summarize the effects of lottery winnings on fertility. Our analysis reveals a heterogeneous fertility response to windfall gains, which varies according to the magnitude of the lottery prize. For smaller wins between 10,000 and 5 million NT$, the effect on fertility is modest, with estimated increases of about 0.008 to 0.036 in the cumulative number of births. However, the statistical significance of these results can change depending on which control variables we include in the regressions. For larger wins between 5 and 50 million NT$, we observe a more substantial and significant effect, with an increase of about 0.1 in the cumulative number of births. Jackpot wins over 50 million NT$ show the largest impact, increasing the cumulative number of births by approximately 0.275. These results suggest that there might be a threshold amount of money needed to significantly influence fertility outcomes, with the impact becoming more pronounced for wins above 5 million NT$.

Although bigger lottery wins generally lead to larger increases in fertility, the impact of each additional dollar on fertility may decrease for larger prize amounts. This could be due to biological limits on the number of children a family can have, as well as the diminishing marginal utility of each additional child. To examine this issue, Figure C2a of the Online Appendix plots the estimated coefficients for each prize range dummy (y-axis) against the average prize in each range (x-axis). We divided lottery prizes more finely into 10 groups. We find that as the prize amount increases, the effect on fertility also increases. However, for very large prizes, we observed that the rate at which fertility increases starts to slow down a bit. In other words, while winning more money still leads to more children, the extra increase in fertility becomes smaller for extremely large prize amounts. Due to the extremely high average amount for very large prizes (over 50 million NT$), Figure C2a shows a clustering of points at the lower end of the x-axis, making it difficult to discern differences among these lower prize ranges. To address this issue, Figure C2b also presents a version with the x-axis in the logarithmic scale.

Table 3 presents wealth elasticity estimates for different prize ranges. These estimates show a consistent pattern: as prize amounts increase, the wealth elasticity of fertility decreases. This means that while larger wins do lead to more children, the proportional increase in fertility becomes smaller relative to the increase in wealth. However, it's important to note that for prize groups below 5 million NT$, the estimated effects are not statistically significant in some specifications, warranting caution in interpretation.

An interesting comparison emerges when we look at the group with prize amounts between 5 to 50 million NT$. In this group, the average winning amount is approximately 8 million NT$. This figure is comparable to the effect we estimated for a 5 million NT$ win in our main analysis, which used a sample of winners below 50 million NT$. We find that the elasticity values estimated by these two different specifications are similar, both around 0.15.

Our findings show that the marginal effect of lottery wealth on fertility decreases as the prize amount increases. This has important implications for comparing results across different studies. To better understand how our estimates change with different prize ranges, Figure C3 in the Online Appendix illustrates our estimates for prize ranges from 10 million to 150 million NT$. We find that including extremely high prizes does reduce the estimated effects on fertility, but the effects remain positive and statistically significant. This analysis demonstrates the importance of considering the range of wealth shocks used in each study when comparing results across different research. Studies that include extremely large windfalls might report smaller per-dollar effects compared to those that focus on more moderate wealth increases. To ensure comparability between studies, it is crucial to consider similar ranges of wealth shocks.

5.3 By Financial Resources

In this section, we examine whether the effects of cash windfalls on fertility vary based on an individual's financial status. Table 4 presents heterogeneous effects relative to individual financial resources. The results in Columns (1) and (2) suggest that individuals with no deposits are primarily responsible for the positive fertility effect of cash windfalls. For winners without deposits, receiving a 5 million NT$ lottery prize significantly increases the cumulative number of children by 0.085 in the sixth year after winning (Column (1)). In contrast, the estimate in Column (2) indicates that fertility responses are small and statistically insignificant for those with cash on hand. The difference between these two groups is statistically significant.

Similar results are observed when we define financial resources by liquid assets (deposits plus stocks). Columns (3) and (4) reveal that the positive fertility effect of windfalls is primarily driven by individuals with zero liquid assets prior to winning. Those with no liquid assets experienced a 0.1 increase in the number of children in the sixth year after winning (Column (3)). Conversely, those with some liquid assets showed no significant effect from receiving a lottery prize. Columns (5) and (6) yield consistent results when using real estate values (estimated market price of owned real estate minus house loan debt). Overall, the evidence demonstrates a pattern of larger fertility responses for individuals with fewer pre-existing financial resources. These findings suggest that credit constraints may play a role in fertility decisions, as individuals with limited financial resources respond more strongly to cash windfalls, potentially indicating that they were previously unable to achieve their desired fertility due to financial limitations.

5.4 By Parenthood Status

To examine whether cash windfalls influence fertility through either the extensive margin (having children or not) or the intensive margin (having additional children), we investigate heterogeneous effects of lottery wins by parenthood status. Columns (1) and (2) of Table 5 compare estimated effects for individuals with and without children in the year preceding their lottery win ($s = -1$). The results reveal that the main effect is primarily driven by the extensive margin. Specifically, childless individuals receiving a 5 million NT$ windfall have 0.102 more children by the sixth year after winning. By contrast, for individuals who already have children, the windfall only increases their number of children by 0.032. The difference in effects between these two groups is statistically significant.

Parenthood and marital status are closely linked, as childless individuals are typically unmarried. Columns (3) and (4) explore fertility responses by marital status. Consistent with the parenthood results, the fertility increase primarily comes from single individuals (Column (3)), with married couples showing only half the effect size (Column (4)). The final two columns of Table 5 combine parenthood and marital status to examine how lottery wins affect couples with and without pre-win children. Childless couples show strong fertility responses: a 5 million NT$ windfall increases their number of children by 0.178 by the sixth year after winning. In contrast, couples with existing children show no significant fertility response to prize money.

Our results demonstrate that cash windfalls raise fertility primarily along the extensive margin, with larger effects for childless individuals compared to those who already have children. This pattern aligns with findings from other studies (Daysal et al., 2021; Bulman, Goodman and Isen, 2022; Cesarini et al., 2023).[16] These results align with Becker's conjecture that income elasticity of child quantity should be small when parents face quantity-quality trade-offs (Becker, 1960, 1965; Becker and Lewis, 1973; Doepke, 2015; Li, Zhang and Zhu, 2008). To further test this hypothesis, we next examine whether parents invest their lottery winnings in child quality, measured through home purchases in neighborhoods with good educational environments and through their children's college attendance.

[16] Daysal et al. (2021) found that while the effect of house price increases on fertility is largest for first-time mothers in Denmark, there are also "statistically significant and sizable impacts... for families with one, two, and 3+ existing children." (see Table 5 of their paper). Moreover, Cesarini et al. (2023) also found that only those without children before winning were affected, while those with children showed no significant effect in Sweden (see Online Appendix Table A.9 of their paper). Similarly, Bulman, Goodman and Isen (2022), using US lottery data, also found that winning had a greater impact on the fertility behavior of those without children prior to winning (see Table 8 of their paper).

6 The Effect of Cash Windfalls on Other Related Outcomes

6.1 Investment in Children's Quality

Our findings suggest that lottery windfalls have a smaller impact on fertility among parents who already had children before winning. According to Becker's theory of fertility, parents often face a trade-off between the quantity and quality of children when making family planning decisions (Becker, 1960, 1965; Becker and Lewis, 1973; Doepke, 2015; Li, Zhang and Zhu, 2008). With additional financial resources, parents may prioritize enhancing their existing children's quality rather than increasing family size. This motivates us to further investigate whether these parents invest their cash windfalls in their existing children's quality.

To test this hypothesis, we examine whether lottery winners improve their children's educational environment by purchasing homes in neighborhoods with a higher proportion of students attending top universities. We estimate the following regression model:

$$\begin{aligned} H_{it} = {} & \alpha_0 Prize_i + \alpha_1 Current_{i,\ell} + \alpha_2 Prize_i \times Current_{i,\ell} + \sum_{s \neq -1} \kappa_s \cdot \mathbf{I}[t = \ell + s] \\ & + \sum_{s \neq -1} \lambda_s \cdot Prize_i \times \mathbf{I}[t = \ell + s] + \sum_{s \neq -1} \beta_s \cdot Current_{i,\ell} \times \mathbf{I}[t = \ell + s] \\ & + \gamma \cdot Current_{i,\ell} \times Prize_i \times Post_{t,\ell} + a_{it} + \theta_t + \boldsymbol{X_i} \psi + \varepsilon_{it} \end{aligned} \tag{2}$$

Most notations in Equation (2) remain the same as in Equation (1), but there are key differences. First, the outcome of interest, H_{it}, indicates whether parents own a house in a neighborhood where students have a higher likelihood of entering top universities. To define a "better" neighborhood, we calculate the proportion of students from each village who enroll in top universities and use the median of these proportions across all villages as a threshold. A village is classified as a "better" neighborhood if its proportion exceeds the median. We employ multiple criteria to define top universities, considering the top 1, top 5, and top 10 universities in Taiwan.[17] This definition helps identify areas that offer potentially better educational opportunities for children.

Second, we modify our regression model from a dynamic DDD approach to a pre/post DDD model, focusing on the average effect of the post-win period. Specifically, we replace the event-time dummies, $\mathbf{I}[t = \ell + s]$, with a binary indicator, $Post_{i,\ell}$, in the three-way interaction term, which captures the causal effect of lottery winnings on the outcome of interest. Here, $Post_{i,\ell}$ denotes whether the observed periods are after lottery wins. We make this change because purchasing a house is typically a one-time event, unlike childbearing which can occur multiple times over time. Finally, we limit the estimation sample to lottery winners who had children prior to their winnings and did not already own a house in a village with a higher probability of students entering top universities.

Table 6 presents the results, suggesting that winning prizes of 5 million NT$ significantly increases the likelihood of purchasing houses in villages with better educational opportunities by approximately 5.7–5.9 percentage points (a 44–46% increase from baseline of 0.124–0.128). This effect is consistent and statistically significant at the 5% level across all specifications, regardless of how we define good neighborhoods based on different top university thresholds.

Another way parents may invest in their children's quality is by financially supporting their higher education, particularly through studying abroad. Overseas education is often perceived as offering higher quality compared to domestic universities but requires substantial financial resources. To explore this aspect of parental investment, we examine the impact of lottery winnings on children's college attendance.

Building on Bulman et al. (2021), who argue that windfall gains can only influence college

[17] The top university in Taiwan is National Taiwan University. The next tier (top 2–5, in no particular order) includes National Chengchi University, National Tsing Hua University, National Chiao Tung University, and National Cheng Kung University. The top 6–10 universities (also in no particular order) are National Taiwan Normal University, National Central University, National Sun Yat-sen University, National Yang-Ming University, and National Taiwan University of Science and Technology. In 2021, National Chiao Tung University and National Yang-Ming University merged to form National Yang Ming Chiao Tung University; however, during our sample period, they were separate institutions and treated as such in our analysis.

attendance if received before children complete high school, we construct treatment and control groups based on the timing of lottery wins relative to children's college decisions. The treatment group includes current winners (those who won during 2007–2012) who received their first lottery prize before their children turned 19, ensuring they had the opportunity to allocate these funds toward their children's higher education. The control group consists of future winners (those who won during 2013–2018) whose first lottery prize was awarded after their children turned 19, meaning their winnings came too late to affect initial college attendance decisions.

This selection process results in a final sample of 80,655 children nested within 58,432 lottery winners. Using this sample, we assess whether lottery windfalls increase college attendance among winners' pre-existing children. Specifically, we estimate the following regression to compare college attendance rates between children of current and future winners who won larger or smaller prizes.

$$E_{ij} = \delta_1 Treated_j + \delta_2 Prize_j + \rho \cdot Treated_j \times Prize_j + \gamma_c + \theta_t + \boldsymbol{X_j}\psi + \boldsymbol{Z_i}\nu + \varepsilon_{ijt} \qquad (3)$$

where E_{ij} represents the outcome of interest for child i whose parent is winner j—a series of dummy variables indicating whether child i has ever attended college, attended a top-ranked domestic university or studied abroad, measured at age 19. $Treated_j$ is a dummy variable equal to 1 if parent j are current winners who won the lottery before their child turned 19, and 0 if they are future winners who won after their child turned 19. The variable $Prize_j$ is a continuous measure of the amount won by parent j. The coefficient δ_1 on $Treated_j$ captures systematic differences in college outcomes between children whose parents won before versus after their college decision period. The coefficient δ_2 on $Prize_j$ controls for potential heterogeneity arising from parents winning different prize amounts. Most importantly, the coefficient of interest ρ on the interaction between $Treated_j$ and $Prize_j$

measures whether larger lottery wins before college age increase the likelihood of attending either top-ranked domestic universities or foreign institutions, which would indicate that parents use windfall income to invest in their children's education quality.

To isolate the impact of lottery prizes, the model includes fixed effects γ_c for the child's birth year, to absorb cohort differences. Calendar year fixed effects θ_t for when the child turns 19 are also included to account for contemporaneous factors affecting overall college attendance. We further control for winner (parent) characteristics X_j and child characteristics Z_i[18] to address outcome heterogeneity arising from these observable factors.

Table 7 presents the estimated effects of lottery wins on college attendance for the children of winners. Column (1) suggests lottery wins have a positive effect on overall college attendance, though the estimate is not statistically significant. We further investigate the effect on attendance at top-ranked universities in Taiwan. Specifically, we analyzed the impact on attendance at the top 1, top 5, and top 10 universities. The estimates are positive and sizable, ranging from 0.5 to 0.8 percentage points (relative to baseline attendance rates of 0.6%, 1.7%, and 2.7%, respectively), and not statistically significant (Columns (3) to (5)).

In Taiwan, as in other countries, some students choose to study overseas, particularly in the US, to pursue higher-quality education, where tuition and living costs are substantially higher than domestic options. For instance, while annual tuition at Taiwanese universities ranges from 58 to 110 thousand NT$, the cost at US universities is 1 million NT$ per year for public universities (out-of-state tuition) and 1.3 million NT$ for private universities. Receiving a cash windfall could enable parents to afford to send their children abroad to study. To examine this possibility, we analyze the impact of lottery wins on the likelihood of children studying abroad for their undergraduate degrees (Column (6)). We find that a 5 million NT$ windfall significantly increases the probability of studying abroad by 1.3 percentage points. This is a sizeable change, representing a 93% increase relative to the baseline probability of

[18] Winner characteristics are the same as the covariates included in Column (6) of Table 2, i.e., our main analysis of lottery impact on fertility. Child characteristics include a child's gender, birthplace, birth order, and birth month.

studying abroad. In summary, while lottery prizes do not affect overall college attendance, the winnings do significantly increase the likelihood of children studying overseas, suggesting that windfalls help families afford the higher costs of international education, which is often perceived as offering higher-quality educational opportunities.

6.2 Marriage Decisions

Our findings demonstrate that cash windfalls increase fertility, primarily along the extensive margin. Given that fertility and marriage decisions are often jointly determined, particularly in East Asian societies where marriage traditionally precedes childbearing (Myong, Park and Yi, 2021), we examine whether lottery wins influence marriage decisions, as marriage could be a potential mechanism through which windfalls affect fertility.

To examine the impact of lottery wins on marriage decisions, we focus on individuals who were single prior to winning the lottery. We modify Equation (1) by using a dummy variable for "getting married" as the outcome.[19] Table 8 presents the dynamic DDD estimates, summarized by the coefficient of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$. The results reveal a significant and persistent increase in the probability of getting married following a substantial windfall. Our preferred estimate shows that a 5 million NT$ windfall increases the likelihood of marriage within six years by 3.8 percentage points—a notable 13% increase relative to the baseline trend.[20]

Interestingly, we find substantial gender differences in the impact of lottery wins on marriage decisions. The effect is primarily driven by male winners, with a 5 million NT$ win significantly increasing the probability of marriage for single men by 5.0 percentage points, representing a 19% increase from the baseline (Panel B of Table 8). In contrast, for single women, a win of the same magnitude has a small and insignificant effect on their likelihood of marriage (Panel C of Table 8). We also examine the impact of lottery wins on divorce

[19] We define "getting married" as having a married spouse in the given year. The results remain robust when we define the variable as "ever married"—first marriage in an individual's lifetime.

[20] The baseline trend refers to the change in the share of future winners who ever married between $s = -1$ and $s = 6$, which is 29.4%.

decisions to facilitate comparisons with other lottery studies in the literature (Section 7.1). Table 9 presents results for individuals who were married prior to winning the lottery, with the outcome in Equation (1) replaced by a dummy variable for "getting divorced." The analysis reveals that lottery wins have small and insignificant impact on divorce decisions for either men or women.

To investigate how much of the observed effect on fertility can be attributed to changes in marriage behavior, we conducted a causal mediation analysis, following the approach of previous studies (Hsia et al., 2021; Breivik and Costa-Ramón, 2022). However, due to our reliance on a single source of exogenous variation (lottery wins), and the fact that both outcomes (marriage and fertility) were determined within the same period, we lacked the specific variation needed to clearly isolate the impact of marriage on fertility. Therefore, the mediation analysis should be interpreted cautiously, albeit it provides a useful insight into whether the marriage mechanism can potentially explain treatment effects.

Specifically, we assumed lottery wins have both direct effects on fertility and indirect effects through influencing marriage behavior. Indirect effects can be obtained by decomposing the effect of lottery wins on fertility γ_s in Equation (1) into three components: 1) the effect of marriage on fertility; 2) the effect of lottery wins on marriage; and 3) the unexplained part of the lottery effect (i.e., direct effect) on fertility. The product of the first two components can be viewed as an increase in fertility caused by lottery wins through changing marriage behavior (Alwin and Hauser, 1975; Sobel and Becker, 2001). Following Hsia et al. (2021) and Breivik and Costa-Ramón (2022), we first estimate the impact of marriage on fertility while controlling for the effect of lottery wins by adding the marriage mediator variable M to Equation (1):

$$
\begin{aligned}
B_{it} = \pi M_{it} + \alpha_0 Prize_i + \alpha_1 Current_{i,\ell} + \alpha_2 Prize_i \times Current_{i,\ell} + \sum_{s \neq -1} \kappa_s \cdot \mathbf{I}[t = \ell + s] \\
+ \sum_{s \neq -1} \lambda_s \cdot Prize_i \times \mathbf{I}[t = \ell + s] + \sum_{s \neq -1} \beta_s \cdot Current_{i,\ell} \times \mathbf{I}[t = \ell + s] \\
+ \sum_{s \neq -1} \gamma_s \cdot Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + s] + a_{it} + \theta_t + \boldsymbol{X_i}\psi + \varepsilon_{it} \qquad (4)
\end{aligned}
$$

where M_{it} indicates whether an individual i was married in year t. Our estimation shows that the effect of being married on fertility was approximately 0.64. Next, we multiply this estimate by the estimated effect of lottery wins on marriage, as shown in Table 8 (0.038). This calculation indicates that the indirect effect of lottery wins on fertility through its influence on the marriage rate is approximately 0.024, thereby accounting for 29% of the total impact on fertility for single winners — 0.083 (see Table 5, Column (3)).

Moreover, we extend our mediation analysis by implementing similar decompositions for male and female winners separately. Our findings reveal a striking gender difference: the mediation effect of lottery wins on fertility through its influence on marriage rates is substantially larger for male winners compared to female winners. Specifically, marriage mediates 42% of the overall lottery impact on fertility for males and has a negligible mediation effect for females.[21] This result aligns with the finding in Cesarini et al. (2023) who found that lottery wealth primarily affects male winners' marital outcomes and estimated that 20–40% of men's fertility response could be explained by changes in marital status. Finally, we conduct an analogous mediation analysis for divorce. Consistent with the results presented in Table 9, which showed no significant impact of lottery wins on divorce decisions, we find that the indirect effect of lottery wins on fertility through changes in divorce rates is negligible.

[21] The mediation effect for females is negative as the lottery prize has a non-significant negative impact on marriage for females.

7 Discussion

7.1 Comparison to Lottery-based Studies

In this section, we compare our estimates with the results from two contemporaneous lottery-based studies conducted in the US (Bulman, Goodman and Isen, 2022) and Sweden (Cesarini et al., 2023). To facilitate these comparisons, we rescale our estimates to reflect the effect of a windfall measured in units of 100,000 US$ (in 2015 real dollar) and focus on the fertility effect up to five years ($s = 5$) after the lottery wins. However, it's important to note that the same nominal wealth change may result in different real wealth differences across countries. To address this, we follow the approach of Daysal et al. (2021) by adjusting the estimated effects using purchasing power parity (PPP) exchange rates.[22] Moreover, we consider the baseline mean when comparing the magnitude of effects across studies.

Based on these adjustments and using estimates from Figure 2, our results show that lottery prizes of 100,000 US$ increase the number of children by 0.020 within five years of winning, representing a 7.3% increase from the baseline mean. This finding aligns closely with Cesarini et al. (2023), who report that a 100,000 US$ lottery win significantly increases cumulative fertility by 0.025 children within five years (a 12.3% increase from baseline) in Sweden. In contrast, Bulman, Goodman and Isen (2022) finds a much smaller and statistically insignificant effect in the US, with a corresponding estimate of only 0.001 (a 0.3% increase from baseline).

To understand these cross-country differences in how cash windfalls affect fertility, we follow the discussion of Daysal et al. (2021), who applied the conceptual framework developed by Berger et al. (2018). While their study primarily focuses on how housing prices influence fertility decisions, it also provides insights into how cash windfalls affect fertility across different institutional contexts. Together with our results and findings from Cesarini et al. (2023) and Bulman, Goodman and Isen (2022), this analysis helps explain why Taiwan and

[22] In particular, the PPP exchange rate in 2015 was 1 for the US, 8.854 for Sweden, and 15.73 for Taiwan.

Sweden show positive fertility responses to lottery wins, while the US does not.

According to the discussions in Daysal et al. (2021), the effect of a wealth shock across countries is driven by differences in the marginal propensity to consume (MPC). Several factors determine variations in MPC: household preferences, the extent to which credit constraints bind, the liquidity of housing, and the transitory versus permanent nature of the shock. When considering the impact of lottery winnings on fertility, some of these mechanisms become less relevant, simplifying the analysis compared to housing price shocks. For instance, unlike housing wealth, which may encounter obstacles in being liquidated, lottery winnings are inherently cash windfalls that can be readily accessed and utilized. Below, we highlight two factors that may explain the differences in the impact of cash windfalls on fertility across Taiwan, Sweden, and the US.

The net price of having children and credit constraints. To understand how credit constraints shape fertility responses to lottery wins across countries, we first examine differences in the net cost of raising children, as these costs influence the extent to which credit constraints bind. When comparing Taiwan, Sweden, and the US, we find significant differences in this net cost, primarily reflected in childcare allowances, parental leave, and healthcare. Detailed comparisons are provided in Table C4 of the Online Appendix. Sweden's social welfare system provides the most generous support among the three countries, offering substantial child allowances (about 144 US$ per month until age 16, with additional allowances for multiple children that can reach about 1,140 US$ for five children), extensive paid parental leave (480 days with 390 days at 80% salary), and heavily subsidized children's healthcare (free outpatient care until 18 and dental care until 23). Taiwan offers moderate support through child allowances (about 160 US$ per month for children under 5), paid parental leave (180 days at 60% salary), and relatively low medical costs under its National Health Insurance system. The US provides the least government support, with limited tax credits, no federal paid parental leave, and considerable out-of-pocket medical expenses for most families.[23] This variation in public support is also reflected in government spending on family benefits: Sweden spends 7,493 US$ per child annually on child-related support, while Taiwan and the US spend significantly less at 2,121 US$ and 1,443 US$ per child, respectively (see Table C5 of the Online Appendix).

These differences in net costs of raising children —driven by varying levels of government support across countries —can influence how credit constraints affect fertility responses to cash windfalls, such as lottery winnings. In countries like Taiwan and the US, where government support is limited, the high net cost of raising children increases the likelihood that individuals face binding credit constraints when making fertility decisions. For these individuals, receiving lottery winnings can alleviate financial pressures, allowing them to better manage consumption over the child-rearing years. As a result, we expect lottery winnings to have a stronger impact on fertility in countries with higher net child-rearing costs and where credit constraints are more binding.

In Taiwan, where government support is moderate, we find evidence that credit constraints may influence fertility decisions. Our subgroup analysis shows that the effect of lottery winnings on fertility is significantly larger for households with low liquidity assets compared to those with high liquidity assets. This heterogeneous response pattern suggests that some individuals might face binding credit constraints when making fertility decisions. By contrast, in Sweden, where extensive government support substantially reduces the net cost of raising children, existing literature suggests that fertility decisions may not be influenced by credit constraints. Specifically, Cesarini et al. (2023) found no significant differences in the effect of lottery winnings on fertility between low-income and high-income

[23]The Child Tax Credit (CTC) provides up to 2,000 US$ per qualifying child under 17, though this begins to phase out for single filers with income above 200,000 US$ (400,000 US$ for married filing jointly). The Child and Dependent Care Credit allows families to claim up to 3,000 US$ in expenses per child (maximum 6,000 US$ for two or more children) for childcare costs. The Earned Income Tax Credit (EITC) also provides substantial support for low-income families with children. However, these tax-based supports are generally less generous and more complex to access compared to the direct cash transfers in Sweden and Taiwan. Additionally, while some states like California, New Jersey, and New York have implemented their own paid family leave programs, these vary significantly in terms of duration and wage replacement rates. Healthcare costs for children also vary widely depending on insurance coverage, with average family insurance premiums exceeding 21,000 US$ annually in 2020, not including deductibles and co-payments.

groups. This absence of heterogeneous effects implies that credit constraints are unlikely to play a significant role in shaping fertility responses to wealth changes in Sweden. In the US, despite the high net cost of raising children due to limited government support, the empirical evidence suggests that households may not face significant credit constraints in their fertility decisions. For instance, Daysal et al. (2021) found that households increase expenditure following the birth of a young child, implying credit constraints might not be binding. Consistent with this finding, Bulman, Goodman and Isen (2022) observed no significant heterogeneous effects in fertility responses by financial status (e.g., earnings, income, and investments). These findings suggest that, despite high child-rearing costs, credit constraints may not substantially influence fertility decisions among US households.

Marriage and fertility relationship. While credit constraints partially explain cross-country differences in fertility responses to lottery wins, the divergent responses observed in Taiwan and Sweden compared to the US may also reflect differences in the marriage-fertility relationship across these countries. In Taiwan and Sweden, substantial increases in fertility following cash windfalls were observed, with approximately 20% to 40% of the fertility effect attributable to changes in marital status. In both countries, this marriage mediation effect was primarily driven by male winners. In Taiwan, lottery wins boosted men's likelihood of marrying without altering divorce rates. In Sweden, the effect was broader: lottery wins not only increased men's marriage probability but also reduced their divorce likelihood, suggesting that fertility is influenced through both higher marriage rates and greater marital stability. By contrast, in the US, while lottery wins similarly increased marriage probabilities, this did not translate into notable fertility gains, indicating a weaker link between marriage and fertility in this context.

Taken together, our analysis reveals how fertility responses to lottery wins vary systematically across countries, shaped by credit constraints and the marriage-fertility relationship. In Taiwan, both binding credit constraints and the marriage mediation effect—influenced by increased marriage rates—contribute to the impact of lottery wins on fertility outcomes. In Sweden, while credit constraints play a minimal role due to generous government support, a strong marriage-fertility relationship—reflected in changes in both marriage and divorce behavior—still leads to substantial fertility increases. The US presents a distinct case where neither mechanism has an effect: despite high child-rearing costs, empirical evidence suggests that credit constraints do not significantly influence fertility decisions, and a weaker marriage-fertility link means that higher marriage rates from lottery wins fail to boost fertility.

7.2 Policy Implications

Our results, consistent with previous literature, demonstrate that wealth positively affects fertility. A lottery win of 5 million NT$ increases the number of children by 0.06, with an estimated wealth elasticity of fertility of 0.15. This finding yields several policy implications. First, the positive income/wealth effect suggests that unconditional cash transfers can generate moderate increases in fertility rates. The 5 million NT$ lottery win in our study approximately equals an annual post-tax annuity payment of 145,130 NT$ (assuming an 80-year life expectancy and a 2.5% interest rate). This permanent change in annual income is comparable to various policy proposals in the literature. For instance, in the context of Universal Basic Income (UBI) proposals, our lottery shock equals a monthly UBI of approximately 12,094 NT$ (400 US$), which falls within the range of popular UBI proposals in other countries that typically suggest between 300 US$ and 1,000 US$ tax-free per month (Stanford, 2024; Hoynes and Rothstein, 2019).[24] The positive wealth effect we observe suggests that unconditional cash transfers or UBI could generate moderate increases in fertility

[24] Multiple cities and states in the US have implemented guaranteed income pilot programs, typically targeting low-income groups. For example, Stockton, California, provided 125 residents with an unconditional cash transfer of 500 US$ per month for two years (Treisman, 2021). As of now, over 70 similar basic income pilots are in progress across the US, with amounts typically ranging from 300 to 1,000 US$ per month (Insider, 2024). Examples include Richmond, Virginia, which provides 500 US$ monthly to 18 low-income families, and Compton, California, which offers 300–600 US$ per month to 800 residents for two years (Abrams, 2021).

rates. However, the effect might be smaller than the lottery effect due to differences between lump-sum windfalls and regular payments.

Second, previous studies show that conditional child-related subsidies, such as baby bonuses and child allowances, can influence fertility decisions (Milligan, 2005; Brewer, Ratcliffe and Dsmith, 2012; Cohen, Dehejia and Romanov, 2013; Gonz'alez, 2013; Kim et al., 2014; Laroque and Salani'e, 2014; Ang, 2015; Garganta et al., 2017; Riphahn and Wiynck, 2017; Andersen and Bhattacharya, 2018; Malak, Rahman and Yip, 2019; Malkova, 2018; Stichnoth, 2020; Chuard and Chuard-Keller, 2021; Gonz'alez and Trommlerov'a, 2023; Lyssiotou, 2021; Kim, 2022). For example, Gonz'alez (2013) examines Spain's universal child benefit program introduced in 2007, which provided an unconditional one-time payment of 2,500 EUR (approximately 3,900 US$) to mothers for each newborn child. She finds that the policy increased fertility by about 6 percent. Theoretically, these subsidies affect fertility through two channels: 1) the income/wealth effect, whereby increased family financial resources make children more affordable, and 2) the substitution effect, whereby subsidies reduce the relative cost of having children versus other goods, thus encouraging fertility.

Our subgroup analysis based on lottery prize amounts suggests that only winnings exceeding 5 million NT$ lead to a statistically significant increase in childbirth. This threshold is substantially higher than typical conditional child-related subsidies. For instance, Taiwan's child-rearing allowance provides 5,000 NT$ per month for children under five, totaling 300,000 NT$ per child over the full 5-year period. This finding implies that the fertility effect of such subsidies is unlikely to be driven primarily by an increase in family financial resources (i.e., an income/wealth effect).

8 Conclusion

This study employs longitudinal administrative data on lottery winners in Taiwan to investigate the effect of cash windfalls on fertility behaviors. We find that a lottery win of 5 million NT$ can significantly increase the number of children ever born by 0.06, which is equivalent to a 20% increase from the baseline. The implied wealth elasticity of fertility is 0.15, which is consistent with the central proposition in Gary Becker's neoclassical theory of fertility, in that children are normal goods, and so demand for the quantity of children should increase in line with individual financial resources (Becker, 1960, 1965).

Additionally, less wealthy individuals exhibit greater fertility responses, suggesting that people have children after accumulating sufficient wealth. Cash windfalls primarily raise fertility by inducing first births among previously childless individuals (i.e., extensive margin) rather than making parents have more children (i.e., intensive margin). Lastly, our analysis reveals that lottery wins boost marriage, and approximately 29% of the total fertility effect stems from increased marriage rates following lottery wins.

Importantly, our findings suggest that while cash windfalls have a smaller impact on higher-parity fertility, they can enhance child quality for existing children through increased investments in education. Specifically, lottery winners are more likely to purchase homes in neighborhoods with higher educational opportunities and to send their children overseas for education. However, other quality measures like educational expenditures or overall child-related spending are unavailable in our administrative data. Future research could explore these dimensions to better understand how cash windfalls influence parental decisions regarding the trade-off between child quantity and quality.

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Tables

Table 1: Descriptive Statistics for Lottery Winners and Population

	Lottery Winner			Population
Minimum Prize	5K	2K	50K	
Individual characteristics				
Age	31.90	31.30	32.80	31.36
	(6.74)	(6.83)	(6.68)	(7.90)
Living in urban area	0.69	0.69	0.70	0.69
	(0.46)	(0.46)	(0.46)	(0.46)
Female	0.52	0.59	0.44	0.50
	(0.50)	(0.49)	(0.50)	(0.50)
Married	0.46	0.45	0.47	0.41
	(0.50)	(0.50)	(0.50)	(0.49)
Winner's Employment	0.75	0.74	0.74	0.69
	(0.43)	(0.44)	(0.44)	(0.46)
Winner's Earnings (NT$1,000)	290	283	290	286
	(394)	(404)	(412)	(546)
Winner's Income (NT$1,000)	308	302	312	308
	(445)	(451)	(484)	(657)
Winner's Assets (NT$1,000)	2,041	1,941	2,360	2,320
	(8,702)	(10,424)	(9,740)	(13,292)
Winner's Liquid Assets (NT$1,000)	612	612	658	709
	(4,791)	(7,775)	(3,870)	(7,939)
Winner's Savings (NT$1,000)	248	270	233	292
	(1,155)	(1,196)	(1,139)	(1,391)
Household Earnings (NT$1,000)	490	495	474	458
	(656)	(708)	(659)	(870)
Household Income (NT$1,000)	524	530	510	497
	(732)	(790)	(748)	(1,344)
Household Assets (NT$1,000)	3,847	3,895	4,027	4,166
	(13,986)	(15,670)	(13,395)	(41,405)
Household Liquid Assets (NT$1,000)	1,065	1,098	1,104	1,209
	(6,840)	(9,663)	(6,358)	(38,198)
Household Savings (NT$1,000)	421	462	389	478
	(1,689)	(1,844)	(1,553)	(2,440)
Fertility variables				
Cumulative Number of Children	0.88	0.85	0.92	0.82
	(1.10)	(1.09)	(1.11)	(1.11)
Gave Birth in $s-1$	0.04	0.04	0.04	0.03
	(0.21)	(0.20)	(0.20)	(0.18)
Gave Birth in $s-2$	0.05	0.04	0.04	0.03
	(0.21)	(0.20)	(0.20)	(0.18)
Gave Birth in $s-3$	0.05	0.05	0.05	0.04
	(0.21)	(0.21)	(0.21)	(0.19)
# of Observations	406,922	1,268,579	65,453	11,205,868

Note: We utilize the all individuals aged 20–44 from 2007–2012 to construct population data. For each individual, we randomly assign one year between 2007–2012 as a placebo "winning year." We then use their individual characteristics from the year prior to this randomly assigned placebo winning year in our analysis. We use the post-stratification weighting technique and match the marital status, age, earnings, and asset stratification for our lottery sample and the population. Urban areas refer to the 6 largest cities in Taiwan with special municipality status: Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City. These cities have the largest populations in Taiwan. Employment is defined as having positive annual labor earnings. Annual earnings are defined as the sum of annual wage income, business income, and professional income. Annual income is defined as the sum of annual labor earnings plus other annual income sources like interest, rents, farming, pensions, etc, excluding lottery winnings. Assets are defined as the sum of real estate value, financial assets, and stocks, minus mortgage debt. Liquid assets are defined as the sum of financial assets and stocks. All monetary values like earnings, income, assets, and liquid assets are measured in thousand New Taiwan Dollars (NT$) and adjusted to 2016 NT$ levels (1 NT$ ≈ 0.033 US$ in 2016). More details on the construction of asset data can be found in Appendix B. Standard deviations are in parentheses.

Table 2: Effect of a Five Million NT$ Lottery Prize on Fertility

Dependent Variable:	Number of Cumulative Children					
	(1)	(2)	(3)	(4)	(5)	(6)
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	0.061***	0.061***	0.062***	0.061***	0.063***	0.063***
	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Baseline trend	0.321					
Observations	4,069,220					
Basic controls	√	√	√	√	√	√
Age fixed effect		√	√	√	√	√
Year fixed effect			√	√	√	√
Individual characteristics				√	√	√
Pre-treatment fertility					√	√
Pre-treatment lottery redemption						√

Note: This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), which stands for the effect of 5 Million NT$ lottery wins on fertility at the sixth year following the receipt of cash windfalls. The outcome of interest is the cumulative number of children that winner i has by the end of the sixth year after a lottery win. The baseline trend is the change in the cumulative number of children for the future winner between one year before and six years after the placebo lottery-winning year. Column (1) includes the amount of lottery prize, a full set of event time dummies, the interaction terms between the lottery prize and event time dummies, and the full interactions between *current* (a dummy indicating a current winner) and the above variables. Column (2) further includes the age fixed effect. Column (3) further includes the calendar year fixed effects. Column (4) includes pre-determined covariates: a set of dummies indicating cities/counties of residence, a dummy indicating the winner was married, a dummy indicating the winner or her spouse was employed, average household earnings per capita (evenly divided between spouses if married), average household income per capita (evenly divided between spouses if married), average household wealth per capita (evenly divided between spouses if married). Note that these covariates are measured in the year right before the lottery-winning year. Column (5) controls for the outcomes variable (the cumulative number of children) in the year right before the lottery-winning year. Column (6) controls for past lottery redemption history (the number of times each type of lottery was redeemed in the one, two, and three years before the winning year). Standard errors are clustered at the winner level and reported in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 3: Effect of Lottery Prize on Fertility—by Prize Group

Dependent Variable:	Number of Cumulative Children						
	(1)	(2)	(3)	(4)	(5)	(6)	Elasticity
$Current_{i,\ell} \times \mathbf{I}[Size_i = 10K - 50K]$	0.003	0.008*	0.007	0.003	0.008*	0.008*	4.715
$\times \mathbf{I}[t = \ell + 6]$	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	
$Current_{i,\ell} \times \mathbf{I}[Size_i = 50K - 500K]$	0.009	0.016**	0.017***	0.011	0.019***	0.019***	1.965
$\times \mathbf{I}[t = \ell + 6]$	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	
$Current_{i,\ell} \times \mathbf{I}[Size_i = 500K - 5M]$	0.025	0.030	0.031*	0.026	0.036*	0.036*	0.260
$\times \mathbf{I}[t = \ell + 6]$	(0.019)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)	
$Current_{i,\ell} \times \mathbf{I}[Size_i = 5M - 50M]$	0.089***	0.096***	0.097***	0.090***	0.101***	0.101***	0.155
$\times \mathbf{I}[t = \ell + 6]$	(0.032)	(0.030)	(0.030)	(0.031)	(0.031)	(0.031)	
$Current_{i,\ell} \times \mathbf{I}[Size_i \geq 50M]$	0.271**	0.281***	0.283***	0.280***	0.275***	0.275***	0.015
$\times \mathbf{I}[t = \ell + 6]$	(0.111)	(0.105)	(0.104)	(0.106)	(0.106)	(0.106)	
Observations	4,069,220						
Basic controls	√	√	√	√	√	√	
Age fixed effect		√	√	√	√	√	
Year fixed effect			√	√	√	√	
Individual characteristics				√	√	√	
Pre-treatment fertility					√	√	
Pre-treatment lottery redemption						√	

Note: This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), but replacing the continuous measure of lottery wins ($Prize$) with a series of binary indicators $\mathbf{I}[Size = k]$ representing different prize ranges: 1) 10 to 50 thousand NT$; 2) 50 to 500 thousand NT$; 3) 500 thousand to 5 million NT$; 4) 5 to 50 million NT$ and 5) 50 million NT$ or more. We use winners of 5 to 10 thousand NT$ as the reference group. The outcome of interest is the cumulative number of children that winner i has by the end of the sixth year after a lottery win. Column (1) includes the amount of lottery prize, a full set of event time dummies, the interaction terms between the lottery prize and event time dummies, and the full interactions between *current* (a dummy indicating a current winner) and the above variables. Column (2) further includes the age fixed effect. Column (3) further includes the calendar year fixed effects. Column (4) includes pre-determined covariates: a set of dummies indicating cities/counties of residence, a dummy indicating the winner was married, a dummy indicating the winner or her spouse was employed, average household earnings per capita (evenly divided between spouses if married), average household income per capita (evenly divided between spouses if married), average household wealth per capita (evenly divided between spouses if married). Note that these covariates are measured in the year right before the lottery-winning year. Column (5) controls for the outcomes variable (the cumulative number of children) in the year right before the lottery-winning year. Column (6) controls for past lottery redemption history (the number of times each type of lottery was redeemed in the one, two, and three years before the winning year). Elasticity is calculated based on the estimates from Column (6) and is defined as the ratio of two quantities. The numerator is the effect of a 5 million $NT lottery prize on fertility in the sixth year after the lottery-winning year, expressed as a percentage of the baseline trend (the change in the cumulative number of children for future winners between one year before and six years after the placebo lottery-winning year) for the given prize group. The denominator is 5 million NT dollars divided by the baseline trend in wealth (the change in net wealth for future winners between one year before and six years after the placebo lottery-winning year) for the given prize group. Standard errors are clustered at the winner level and reported in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 4: Subgroup Analysis—By Financial Resources

Dependent Variable:	Cumulative Number of Children					
	(1)	(2)	(3)	(4)	(5)	(6)
	Deposit		Liquid Asset		Real Estate	
	$= 0$	> 0	$= 0$	> 0	$= 0$	> 0
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	0.085***	0.019	0.103***	0.028	0.092***	0.022
	(0.019)	(0.024)	(0.024)	(0.020)	(0.021)	(0.021)
$Difference$	0.066**		0.075**		0.070**	
	(0.031)		(0.031)		(0.030)	
Baseline Trend	0.313	0.345	0.313	0.332	0.333	0.288
Observations	3,047,900	1,021,320	2,259,580	1,809,640	2,887,980	1,181,240

Note: This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), which stands for the effect of 5 Million NT$ lottery wins on fertility in the sixth year following the receipt of a cash windfall. The difference is estimated using Equation (1), with the group variable interacting with the treatment variable and all covariates and fixed effects. The outcome of interest is the cumulative number of children that winner i has by the end of the sixth year after the lottery win. The baseline trend is the change in the cumulative number of children for the future winner between one year before and six years after the placebo lottery-winning year. All regressions include the same set of covariates shown in Column (6) of Table 2. Columns (1) and (2) divide the sample into two groups based on whether the winner had any deposits one year previous to the (placebo) winning year. Column (1) reports the estimate based on winners with no deposits. Column (2) reports the estimate based on winners having a positive deposit. Columns (3) and (4) divide the sample into two groups based on whether the winner had liquid assets one year previous to the (placebo) winning year. Liquid assets is defined as the sum of market values of stock and capital savings. Column (3) reports the estimate for winners with no liquid assets. Column (4) reports the estimate for winners having liquid assets. Columns (5) and (6) divide the sample into two groups based on whether the winner has real estate one year previous to the (placebo) winning year. Real estate is defined as lands and houses. Column (5) reports the estimate for winners with no real estate. Column (6) reports the estimate for winners having real estate. Standard errors are clustered at the winner level and reported in parentheses.
*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 5: Subgroup Analysis—By Parenthood Status and Household Status

Dependent Variable:	Cumulative Number of Children					
	(1)	(2)	(3)	(4)	(5)	(6)
	Parenthood Status		Household Status			
	w/o Child	w/ Child	Single	Couple	Couple w/o Child	Couple w/ Child
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	0.102***	0.032**	0.083***	0.046**	0.178**	0.023
	(0.025)	(0.014)	(0.023)	(0.019)	(0.078)	(0.015)
$Difference$	0.070**		0.037		0.155*	
	(0.029)		(0.030)		(0.079)	
Baseline Trend	0.313	0.345	0.313	0.332	0.333	0.288
Observations	2,194,390	1,874,830	2,188,060	1,881,160	298,740	1,582,420

Note: This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), which stands for the effect of 5 Million NT$ lottery wins on fertility in the sixth year following the receipt of a cash windfall. The difference is estimated using Equation (1), with the group variable interacting with the treatment variable and all covariates and fixed effects. The outcome of interest is the cumulative number of children that winner i has by the end of the sixth year after the lottery win. The baseline trend is the change in the cumulative number of children for the future winner between one year before and six years after the placebo lottery-winning year. All regressions include the same set of covariates shown in Column (6) of Table 2. Columns (1) and (2) separate the sample into two groups based on the cumulative number of children before the winning year. Column (1) includes winners with no child before winning the lottery. Column (2) includes winners with at least one child before winning the lottery. Columns (3) to (6) separate households into four groups based on family types. Column (3) includes winners who were unmarried before winning the lottery. Column (4) includes winners who were married before winning the lottery Column (5) includes married winners without children before winning the lottery. Column (6) includes married winners with children before winning the lottery. Standard errors are clustered at the winner level and reported in parentheses.
*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 6: Effect of a Five Million NT$ Lottery Prize on House Ownership in Good Neighborhood

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Own a House in the Neighborhood:					
	Pr(Top1)	>Median	Pr(Top5)	>Median	Pr(Top10)	>Median
$Current_j \times Prize_j \times Post_t$	0.057**	0.057**	0.059**	0.059**	0.059**	0.059**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Baseline Trend	0.124	0.124	0.128	0.128	0.128	0.128
Observations	1,430,600	1,430,600	1,435,480	1,435,480	1,432,330	1,432,330
Basic controls	√	√	√	√	√	√
Age fixed effect	√	√	√	√	√	√
Year fixed effect	√	√	√	√	√	√
Individual characteristics		√		√		√
Pre-treatment fertility		√		√		√
Pre-treatment lottery redemption		√		√		√

Note: This table reports estimated coefficients of $Current_j \times Prize_j$, which stands for the effect of a 5 Million NT$ lottery win on house ownership in good neighborhoods. The outcomes of interest are dummies indicating ownership in Top 1, Top 5, or Top 10 neighborhoods (Columns (1) to (6)). The baseline trend is the mean change of the outcome variables for future winners (those who won a lottery prize at a later period) in the post-treatment period compared to one year prior to pseudo winning year. Columns (1), (3), and (5) include only basic DID variables (the amount of lottery prize, a full set of event time dummies, the interaction terms between the lottery prize and event time dummies, and the full interactions between *current* (a dummy indicating a current winner) and the above variables.), age fixed effect, and calendar year fixed effect. Columns (2), (4), and (6) further include includes pre-determined covariates: a set of dummies indicating cities/counties of residence, a dummy indicating the winner was married, a dummy indicating the winner or her spouse was employed, average household earnings per capita (evenly divided between spouses if married), average household income per capita (evenly divided between spouses if married), average household wealth per capita (evenly divided between spouses if married), the cumulative number of children in the year right before the lottery-winning year, and controls for past lottery redemption history (the number of times each type of lottery was redeemed in the one, two, and three years before the winning year). Standard errors are clustered at the winner level and reported in parentheses.
*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 7: Effect of a Five Million NT$ Lottery Prize on Children's College Attendance

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Ever Attend ...					
	Any College	Domestic College				Oversea College
		Any	Top1	Top5	Top10	
$Treated_j \times Prize_j$	0.007	0.005	0.005	0.006	0.008	0.013***
	(0.025)	(0.025)	(0.006)	(0.006)	(0.007)	(0.005)
Baseline mean	0.734	0.727	0.006	0.017	0.027	0.014
Observations	80,655	80,655	80,655	80,655	80,655	80,655

Note: This table reports estimated coefficients of $Treated_j \times Prize_j$ in Equation (3), which stands for the effect of 5 Million NT$ lottery wins on winners' children's college attendance. The outcomes of interest are dummies indicating the child ever attended any college (Columns (1)), domestic college (Columns (2) to (5)), or overseas college (Columns (6)) as of age 19. The baseline mean is the mean of the outcome variables for the future winners (those who won a lottery prize at a later period when their children were already greater than age 19). Columns (3) to (5) further separate the outcomes by the ranking of the colleges. All columns include basic DID (difference-in-differences) variables—lottery winnings amount, a dummy indicating if the parent is a current winner, and their interaction term—as well as fixed effects for child cohort and calendar year. The regressions also control for parental characteristics: city/county of residence (dummy variables), marital status, employment status (for winner or spouse), average per capita household earnings, income, and wealth (each divided equally between spouses if married), number of children before the lottery win, and prize amounts won in the previous three years. Additionally, we control for child characteristics including gender, birthplace, birth order, and birth month. Standard errors are clustered at the winner level and reported in parentheses.
*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 8: Effect of a Five Million NT$ Lottery Prize on Getting Married

Dependent Variable:	Getting Married					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Male+Female						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	0.038	0.039**	0.038**	0.038**	0.038**	0.038**
	(0.000)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Baseline Trend	0.294					
Observations	2,188,060					
Panel B: Male						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	0.049**	0.051***	0.050***	0.050***	0.050***	0.050***
	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Baseline Trend	0.265					
Observations	1,206,920					
Panel C: Female						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	-0.006	-0.012	-0.010	-0.010	-0.010	-0.010
	(0.000)	(0.030)	(0.029)	(0.029)	(0.029)	(0.029)
Baseline Trend	0.327					
Observations	981,140					
Basic controls	√	√	√	√	√	√
Age fixed effect		√	√	√	√	√
Year fixed effect			√	√	√	√
Individual characteristics				√	√	√
Pre-treatment fertility					√	√
Pre-treatment lottery redemption						√

Note: The sample in this table only includes winners who were unmarried before winning the lottery. This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), which stands for the effect of 5 Million NT$ lottery wins on marriage in the sixth year following the receipt of a cash windfall. The outcome of interest is getting married by the end of the sixth year after the lottery win. The baseline trend is the change in the proportion of individuals married for the future winner between one year before and six years after the placebo lottery-winning year. Column (1) includes the amount of winnings, a full set of event time dummies, the interaction terms between lottery prize and event time dummies, and the full interactions between *current* (a dummy indicates current winner) and the above variables. Column (2) further includes the age fixed effect. Column (3) further includes the calendar year fixed effects. Column (4) includes pre-determined covariates, i.e., a set of dummies indicating cities/counties of residence, a dummy indicating the winner was married, a dummy indicating the winner or her spouse was employed, average household earnings per capita (evenly divided between spouses if married), average household income per capita (evenly divided between spouses if married), average household wealth per capita (evenly divided between spouses if married). Note that these covariates are measured in the year right before the lottery-winning year. Column (5) controls for the pre-treatment fertility (the cumulative number of children) in the year right before the lottery-winning year. Column (6) includes the previous lottery redemption record (the number of lottery redemptions by type in one, two, and three previous to the lottery winning year). Standard errors are clustered at the winner level and reported in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 9: Effect of a Five Million NT$ Lottery Prize on Getting Divorced

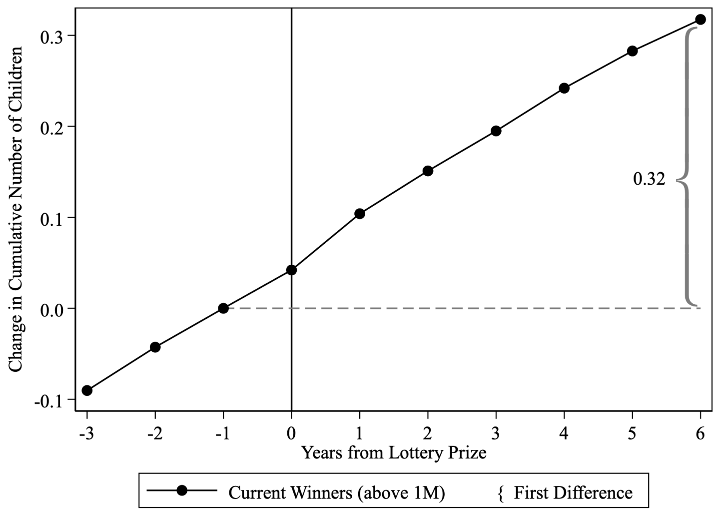
Dependent Variable:	Getting Divorced					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Male+Female						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	-0.006	-0.006	-0.007	-0.007	-0.007	-0.007
	(0.000)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Baseline Trend	0.092					
Observations	1,881,160					
Panel B: Male						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	-0.004	-0.003	-0.006	-0.006	-0.006	-0.006
	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Baseline Trend	0.094					
Observations	757,770					
Panel C: Female						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.000)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Baseline Trend	0.091					
Observations	1,123,390					
Basic controls	$\surd$	$\surd$	$\surd$	$\surd$	$\surd$	$\surd$
Age fixed effect		$\surd$	$\surd$	$\surd$	$\surd$	$\surd$
Year fixed effect			$\surd$	$\surd$	$\surd$	$\surd$
Individual characteristics				$\surd$	$\surd$	$\surd$
Pre-treatment fertility					$\surd$	$\surd$
Pre-treatment lottery redemption						$\surd$

Note: The sample in this table only includes winners who were married before winning the lottery. This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), which stands for the effect of 5 Million NT$ lottery wins on divorced in the sixth year following the receipt of a cash windfall. The outcome of interest is ever getting divorced by the end of the sixth year after the lottery win. The baseline trend is the change in the proportion of individuals unmarried for the future winner between one year before and six years after the placebo lottery-winning year. Column (1) includes the amount of winnings, a full set of event time dummies, the interaction terms between lottery prize and event time dummies, and the full interactions between *current* (a dummy indicates current winner) and the above variables. Column (2) further includes the age fixed effect. Column (3) further includes the calendar year fixed effects. Column (4) includes pre-determined covariates, i.e., a set of dummies indicating cities/counties of residence, a dummy indicating the winner was married, a dummy indicating the winner or her spouse was employed, average household earnings per capita (evenly divided between spouses if married), average household income per capita (evenly divided between spouses if married), average household wealth per capita (evenly divided between spouses if married). Note that these covariates are measured in the year right before the lottery-winning year. Column (5) controls for the pre-treatment fertility (the cumulative number of children) in the year right before the lottery-winning year. Column (6) includes the previous lottery redemption record (the number of lottery redemptions by type in one, two, and three previous to the lottery winning year). Standard errors are clustered at the winner level and reported in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

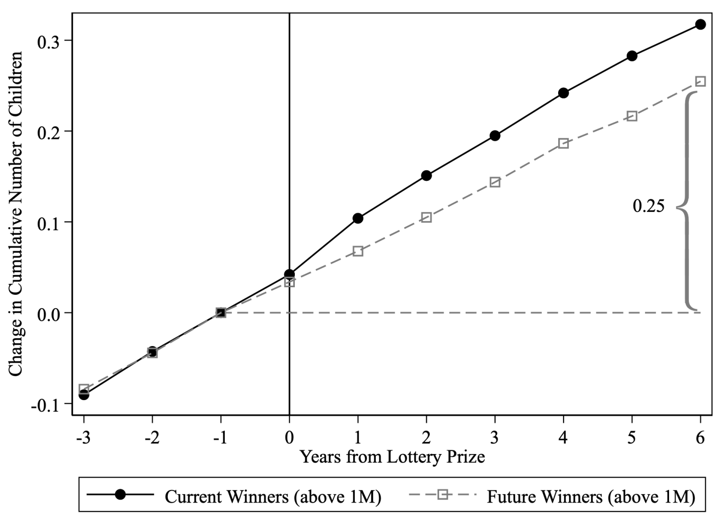
Figures

Figure 1: Trend in the Cumulative Number of Children: Current vs. Future Winners

(a) First Difference: Current Winners

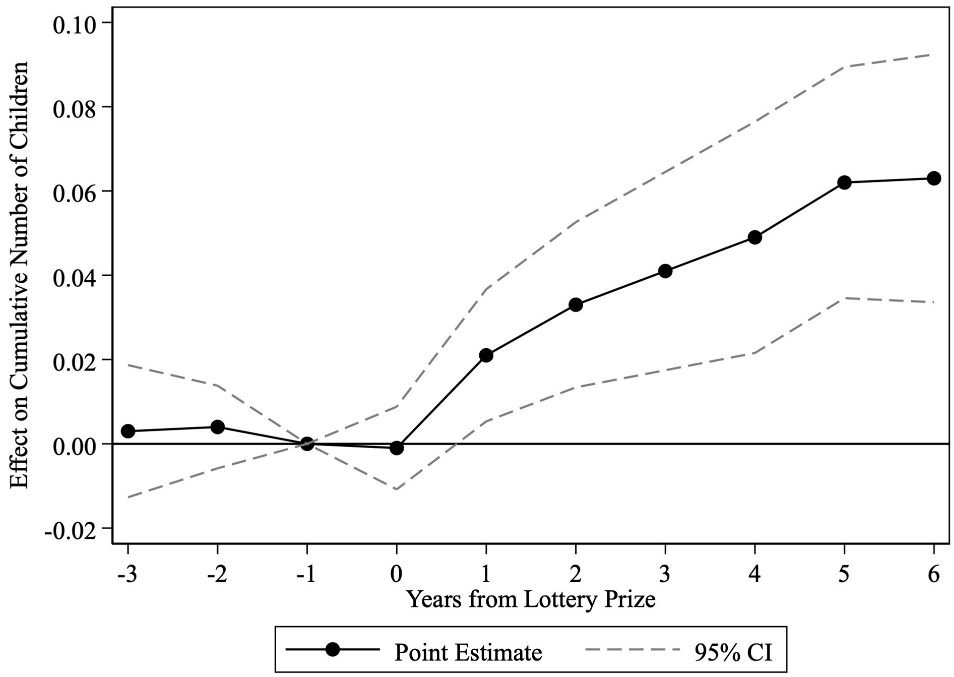


(b) Current vs. Future Winners



Notes: This figure compares the trend in the number of cumulative children from three years before to six years after the time of winning a lottery prize. The solid line with circular symbols stands for current winners who won above NT$ 1M, and the dashed line with square symbols stands for future winners who won the same amount in prize money. The vertical axis displays the outcomes (the number of cumulative children) relative to the baseline year (one year previous to the (placebo) lottery-winning year) for each group. The horizontal axis refers to the number of years from the (placebo) lottery-winning year.

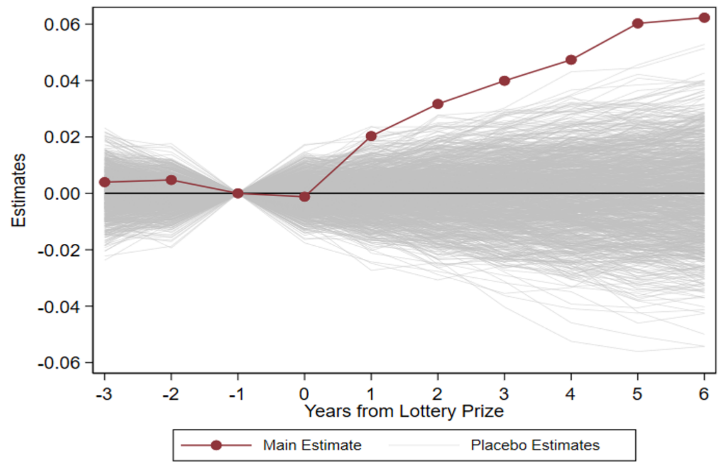
Figure 2: Effect of a Five Million NT$ Lottery Prize on Fertility



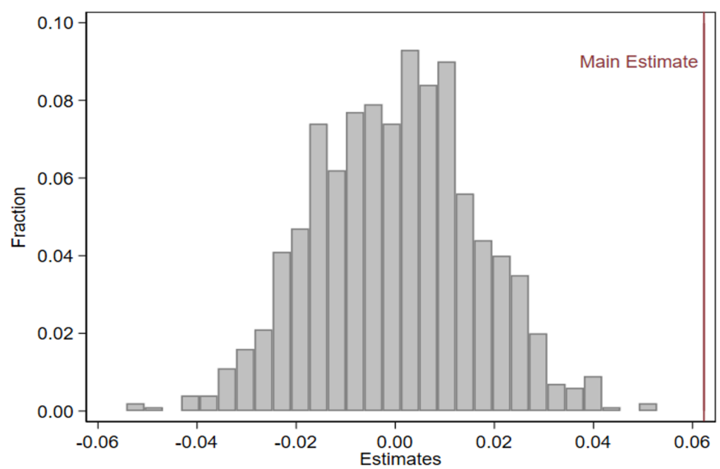
Notes: This figure displays the estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + s]$ from Equation (1). The outcome of interest is the cumulative number of children. The solid line denotes the point estimates. The dashed line denotes the 95% confidence interval. The horizontal axis refers to the number of years from the (placebo) lottery-winning year.

Figure 3: Permutation Test: Randomly Assigned Lottery Prize

(a) Main Results and Placebo Estimates



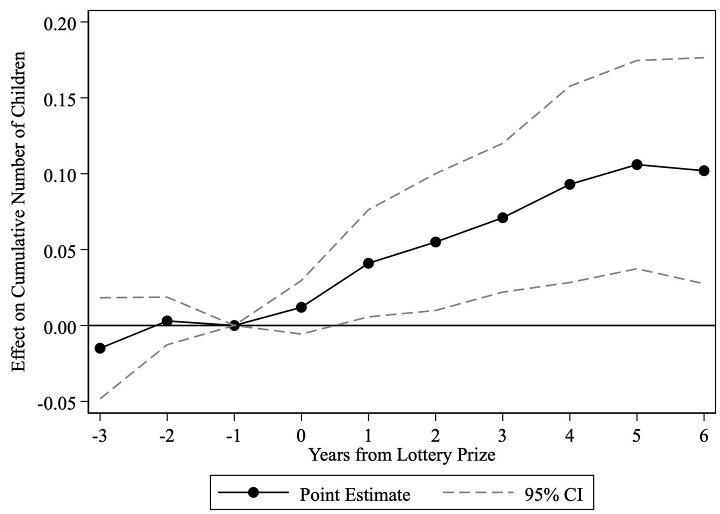
(b) The Estimated Coefficient of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ and Placebo Estimates



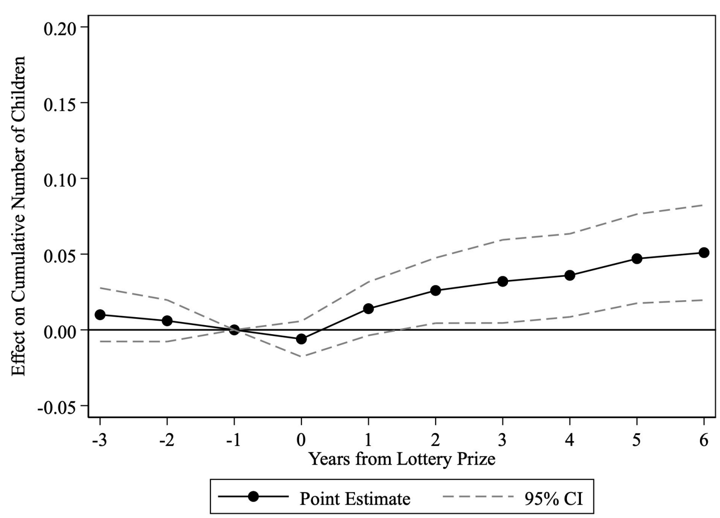
Notes: This figure shows the distribution of 1,000 placebo estimates. Specifically, we randomly permute lottery prizes and attach them to each winner. Then, we use these "pseudo" prizes to estimate Equation (1). We repeat the above procedures 1,000 times to obtain the distribution of pseudo estimates. Figure 3a compares the real estimate (bold line with a circular symbol) with these fake ones (thin lines, gray in color). As we mainly focus on the estimated coefficient of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$, which summarizes the effect of the 5 Million NT$ lottery win on total fertility, Figure 3b shows the real estimates (vertical line) and distribution of pseudo ones (histogram) for γ_6.

Figure 4: Effect of a Five Million NT$ Lottery Prize on Fertility: Young and Middle-aged Winners

(a) Young Winners



(b) Middle-aged Winners



Notes: These two figures display the estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + s]$ from Equation (1). The outcome of interest is the cumulative number of children. The solid line denotes the point estimates. The dashed line denotes the 95% confidence interval. The horizontal axis refers to the number of years from the (placebo) lottery-winning year. Figure 4a shows the results for young winners (i.e., aged 20–29). Figure 4b shows the results for middle-aged winners (i.e., aged 30–44).

Online Appendix: For Online Publication

A Lottery Games in Taiwan

A.1 Public Welfare Lottery

The Taiwanese government initiated the Public Welfare Lottery in 1999 to improve social welfare by creating job opportunities for disadvantaged groups (including the disabled, native aborigines, and single-parent families) to sell tickets. The lottery revenue directly supports various social welfare programs. According to the Social Intention Survey of Public Welfare Lotteries (Hsiao, 2013), approximately 68% of adults (aged 18 and above) have purchased these lottery tickets at least once. During our sample period, there were three main types: (1) Computer-drawn games, (2) scratchcard games, and (3) Keno games.

In this section, we present examples of these lottery formats. For computer-drawn games, players select numbers and await regular prize drawings (typically twice weekly). Lotto 6/49, one of Taiwan's most popular games, is shown in Figure A1. Players choose six numbers (1-49) at 50 NT$ per bet, with prizes determined by matching numbers. The jackpot accumulates until won. For scratchcard games (Figure A2), players reveal potential prizes by scratching away designated areas. Keno games (Figure A3) require players to select both numbers and game types. Players typically choose 20 numbers (1-80) and one of ten gameplay options, with payouts varying by gameplay and number selection.

A.2 Taiwan Receipt Lottery

Established in 1950, the Taiwan Receipt Lottery serves as a tax compliance mechanism by incentivizing consumers to request receipts for purchases. While businesses with monthly revenue below 200,000 NT$ are exempt from issuing receipts, approximately 70% of businesses participate in the receipt system.[25] Essential service providers, including utility and telecommunications companies, consistently issue receipts due to their revenue levels, ensuring widespread receipt collection in daily transactions.

[25] See https://www.fia.gov.tw/singlehtml/43?cntId=c881194d85ce4fc99561c898796f7ef6.

Each valid receipt contains an eight-digit lottery number (Figure A4), regardless of the purchase amount. The government conducts bi-monthly drawings, with prizes ranging from 200 NT$ (approximately 6.7 US$) to 2 million NT$ (about 67 thousand US$) before 2011. In 2011, the maximum prize increased to 10 million NT$ (approximately 333 thousand US$). Table A1 details the complete prize structure. Government data indicates that about 70% of winning receipts are redeemed (FIA, 2023), suggesting that most people retain their receipts and regularly check for winning numbers.

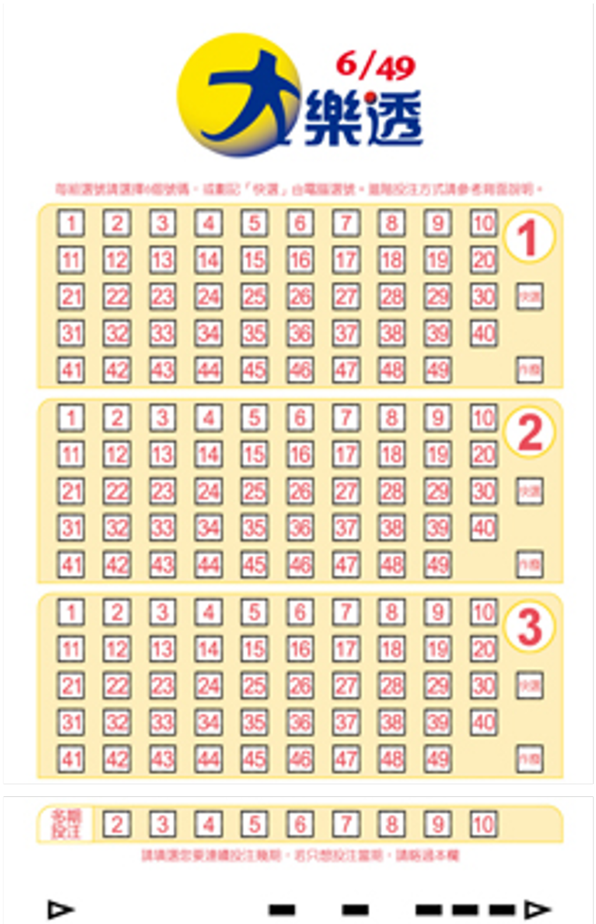
Table A1: Rules for the Taiwan Receipt Lottery

Prizes (in TWD)		Matching Winning Numbers
Special Prize	10 million	all 8 digits from the special prize number
Grand Prize	2 million	all 8 digits from the grand prize number
First Prize	200,000	all 8 digits from any of the First Prize numbers
Second Prize	40,000	the last 7 digits from any of the First Prize numbers
Third Prize	10,000	the last 6 digits from any of the First Prize numbers
Fourth Prize	4,000	the last 5 digits from any of the First Prize numbers
Fifth Prize	1,000	the last 4 digits from any of the First Prize numbers
Sixth Prize	200	the last 3 digits from any of the First Prize numbers
Additional Sixth Prize	200	the last 3 digits from the Additional Sixth Prize number(s)

Note: This table displays the rules for the Taiwan Receipt Lottery. People receive an entry, which contains 8 numbers (see Figure A4), when they purchase goods. They match these numbers on the receipt to the numbers randomly drawn by the Ministry of Finance every two months.

Figure A1: Computer-Drawn Game - Lott 6/49

(a) Purchase Sheet



(b) Purchase Receipt

Notes: Figure A1a displays the Lott 6/49 purchase sheet. Each sheet has multiple sections. Players choose six numbers from section one for one bet. If players want to have more than one bet, they can repeat the same process in other sections. Players also can choose the right column below the section number to let the betting machine choose six numbers randomly. After submitting the purchase sheet to the betting shop, the player receives a receipt, as displayed in Figure A1b, which can be used to redeem the prize. Figure source: Taiwan Lottery Website. Retrieved November 30, 2023, from https://www.taiwanlottery.com.tw/Lotto649/index.asp.

Figure A2: Scratched Game

(a) Unscratched (b) Scratched

Notes: This figure displays one of the famous scratchcard games. Figure A2a displays the unscratched card, which has eight sets of games. Players need to scratch the card and match the numbers in each set to win specific prizes. As shown in Figure A2b, the numbers inside the blue shape matched each other. Hence, the player won the prize as shown in the shape.
Figure source: Taiwan Lottery Website. Retrieved November 30, 2023, from https://www.taiwanlottery.com.tw/instant/instant_games_details_4573.asp.

Figure A3: Keno Game

(a) Purchase Sheet

(b) Purchase Receipt

Notes: Figure A3a displays a Keno game purchase sheet. Players first choose one of ten gameplays in the first row, then choose 20 numbers from 1 to 80. They can also bet whether the numbers will be high or low, even or odds in the bottom panel. After submitting the purchase sheet to the betting shop, the player receives a receipt as shown in Figure A3b, which can be used to redeem a prize. The prizes are different according to the gameplay and how many numbers a player matches.
Figure source: Taiwan Lottery Website. Retrieved November 30, 2023, from https://www.taiwanlottery.com.tw/BINGOBINGO/index.asp.

Figure A4: Taiwan Receipt Lottery

Notes: This figure displays an example from the Receipt Lottery, which contains 8 numbers (04841548).

B Construction of Individual Wealth Data

We construct individual wealth data using the following administrative records: (1) wealth registry; (2) income statement file; and (3) records on mortgage interest costs. The wealth register contains the third-party reported variables of financial and non-financial assets for all individuals in Taiwan. Financial assets include detailed information on end-of-year listed and unlisted stocks. The price of stocks is measured by the trading price at the ex-dividend date on the Taiwan Stock Exchange (TWSE) and the Taipei Exchange.[26] The stocks of unlisted companies are also included and priced by the net asset value share.[27]

Non-financial assets include real estate (lands and houses). The information includes areas, locations, and unique identification numbers. The value of land and houses in wealth registers is measured by their assessed values, which are announced by the local government in Taiwan for tax purposes once per year, and they are considered much lower than trading prices in the market.[28] To bring the value of land and houses closer to the trading price in the market, following the procedures in Leth-Petersen (2010) and Boserup, Kopczuk and Kreiner (2016), we multiply the assessed values of houses or land by the ratio of average trading prices to average assessed values at the township level.

However, the wealth register does have two limitations. First, bank deposits, bonds, and other assets in the money markets, such as short-term bills, are not included in the data.[29] Therefore, we estimate the value of these assets by using information on interest income from the income statement and a simple capitalization method (Saez and Zucman, 2016).

[26] The Taipei Exchange is the stock exchange for listed companies in the Over-the-Counter (OTC) market and the emerging stock market. For those stocks with no information on ex-dividend date trading price, we use the closing price at the end of July instead; for those stocks that do not have a closing price at the end of July, we use the net asset value share instead.

[27] The net asset value of a company is defined as the total assets (including cash, saving, merchandise inventory, equipment, investments, etc.) and liabilities (including loans, accounts payable, pension reserves, etc.) as listed on the income return file of the company.

[28] For example, the assessed value of a house is based on construction costs, depreciation, and location ranking adjustment.

[29] Individual interest income of bonds and short-term bills is taxed separately with uniformly 10%. They are common tools used to save individual income tax in Taiwan.

To start, we separately aggregate the interest income of deposits, bonds, and short-term bills. Then, in order to construct the capitalization rate, we divide each aggregate interest income by the aggregate amount of assets (i.e., bank deposits, bonds, and short-term bills) reported in the Financial Statistics published by the Central Bank. Thus, r_{jt} is the capitalization rate for asset j in year t, defined as follows:

$$r_{jt} = \frac{\sum_i d_{ijt}}{W_{jt}}, \tag{B.1}$$

where d_{ijt} is the interest income for asset j held by individual i in year t, and W_{jt} is the corresponding aggregate amount of the asset j in year t. Finally, we can calculate each individual i's capitalized assets w_{ijt} by dividing interest income d_{ijt} of asset j by the corresponding capitalization rate r_{jt}.

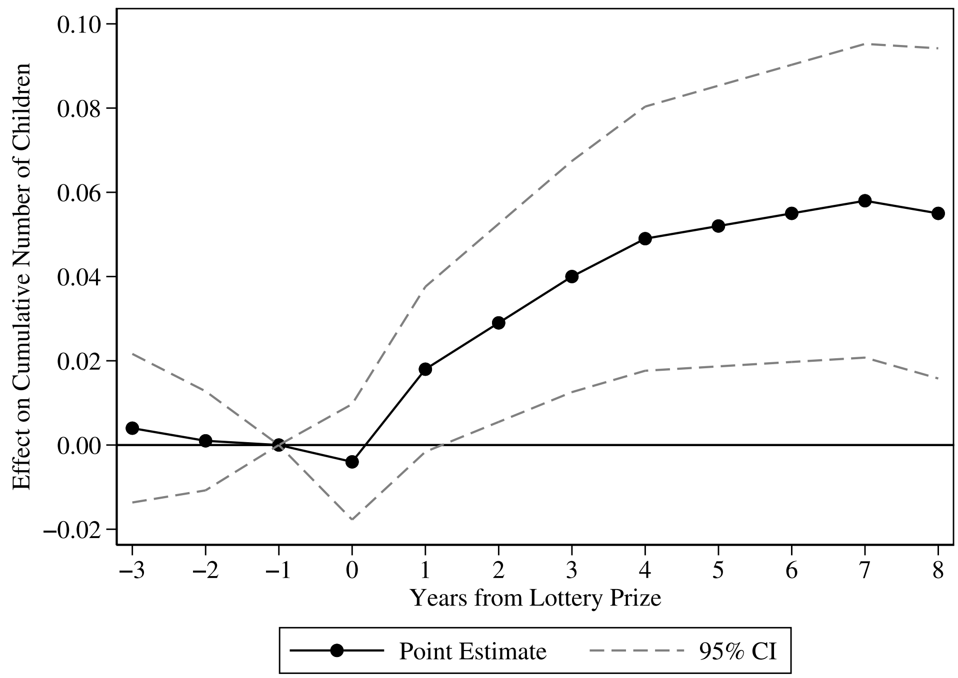
$$w_{ijt} = \frac{d_{ijt}}{r_{jt}}, \tag{B.2}$$

Second, the wealth registry data lacks information on debt. We use records on mortgage interest costs reported by third parties (i.e., banks) and the same capitalization method to impute the value of debt for each individual. According to Lien et al. (2021), mortgages reported to the tax agency account for around 53% of total debt in Taiwan. Therefore, we think our wealth data should cover most debts held by the Taiwanese. Finally, one important reminder is that pensions and insurance are not included in our wealth data, which is a common drawback of administrative wealth data in Nordic countries. According to the National Wealth Report, pensions and insurances account for 17% of individuals' total net wealth in 2014.[30]

[30]Retrieved from: https://www.stat.gov.tw/public/Data/861393520GEYI9Z14.pdf. Date of access: July 31, 2022.

C Additional Tables and Figures

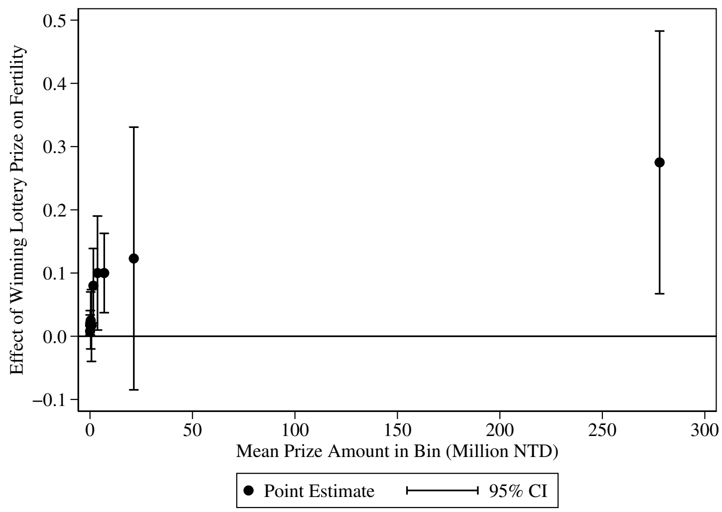
Figure C1: Effect of a Five Million NT$ Lottery Prize on Fertility (Tracking 8 Years)



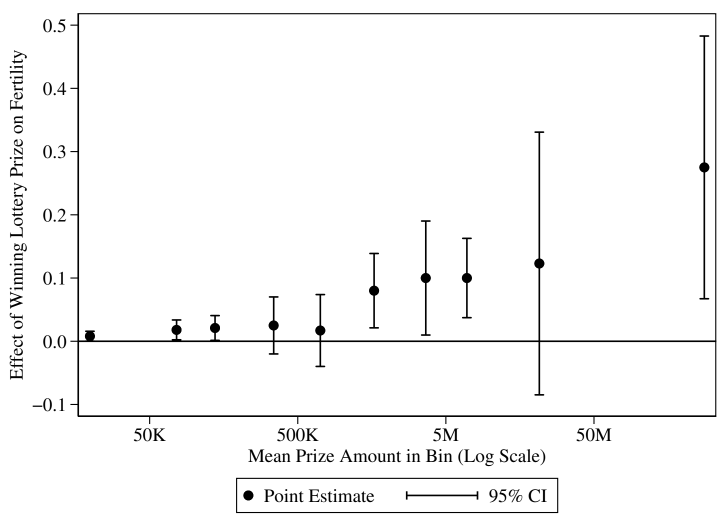
Notes: This figure displays the estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + s]$ from Equation (1), but set s = -3, -2,..., 8. The sample only consists of winners whose (placebo) winning years are from 2007 to 2010 (four cohorts). The outcome of interest is the cumulative number of children. The solid line denotes the point estimates. The dashed line denotes the 95% confidence interval. The horizontal axis refers to the number of years from the (placebo) lottery-winning year.

Figure C2: Effect of a Lottery Prize on Fertility by Prize Bins

(a) Prize Amount as Level Values

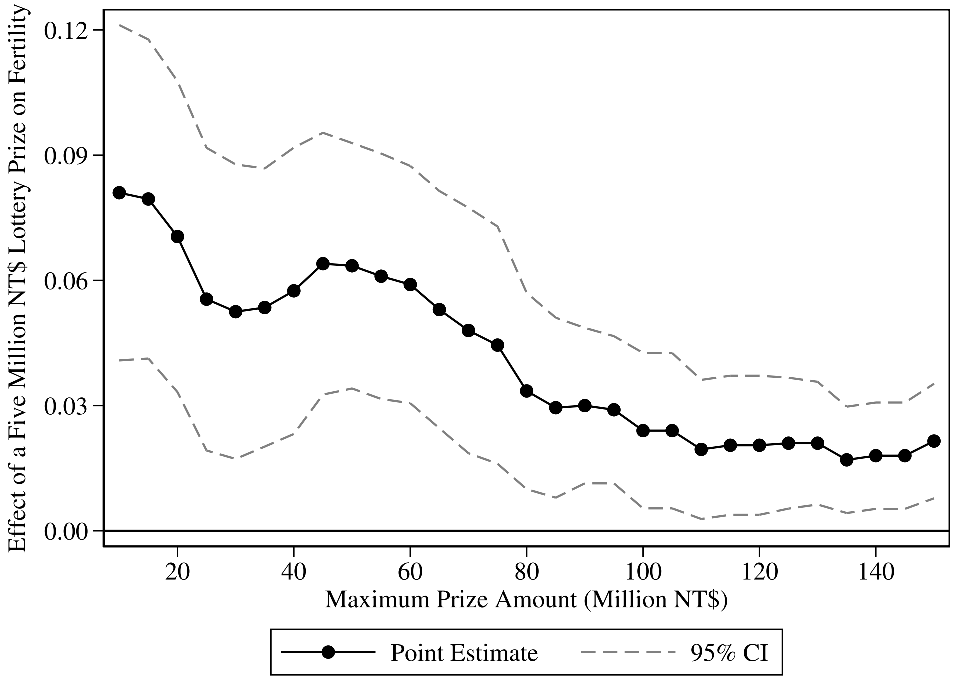


(b) Prize Amount as Log Scale



Notes: This figure reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), but replacing the continuous measure of lottery wins ($Prize$) with a series of binary indicators $\mathbf{I}[Size = k]$ representing different prize ranges: 1) 10 to 50 thousand NT\$; 2) 50 to 100 thousand NT\$; 3) 100 to 250 thousand NT\$; 4) 250 to 500 thousand NT\$; 5) 500 thousand to 1 million NT\$; 6) 1 to 2.5 million NT\$; 7) 2.5 to 5 million NT\$; 8) 5 to 10 million NT\$; 9) 10 to 50 million NT\$ and 10) 50 million NT\$ or more. We use winners of 5 to 10 thousand NT\$ as the reference group. The outcome of interest is the cumulative number of children. The circle symbol denotes the point estimates. The dashed line denotes the 95% confidence interval. The horizontal axis refers to the log average prize amount within the bin.

Figure C3: Robustness Check: Alternative Maximum Prize Amount Cutoff



Notes: This figure displays the estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ from Equation (1), with alternative settings on the maximum prize amount (ranges from 10 Million NT$ to 150 Million NT$) included in the sample. The outcome of interest is the cumulative number of children. The solid symbol denotes the point estimates. The dashed line denotes the 95% confidence interval. The horizontal axis refers to the maximum prize amount.

Table C1: Distribution of a Lottery Prize

Prize Amount	Number of Winners	Mean Win (Thousand NT$)	Median Win (Thousand NT$)
All Prizes			
5K–10K	180,120	8	8
10K–50K	178,265	20	17
50K–500K	42,134	118	92
500K–5M	4,965	1,334	812
5M–50M	1,438	8,064	6,822
>50M†	150	295,904	183,709
Public Welfare Lottery			
5K–10K	96,275	7	7
10K–50K	166,113	19	17
50K–500K	41,173	117	90
500K–5M	4,490	1,322	811
5M–50M	1,234	8,064	6,726
>50M†	150	295,904	183,709
Taiwan Receipt Lottery			
5K–10K	95,862	8	8
10K–50K	10,771	28	32
50K–500K	918	164	162
500K–5M	475	1,452	1,622
5M–50M	204	8,061	8,000

Note: All prizes are after-tax amounts and adjusted with CPI, displayed in 2016 NT$ (1 NT$ $\approx$ 0.033 US$). An individual can win both the Public Welfare Lottery and the Taiwan Receipt Lottery in a given year. Therefore, the sum of the head counts of two subcategories might exceed the total head counts.
† Not included in the main sample.

Table C2: Regression Analysis of Prize Amounts Predicted by Predetermined Covariates

	Prize Won in Year t (1,000 NT$)	
	Current Winners	Future Winners
Characteristics in $t-1$:		
Urban	4.465*	8.833***
	(2.530)	(3.146)
Female	-13.126***	-29.391***
	(2.427)	(3.038)
Married	1.938	-1.991
	(3.030)	(3.984)
Employed	0.012	-1.918
	(3.022)	(3.704)
Earnings (million NT$)	-9.032	-12.395
	(8.485)	(9.674)
Income (million NT$)	9.820	13.279
	(7.726)	(8.621)
Asset (million NT$)	0.105	-0.100
	(0.166)	(0.246)
Liquid Asset (million NT$)	-0.206	0.033
	(0.318)	(0.438)
Savings (million NT$)	-0.862	-2.655*
	(1.051)	(1.411)
Number of Children	-0.031	0.434
	(1.457)	(1.966)
Observations	222,937	183,985

Note: This table presents a linear model predicting the prize amount won in the treated year (measured in NT$1,000) using predetermined covariates measured one year before the lottery win. All models include age fixed effects. The predetermined covariates include urban residence (a dummy indicating residence in a special municipality), marital status, employment status, earnings, income, assets, liquid assets, savings, and the number of children. Standard errors are reported in parentheses.
*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table C3: Descriptive Statistics for Current and Future Lottery Winners

	Current Winners	Future Winners	Future Winners (Re-weighted)
Individual characteristics			
Age	32.76	30.86	32.76
	(6.47)	(6.91)	(6.47)
Living in urban area	0.69	0.68	0.69
	(0.46)	(0.47)	(0.46)
Female	0.49	0.55	0.55
	(0.50)	(0.50)	(0.50)
Married	0.49	0.42	0.49
	(0.50)	(0.49)	(0.50)
Winner's Employment	0.75	0.74	0.75
	(0.43)	(0.44)	(0.43)
Winner's Earnings (NT$1,000)	306	270	297
	(403)	(383)	(406)
Winner's Income (NT$1,000)	326	287	317
	(447)	(443)	(462)
Winner's Assets (NT$1,000)	2,160	1,897	2,227
	(9,010)	(8,312)	(8,797)
Winner's Liquid Assets (NT$1,000)	625	597	689
	(4,762)	(4,827)	(4,783)
Winner's Savings (NT$1,000)	249	248	291
	(1,193)	(1,107)	(1,228)
Household Earnings (NT$1,000)	502	477	529
	(680)	(624)	(659)
Household Income (NT$1,000)	538	507	567
	(752)	(706)	(744)
Household Assets (NT$1,000)	3,971	3,697	4,357
	(14,155)	(13,776)	(15,479)
Household Liquid Assets (NT$1,000)	1,075	1,053	1,225
	(7,551)	(5,864)	(6,056)
Household Savings (NT$1,000)	416	427	501
	(1,727)	(1,641)	(1,794)
Fertility variables			
Cumulative Number of Children	0.96	0.79	0.94
	(1.12)	(1.07)	(1.12)
Gave Birth in $s-1$	0.05	0.04	0.04
	(0.21)	(0.20)	(0.20)
Gave Birth in $s-2$	0.05	0.04	0.04
	(0.21)	(0.20)	(0.21)
Gave Birth in $s-3$	0.05	0.04	0.05
	(0.22)	(0.20)	(0.21)
# of Observations	222,937	183,985	222,937

Note: The Current (Future) Winners sample refers to individuals who only won the lottery in the treatment year (will win in future years). The third column reweighs the future winners to match the age distribution of the current winners using the post-stratification weighting technique. Urban areas refer to the 6 largest cities in Taiwan with special municipality status: Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City. These cities have the largest populations in Taiwan. Employment is defined as having positive annual labor earnings. Annual earnings are defined as the sum of annual wage income, business income, and professional income. Annual income is defined as the sum of annual labor earnings plus other annual income sources like interest, rents, farming, pensions, etc, excluding lottery winnings. Assets are defined as the sum of real estate value, financial assets, and stocks, minus mortgage debt. Liquid assets are defined as the sum of financial assets and stocks. All monetary values like earnings, income, assets and liquid assets are measured in thousand New Taiwan Dollars (NT$) and adjusted to 2016 NT$ levels (1 NT$ $\approx$ 0.033 US$ in 2016). More details on the construction of asset data can be found in Appendix B. Standard deviations are in parentheses.

Table C4: Child-related Social Welfare Policies in US, Sweden, and Taiwan

Policy	**US**	**Sweden**	**Taiwan**
Child Cash Subsidies	Child Tax Credit: Up to \$2,000 annually per qualifying child under 17 (phases out at \$200,000 for single filers, \$400,000 for married). EITC for low-income families.	Child allowance: ~\$144/month until age 16. Additional allowance for multiple children (up to ~\$1,140 for five children).	Child allowance: ~\$160/month for children under 5. Special Tax Deduction for Children: Up to \$3,800 per child annually (corresponding to around \$760 using 20% marginal tax rate).
Parental Leave	No federal paid leave. Some states offer paid family leave with varying coverage.	480 days of paid parental leave, 390 days at 80% salary.	180 days of paid parental leave at 60% salary.
Health Insurance	High out-of-pocket costs for many families, with premiums averaging over \$21,000 annually. Medicaid and SCHIP for low-income families.	Heavily subsidized children's healthcare. Free outpatient care until age 18 and dental care until age 23.	National Health Insurance system with relatively low medical costs for children.
Child Care	Child and Dependent Care Credit: Claim 20%–35% of care expenses, up to \$3,000 for one child, or \$6,000 for two or more children.	Subsidized childcare capped at \$135/month for the first child (up to 3% of gross income). Lower fees for additional children.	For children under 2: Subsidy of \$230 to \$430/month for child care. For children aged 2–6: Subsided public child care capped at \$100/month for the first child (Lower fees for additional children.) or subsidy of \$160/month for private child care.

Data source: Internal Revenue Service (US), US Department of Labor, Kaiser Family Foundation, European Commission, Swedish Social Insurance Agency (Försäkringskassan), Ministry of Finance (Taiwan), Ministry of Health and Welfare (Taiwan), Ministry of Education (Taiwan), Ministry of Labor (Taiwan).

Table C5: Public Family Benefits Spending in US, Sweden, and Taiwan

	US	Sweden	Taiwan
Public Family Benefits Spending			
Total Spending, National Currency (Millions)	130,903	172,746	147,948
Spending per-child, National Currency	1,541	72,233	34,693
Spending per-child, PPP converted (in 2015$)	1,443	7,493	2,121
Percentage of GDP (%)	0.6	3.4	0.8

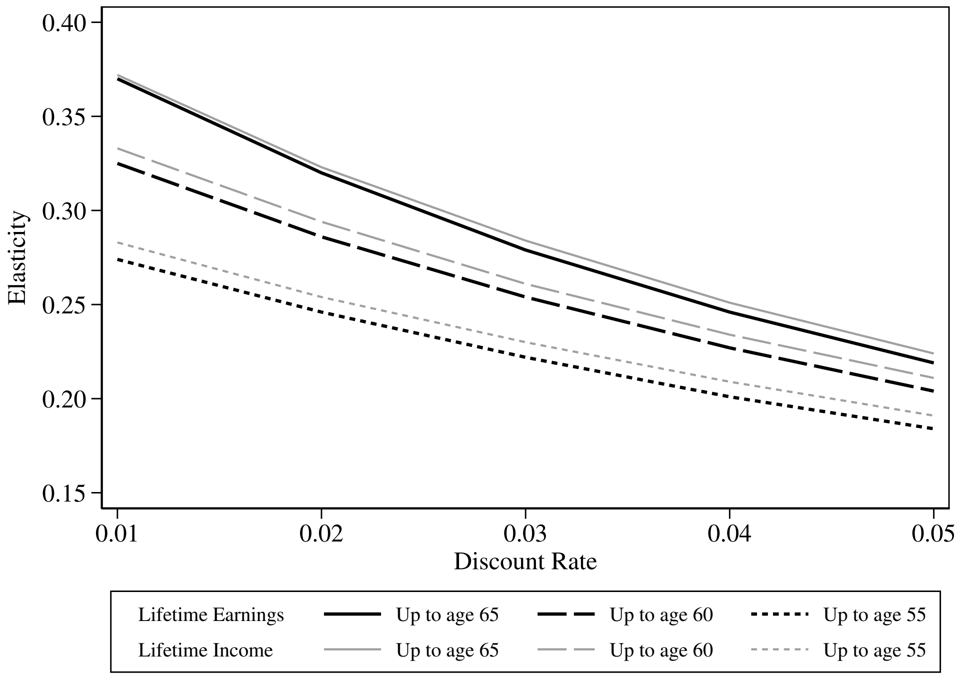
Note: Public family benefits spending includes financial support that is exclusively for families and children. Such as child-related cash transfers, income support payments during parental leave, income support for sole parents' families, financing and subsidizing of childcare and early education providers, and child-related tax spending. The data is as of 2019. Data source: OECD Family Database, United Nations Data Portal Population Division, Ministry of Interior (MOI) Taiwan, Ministry of Health and Welfare (MOHW) Taiwan, and Directorate General of Budget, Accounting and Statistics (DGBAS) Taiwan. Children are defined as the population under age 19.

D Alternative Approach to Estimate Wealth Elasticity of Fertility

In the main analysis, we use the change in accumulated wealth in the comparison group to measure the magnitude of the income shock from the lottery wins. An alternative approach is to use the accumulated income flow during one's lifetime. To estimate the lifetime income, we first take the population data and estimate the year-to-year income (earnings) growth rate for each individual. And then, we take the median growth rate by gender and age and apply it to our sample. We then calculate the counterfactual of the potential income (earnings) for lottery winners as if they had not received the lottery gain. We compute the annual income (earnings) up to their retirement age (which is defined as 55, 60, or 65). We also apply various discount rates (from 0.01 to 0.05) to compute future lifetime income (earnings) to current values. Using this information, we re-compute the wealth elasticity driven by the lottery on fertility.

Figure D1 displays the results. Using different assumptions, the estimated elasticity falls between 0.18 and 0.37. The elasticity is lower when we assume a higher discount rate and an earlier retirement age. The elasticity estimates are quite consistent whether we use labor market earnings or total income.

Figure D1: Estimated Elasticity with Lifetime Income/Earnings



Notes: This figure denotes the estimated wealth elasticity on fertility using lifetime income/earnings as the base of wealth change. The horizontal axis denotes the discount rate. The vertical axis demonstrates the estimated elasticity. The back lines denote estimations using lifetime earnings, and the gray lines denote estimations using lifetime income. The solid, dashed, and dotted lines are based on the estimation that calculates lifetime income/earnings up to 65, 60, and 55, respectively.

E Robustness Checks: Details

In this Online Appendix, we carry out a range of robustness checks for our main results, the outcomes of which we display in Table E1. Again, we use estimated effects at the sixth year post-lottery win ($s = 6$) to summarize the wealth effect on total fertility so that Table E1 only displays the estimated γ_6. Our main results are based on all lottery wins between 5,000 NT$ to 50 million NT$. In conducting the robustness checks, we confine our analysis to winnings amounting to 50,000 NT$ or more (see Column (1)). This step is taken to verify that the main results are not driven by the large volume of individuals winning small prizes. We also lower the minimum win threshold to 2,000 NT$ (see Column (2)), which is the smallest win we can observe. Despite this alteration, our results prove to be robust.

Another concern for the main estimate is that our sample only consists of lottery winners, as the characteristics of these people could be different from those of the general population. Table 1 indicates that the lottery sample was slightly older. Consistent with this fact, they are more likely to be married and employed than the general population. In order to investigate this issue, we first re-weight the sample to make these characteristics similar to those of the general population in Taiwan.[31] After re-weighting, the sizes of these differences become smaller, as the proportion of the population means is mostly below 10% (see Table E2). Column (3) of Table E1 suggests that the result based on population re-weighting is statistically significant and gives an estimate of 0.065.

One potential threat to our empirical strategy is that future winners might not serve as valid counterfactuals for current winners. Table C3 in the Online Appendix compares the demographic statistics of current and future winners. We find that their characteristics are generally similar, with the notable exception that current winners tend to be older. This age

[31] We use the post-stratification weighting technique and match the marital status, age, earnings, and asset stratifications for our lottery sample and the population, the latter of which is defined as individuals aged 20 to 44 from 2007 to 2012 (same as our winning years) in Taiwan. This leads to 11 million observations, which is around half of the nation's population. We randomly assign a placebo-winning year to the population and use their characteristics as one year prior to the placebo-winning years.

difference aligns with findings in previous literature (Golosov et al., 2024). To address this discrepancy, we conducted an additional analysis using future winners from the same age cohort as current winners. Specifically, we resampled (with replacement) within the age-by-cohort cluster among the future winners based on the number of observations in that cluster of current winners. This approach allows us to construct a future winner sample that mirrors the age distribution of the current winners (see the last column of Table C3). Column (4) of Table E1 reports the estimate based on this adjusted sample. The point estimate is 0.060, which closely aligns with our main findings.

In our main specification, we control for fixed effects based on the age of the winner. However, female age is more likely to be the key factor determining fertility behavior, so in this robustness check, we include fixed effects (separately) for male and female ages.[32] As indicated in Column (5) of Table E1, the estimate (0.065) does not deviate from our main results. Additionally, we implement a robustness check, incorporating individual fixed effects to account for any unobserved, time-invariant disparities between individuals that may influence fertility decisions, such as the preference to have children and the ability to get pregnant. The resulting estimation (0.064), found in Column (6) of Table E1, aligns closely with our primary findings. In the main specification, we define the winning year as the year of the first lottery win, thus allowing individuals to win multiple times. Since subsequent lottery wins could also influence fertility, we check the robustness of only including individuals who won the lottery once during the sample period. Column (7) of Table E1 reports estimates using the restricted sample of single-time winners. The estimate is 0.056, which is close to our main result.

Our data consists of six cohorts with different treatment timings, namely, treated individuals winning lottery prizes in a given year from 2007 to 2012. Several recent studies

[32]For male winners, the female age is defined as their pre-lottery spouse's (if present) age; for female winners, the male age is defined as their pre-lottery spouse's (if present) age; for winners with no pre-lottery spouse, we create a dummy indicating the missing age for their spouse. Taiwan legalized same-sex marriage in 2019. The last observed year in our analysis is 2018, so there is no case when a winner and their spouse is of the same sex.

(De Chaisemartin and d'Haultfoeuille, 2020; Callaway and Sant' Anna, 2021; Goodman-Bacon, 2021; Baker, Larcker and Wang, 2022; Sun and Abraham, 2021) suggest that if treatment effects are heterogeneous across treated cohorts, conventional DID estimates could be biased. To address this concern, we individually estimate the lottery effect for each cohort and then average these estimates. In particular, we compare winners who secured the lottery prize in 2007 with the corresponding future winner cohort (those who won the lottery prize in 2014, with the placebo winning year set at 2007). We carry out a similar estimation separately for each cohort, and subsequently, we calculate the average estimate, weighted by the sample size of each cohort. We estimate the standard error through 1,000 times bootstrapping (re-sampling with a replacement within lottery cohorts). This approach ensures that we avoid comparing observations from different treatment timings and mitigates the bias that could arise from a staggered DID design. Column (8) of Table E1 presents the estimated effect as 0.065, which closely aligns with our main result. Overall, the evidence in this section demonstrates that our primary estimate remains robust across various sample selection criteria and empirical specifications.

Table E1: Robustness Checks

Dependent Variable:	Number of Cumulative Children							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Minimum Prize		Population Re-weighting	Age-matched Sample	Age FE by Gender	Individual FE	Single-time Winners	Cohort-by-Cohort
	50K	2K						
$Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$	0.051***	0.065***	0.065***	0.060***	0.065***	0.064***	0.056***	0.065***
	(0.013)	(0.017)	(0.014)	(0.015)	(0.015)	(0.015)	(0.017)	[0.016]
Baseline trend	0.297	0.320	0.278	0.301	0.321	0.321	0.323	0.320
Observations	654,530	12,685,790	4,069,160	4,458,740	4,069,214	4,069,220	3,408,070	4,069,220

Note: This table reports estimated coefficients of $Current_{i,\ell} \times Prize_i \times \mathbf{I}[t = \ell + 6]$ in Equation (1), which stands for the effect of 5 Million NT$ lottery wins on fertility at the sixth year following the receipt of cash windfalls. The outcome of interest is the cumulative number of children that winner i has by the end of the sixth year after a lottery win. The baseline trend is the change in the cumulative number of children for the future winner between one year before and six years after the placebo lottery-winning year. Columns (1) and (2) report the estimate using different thresholds of "minimum prizes,"— the threshold we use to exclude observations—less than 30 thousand NT$ (Column (1)) or less than 2 thousand NT$ (Column (2)). Column (3) reports the estimate based on re-weighting the lottery winner sample to make these characteristics similar to those of the general population in Taiwan. Column (4) reports the estimate based on resampling within the future winner sample to make their age distribution match those of the current winner sample. Column (5) includes both male and female age fixed effects. For winners with no spouse, we include a dummy indicating a missing spouse (either male or female). Column (6) includes individual (winner) fixed effects to account for any individual time-invariant unobserved factors. Column (7) restricts samples to those who only win a lottery prize once in the sample period (2004 to 2018). Column (8) estimates the lottery impact within each cohort ([placebo] lottery winning years) separately and the average effect weighted by the number of observations in each cohort. The standard error is obtained by 1,000 times bootstrapping (re-sampling within replacement within the cohorts [winning years] cluster). Standard errors are clustered at the winner level and reported in parentheses. Bootstrapping standard errors are reported in squared brackets. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table E2: Descriptive Statistics for Lottery Winners (Re-weighted) and Population

	Lottery Winners	Lottery Winners (Re-weighted)	Population
Individual characteristics			
Age	31.90	31.36	31.36
	(6.74)	(7.90)	(7.90)
Living in urban area	0.69	0.69	0.69
	(0.46)	(0.47)	(0.46)
Female	0.52	0.50	0.50
	(0.50)	(0.50)	(0.50)
Married	0.46	0.41	0.41
	(0.50)	(0.49)	(0.49)
Winner's Employment	0.75	0.69	0.69
	(0.43)	(0.46)	(0.46)
Winner's Earnings (NT$1,000)	290	281	286
	(394)	(452)	(546)
Winner's Income (NT$1,000)	308	302	308
	(445)	(513)	(657)
Winner's Assets (NT$1,000)	2,041	2,258	2,320
	(8,702)	(9,771)	(13,292)
Winner's Liquid Assets (NT$1,000)	612	676	709
	(4,791)	(5,517)	(7,939)
Winner's Savings (NT$1,000)	248	262	292
	(1,155)	(1,235)	(1,391)
Household Earnings (NT$1,000)	490	465	458
	(656)	(720)	(870)
Household Income (NT$1,000)	524	500	497
	(732)	(803)	(1,344)
Household Assets (NT$1,000)	3,847	3,973	4,166
	(13,986)	(14,998)	(41,405)
Household Liquid Assets (NT$1,000)	1,065	1,123	1,209
	(6,840)	(7,457)	(38,198)
Household Savings (NT$1,000)	421	436	478
	(1,689)	(1,794)	(2,440)
Fertility variables			
Cumulative Number of Children	0.88	0.83	0.82
	(1.10)	(1.10)	(1.11)
Gave Birth in $s-1$	0.04	0.04	0.03
	(0.21)	(0.18)	(0.18)
Gave Birth in $s-2$	0.05	0.04	0.03
	(0.21)	(0.19)	(0.18)
Gave Birth in $s-3$	0.05	0.04	0.04
	(0.21)	(0.19)	(0.19)
# of Observations	406,922	406,922	11,205,868

Note: We utilize all individuals aged 20–44 from 2007–2012 to construct population data. For each individual, we randomly assign one year between 2007–2012 as a placebo "winning year." We then use their individual characteristics from the year prior to this randomly assigned placebo winning year in our analysis. We use the post-stratification weighting technique and match the marital status, age, earnings, and asset stratifications for our lottery sample and the population. Urban areas refer to the 6 largest cities in Taiwan with special municipality status: Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City. These cities have the largest populations in Taiwan. Employment is defined as having positive annual labor earnings. Annual earnings are defined as the sum of annual wage income, business income, and professional income. Annual income is defined as the sum of annual labor earnings plus other annual income sources like interest, rents, farming, pensions etc, excluding lottery winnings. Assets are defined as the sum of real estate value, financial assets, and stocks, minus mortgage debt. Liquid assets are defined as the sum of financial assets and stocks. All monetary values like earnings, income, assets and liquid assets are measured in thousand New Taiwan Dollars (NT$) and adjusted to 2016 NT$ levels (1 NT$ $\approx$ 0.033 US$ in 2016). More details on the construction of asset data can be found in Appendix B. Standard deviations are in parentheses, and standard errors are in brackets.

F Estimates based on Golosov et al. (2021)'s Approach

In this Online Appendix, we follow the research design in Golosov et al. (2024) that combines a staggered difference-in-differences (DID) design and instrumental variables approach to estimate the effect of lottery wealth on fertility.[33] To implement the DID design, we estimate the following regression:

$$\begin{aligned} B_{it} = {} & \alpha_0^{\ell,s} + \alpha_1^{\ell,s} \cdot Current_{i,\ell} + \alpha_2^{\ell,s} \cdot \mathbf{I}[t = \ell + s] \\ & + \gamma^{\ell,s} \cdot Current_{i,\ell} \times \mathbf{I}[t = \ell + s] + a_{it} + \theta_t + \boldsymbol{X_i} \psi + \varepsilon_{it}^{\ell,s} \end{aligned} \tag{F1}$$

The outcome of interest, denoted by B_{it}, represents the cumulative number of children that individual i has at time t. The variable $Current_{i,\ell}$ is a dummy indicator that equals 1 if individual i is a current lottery winner (who first won a lottery prize in year ℓ) and 0 if individual i is a future winner (whose first lottery win occurs after $\ell + 6$). The term $\alpha_1^{\ell,s}$ represents a fixed effect for individuals who won lottery prizes in year ℓ. Event time dummies, $\mathbf{I}[t = \ell + s]$, indicate whether an observation occurs before or after the lottery win, where ℓ is the year of individual i's first lottery win. Thus, $\mathbf{I}[t = \ell + s]$ is an indicator for whether the observation year t is s years away from the winning year ℓ, with s taking values of $-3, -2, 0, 1, 2, 3, 4, 5, 6$. The term $\alpha_2^{\ell,s}$ captures a time effect for event time s. We normalize the coefficient $\alpha_2^{\ell,s}$ at the baseline year $s = -1$ to zero. The variable a_{it} represents age fixed effects, θ_t denotes year fixed effects, and $\boldsymbol{X}_i$ is a vector of pre-determined covariates.

Following Golosov et al. (2024), we estimate equation (F1) separately for each winning cohort ℓ and then calculate a weighted average of the estimates for each event time, with weights based on the cohort size. This approach addresses concerns related to staggered DID designs as discussed by De Chaisemartin and d'Haultfoeuille (2020), Callaway and Sant' Anna (2021), and Sun and Abraham (2021). The standard errors were computed using a

[33] Following Golosov et al. (2024)'s setting, the estimation sample consists of lottery winners who won more than 1 million NT\$ ($\approx$ 30 thousand US\$), resulting in a total of 3,445 lottery winners.

bootstrapping method with 1,000 resamples, with replacement within the cohort-by-group cluster. Figure F1a shows the estimated coefficients $\gamma^{\ell,s}$ from equation (F1). Consistent with Figure 2, there is no evidence of differential trends between current and future winners during the pre-win event times -3 to -1, supporting the common-trend assumption. The results suggest that fertility among lottery winners significantly increases after their wins, with the number of children ever born rising by 0.08 in the sixth year after the win.

It is challenging to interpret the magnitude of the effects reported in the previous DID design because the treatment variable captures whether an individual wins, but not the size of the lottery win. To obtain economically interpretable estimates, similar to our main specification—the triple-differences design—we further exploit variations in lottery prizes. Following Golosov et al. (2024), we combine the DID design with an instrumental variable (IV) approach, using the timing of lottery wins as an instrument for the lottery winnings. Specifically, we estimate the following two-stage least squares (2SLS) model:

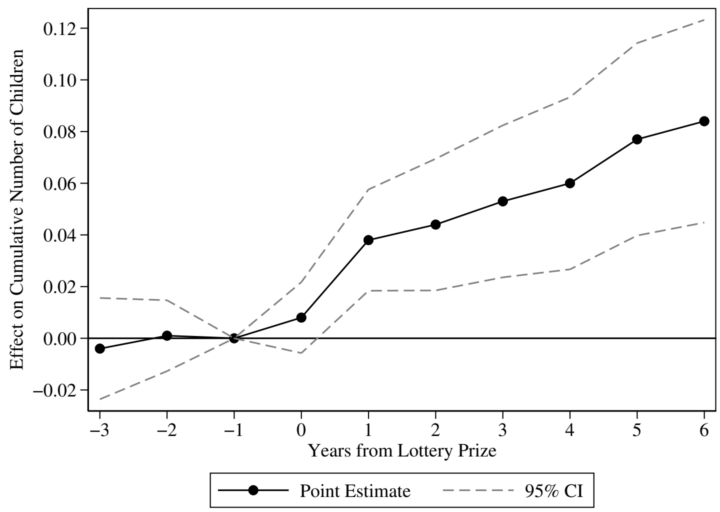
$$\begin{aligned} Prize_{it} &= \nu_0^{\ell,s} + \nu_1^{\ell,s} \cdot Current_{i,\ell} + \nu_2^{\ell,s} \cdot \mathbf{I}[t = \ell + s] \\ &\quad + \eta^{\ell,s} \cdot Current_{i,\ell} \times \mathbf{I}[t = \ell + s] + a_{it} + \delta_t + \boldsymbol{X_i}\phi + \epsilon_{it} \end{aligned} \tag{F2}$$

$$\begin{aligned} B_{it} &= \zeta_0^{\ell,s} + \zeta_1^{\ell,s} \cdot Current_{i,\ell} + \zeta_2^{\ell,s} \cdot \mathbf{I}[t = \ell + s] \\ &\quad + \lambda^{\ell,s} \cdot \widehat{Prize_{it}} + a_{it} + \xi_t + \boldsymbol{X_i}\omega + \upsilon_{it} \end{aligned} \tag{F3}$$

Equation (F2) is the first-stage regression, where $Prize_{it}$ represents the post-tax lottery winnings. The coefficient $\eta^{\ell,s}$ captures the impact of winning the lottery on these winnings. Equation (F3) is the second-stage regression, where the coefficient $\lambda^{\ell,s}$ measures the average effect of lottery wealth ($Prize_{it}$) on fertility (B_{it}). We estimate this IV model separately for each cohort and event time, and then compute weighted averages, similar to the reduced-form analysis. To allow for a more meaningful comparison with our main estimates, we scale the effect to correspond to a five-million NT$ lottery prize win. Figure F1a illustrates the estimated results. The findings suggest that a five-million NT$ lottery prize increases total fertility by 0.085 by the end of the sixth year after the lottery win. This estimate closely aligns with our main findings from the triple-differences design.

Figure F1: Effect of Winning Lottery on Fertility

(a) Cumulative Number of Children: DID Estimation



(b) Cumulative Number of Children: IV Estimation

Notes: Figure F1a displays the estimated $\gamma^{\ell,s}$ from Equation (F1). Figure F1b displays the estimated $\lambda^{\ell,s}$ from Equation (F3). The outcome of interest is the cumulative number of children. The solid line denotes the point estimates. The dashed line denotes the 95% confidence interval. The horizontal axis refers to the number of years from the (placebo) lottery-winning year.