Pure Windfall Gain and Stock Market Participation: Evidence from Administrative Data

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Abstract

This paper utilizes receipt lotteries that almost every shopper participates in and complete administrative data in Taiwan to study the effect of wealth on stock market participation. The advantage of using receipt lottery winning, compared with the existing studies, is its immunity from the influences of family ruptures on mood/risk preferences or self-selection into stock and lottery participation. We find that each million TWD (around 35,000 USD) windfall gain increases the stock market participation probability by around 0.76 percentage points, around 4.34% of the average level. Our results suggest that financial constraints do negatively influence stock market participation.

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1 Introduction

It is challenging to empirically test the effect of wealth on stock market participation implied by life-cycle models of consumption and saving (e.g., Samuelson, 1969; Merton, 1971). The challenge lies in the endogenous nature of the two observables. Wealthy people tend to participate in stock markets as magnitudes of equity risk premium earned from the stock market participation increase with wealth (Vissing-Jorgensen, 2003). The stock markets may play an important role in increasing both wealth and wealth inequality as well (Favilukis, 2013). It could also be innate attributes of individuals, such as IQ, that drive both stock market participation and wealth generated from investments (e.g., Grinblatt, Keloharju and Linnainmaa, 2011*a*, 2012). Hence, the ideal empirical framework for the test is a randomized controlled trial that gives the treated group a sufficient amount of windfall gains such that the wealth effect on stock market participation can be discernible to econometricians. However, such kind of experiments is too costly to be conducted in economies with stock markets for a meaningful observation number.

As far as we know, two existing studies provide partial solutions to this challenge using exogenous shocks to an individual's wealth as the identification strategy. One is Andersen and Nielsen (2011) who use Danish inheritances from sudden parental deaths as exogenous shocks to one's wealth. They conclude that limited participation is unlikely to be driven by financial participation costs. However, whether sudden deaths of parents increase or decrease the life-cycle wealth can be an empirical issue itself. Moreover, mood, stress, mental health, and risk perception might be severely affected by the sudden deaths of parents, which in turn affect the stock market participation. These concurrent impacts on an individual might convolute the interpretations of the findings given that sudden deaths of parents affect the stock market participation via multiple potential channels.

The other one is Briggs et al. (2021) who use Swedish lottery winning as windfall gains to an individual's wealth. The key assumption in their identification strategy is that the

winning lottery is randomly assigned conditional on expenditures and participation of the gambling lotteries. It is important to condition on lottery expenditures as, unconditionally, the probability of winning could be correlated with stock market participation. This correlation could arise if the conditions that prompt individuals to buy lottery tickets are the same as those that drive individuals to participate in the stock market. In this case, an individual that has a higher tendency to participate in the stock market would buy more lottery tickets, and thus would be more likely to win. In other words, lottery gamblers and stock traders can be partially overlapped or at least both driven by gambling preferences. This argument is supported by the empirical finding in Gao and Lin (2015) who show that stock trading and lottery gambling are substitutes as retail trading volume of lottery-like stocks drops on a large jackpot drawing day. The conclusion of Briggs et al. (2021) that windfall gain increases stock market participation is at odds with that of Andersen and Nielsen (2011).

The key innovation of our paper is to utilize a new empirical strategy and complete administrative data in Taiwan for addressing the empirical challenge and shedding light on the inconclusive prior findings. Our strategy is not only immune to the influences of family ruptures on mood or risk preference but also to self-selection into stock and lottery participation. Specifically, we use the universal receipt lottery winnings in Taiwan as exogenous wealth shocks to individuals and study their stock market participation. Taiwan receipt lottery is designed to encourage consumers to take receipts when they shop such that avoidance of sales and corporate income taxes can be minimized. Unlike typical lotteries, almost every shopper in Taiwan participates in the receipt lottery. Hence, the concern of only a selected group with specific gambling or risk preferences would buy lottery tickets is largely mitigated. Such windfall gains have a direct impact on wealth but no negative shock to mood or risk preference from the sudden death of parents.

We find that each million TWD (around 35,000 USD) windfall gain increases the stock market participation probability by around 0.76 percentage points, which is around 4.34% of the average level of stock market participation. Furthermore, individuals not only increase

the number of stocks they hold to diversify their portfolios but also purchase more stocks after they receive the windfall gains from the receipt lottery.

The contribution of this paper is twofold. First, we arguably provide the first causal evidence regarding the effect of wealth shocks on stock market participation that is not contaminated by either sample selection due to gambling preferences or multiple interpretations (e.g., mood or risk preference). Our paper thus differs from but complements Andersen and Nielsen (2011) and Briggs et al. (2021). In addition, our results echo Badarinza, Campbell and Ramadorai (2016) and Badarinza, Balasubramaniam and Ramadorai (2019) on expanding the study of household finance to a broader international context as Taiwan is relatively less developed than the Nordic countries.

Our paper also contributes to the literature on the determinants of stock market participation. For example, several recent studies find that cognitive abilities, IQ, and human capital play a role in explaining stock market participation (e.g., Christelis, Jappelli and Padula, 2010; Grinblatt, Keloharju and Linnainmaa, 2011*b*; Athreya, Ionescu and Neelakantan, 2015; Vestman, 2019; Georgarakos and Pasini, 2011). Asides from the individuals' characteristics, the previous literature also indicates that social interaction, trust, and internet access affect stock market participation (e.g., Hong, Kubik and Stein, 2004; Bogan, 2008; Brown et al., 2008; Guiso, Sapienza and Zingales, 2008; Georgarakos and Pasini, 2011; Kaustia and Knüpfer, 2012; Banyen and Nkuah, 2015). While these studies present plenty of endogenous characteristics that affect the stock market participation, our paper extend this line of research by examining the impact of wealth on stock investment decisions using the exogenous cash windfalls.

Second, our study is related to a large volume of literature on decisions and choices after windfall gain, including labor supply, health and mortality, marriage and divorce, saving and consumption, mental health, voting behavior, and child development (e.g., Imbens, Rubin and Sacerdote, 2001; Lindahl, 2005; Hankins and Hoekstra, 2011; Kuhn et al., 2011; Apouey and Clark, 2015; Bagues and Esteve-Volart, 2016; Cesarini et al., 2017, 2016). We differ

from these studies as we focus on stock market participation and utilize a windfall gain from universal receipt lottery that almost everyone participates in.

2 Background: Taiwan Receipt Lottery

In this section, we discuss the institutional details of Taiwan receipt lottery, which is also called Uniform Invoice lottery. This background knowledge helps us construct the estimation sample for empirical analysis. In order to encourage legal tax reporting, the government initiated Taiwan Receipt Lottery (RL) since January 1, 1951. RL is a bi-monthly receipt lottery, which gives consumers an incentive to purchase at stores that legally report value-added tax (VAT).[1] Whenever a consumer buys any form of goods or services, he/she receives a receipt with a set of lottery number consist of eight-digit number printed along the top. Figure 1 displays an example of the typical receipt and highlights the lottery numbers. Every odd month, the Ministry of Finance randomly draws sets of the winning numbers for different amount of prizes. Table 1 shows the prize rule for receipt lottery.

It is worth mentioning that during our sample period (i.e. 2005-2016), two lottery games were also run by the Taiwanese government, namely, Public Welfare Lottery (PWL) and Taiwan Sport Lottery (SL).[2] Unlike PWL and SL, and a wide class of typical lotteries played all over the world, RL is uniquely featured by its universal reach in the sense that almost all people in Taiwan can get their receipts through the daily consumption. According to the survey from Pollster[3], 92% of people choose to keep their receipts for the RL prizes. In our empirical analysis, we specifically focus on RL and exclude the winning prizes of PWL and SL. This avoids the sample selection issue, which is the biggest difference from the existing literature.

[1] Taiwan's VAT rate is 5% and paid by sellers and service providers.

[2] Online Appendix A provides background information about these two lottery games.

[3] The Pollster Online Survey is conducted by Pollster Technology Marketing Ltd. during the period from June 6 to June 9, 2009. The sample size is 9,929. The details can be referred to the following link: `https://www.pollster.com.tw/Aboutlook/lookview_item.aspx?ms_sn=308`

3 Data and Sample

3.1 Data

We implement our empirical analysis using several administrative records: (*i*) income tax return file; (*ii*) income statement file; (*iii*) wealth registry file; (*iv*) personal information file, provided by Taiwan's Fiscal Information Agency (FIA). All files contain scrambled personal ID, which allows the data to be linked at the individual level.

The lottery data is obtained from the income statement file, which contains each individual's income payment on a yearly basis. Most are third-party reported payments: wage income, interest income, pension income, and lottery income, while the remaining are self-reported information such as rental income, business income and agricultural income. The records cover all lottery winners who won more than 2,000 TWD (about 60 USD) because only lottery prizes above 2,000 TWD are taxable and reported to FIA. The income statement file includes the following information: 1) the taxpayer ID (i.e., the winner); 2) the amount of lottery prize; 3) the bank ID where the prize is redeemed. Since each lottery game has specific banks for prize redemption, we can use bank ID to select RL winners and sum the prizes won by individuals on a yearly basis to get the annual RL income.

Following Lien et al. (2021) and Chu, Kan and Lin (2019), we utilize income statement file and wealth registry file to construct the individual-level wealth data, which will be used for our subgroup analysis. Finally, the personal information file provides the variables related to demographics, such as gender, year of birth, location of birth, place of residence, year of marriage, and spouse's ID.

3.2 Sample

The unit of analysis in our empirical specification is an individual, and the sample period is 2005 to 2016. To arrive at our estimation sample, we apply the following sample selection

criteria. We first restrict sample to individuals whose age between 20 and 75 to alleviate the concern that stock investment decisions are made by other household members. Since we focus on RL winners, we also drop the individuals who won over 5,000 TWD from the PWL and SL during the study period. In order to avoid the spillover effects of winning lottery from an individual's spouse, our main results are based on the sample of individuals whose martial status are single. Therefore, we exclude people whose marital status changed after winning lottery.

4 Empirical Specification

There are two steps for an individual to win the RL: the first step is to make a purchase and obtain a receipt, and then the second step is to check the receipt numbers every two months for winning the prizes. In the first step, people obtain receipts conveniently through the daily consumption. In the second step, since storing receipts and matching the winning numbers for each collected receipt require considerable effort, people may differ by the effort they spend to check their receipts; therefore, the estimated effect could be biased if the effort is correlated with the risk or costs to participate in the stock market. In fact, all the existing literature faces the same issue since people might forget to check their lottery numbers after purchasing the lotteries.

To overcome this issue, we include the individual fixed effects to control for any time-invariant factors that affect the willingness to invest in the stock market, such as personality or risk preference. To the best of our knowledge, this study represents the first attempt to include the individual fixed effects to examine the effect of windfall gains. The regression model is given by:

$$Y_{it+1} = \beta_0 + \beta_1 R_{it} + \mathbf{X}_{it}\boldsymbol{\gamma} + f_i + \tau_t + \epsilon_{it}, \tag{1}$$

where Y_{it+1} is the outcome variable of interest for individual i in year $t+1$, and R_{it} denotes the RL prize size (in million TWD) for individual i in year t. Besides specifying the individual fixed effect, f_i, we also control for the year fixed effects, τ_t, and the individual time-varying characteristics, $\mathbf{X}_{it}$, such as the age, wealth, income, and financial assets of individuals.

Table 2 shows the summary statistics of individual characteristics between nonwinners and winners. Each observation refers to an individual in a particular year, so the probability of winning the RL is roughly 0.55%. First, the winners are slightly younger than the nonwinners, which might indicate that young people may make more efforts to check the receipt lotteries than old people if we assume that both of them have similar levels of consumption. Perhaps due to the age difference, the winners also have the lower wealth level, accumulate less financial assets, and hold less shares in the stock market than the nonwinners. Besides the differences raised by age, both of them have similar income levels, stock market participation rates, and number of stocks they hold. Even in the housing market, they have close real estate ownership rates. Lastly, female individuals have higher likelihood to win the RL, potentially due to that they are more careful to collect the receipt than males. Table 3 displays the distribution of RL prizes.

5 Results

In this section, we first present the baseline results from equation (1), and then we examine the robustness of our main findings and conduct a series of subgroup analysis.

5.1 Main Results

Table 4 provides the main estimates of equation (1), which directly indicate the effects of wealth on stock market participation, both on the extensive (Panel A) and intensive margins (Panels B and C). For the extensive margin, the dependent variable is defined as a dummy variable which indicates whether individual i participates in the stock market in year $t+1$ or

not. The result in Column (4) shows that one million TWD (around 35,000 USD) windfall gain increases the stock market participation probability by around 0.76 percentage points, which is around 4.34% of the average level of stock market participation. If the individual fixed effects are not included, the estimates in Columns (1)-(3) are much larger than that in Column (4). The difference in magnitude could be from the individual unobserved effects, e.g., the effort of checking receipt lotteries, that are correlated with the individual motivation for the stock market.

To further explore the intensive margin, the dependent variables are the logarithm of two measures[4]: one is the number of stocks an individual holds in her portfolio (Panel B), and the other one is the number of shares for an individual in the stock market (Panel C). As shown in Panel B Column (4), an one million TWD windfall from the RL increases the number of stocks an individual holds, by around 1.09%. This implies that individuals are more likely to diversify their portfolios in the stock market when they receive the receipt lottery prizes. In addition, the result in Panel C Column (4) presents that an individual tends to purchase more stocks, increased by around 7.58%, after she receives an one million TWD cash windfall. To sum up, individuals not only purchase more but also diversify their portfolios after they receive a certain amount of windfall gains.

5.2 Robustness Checks

This section establishes the robustness of our main findings by a battery of tests. We first consider estimations under an alternative sample selection to examine the extent to which our results rely on the sample construction. In addition, to address the potential selection bias, we utilize the propensity score matching to estimate the effect of windfall gains. In a nutshell, our findings in the main results are robust across tests considered in this context.

Our sample uses the population consisting of all single RL winners. As only prizes beyond

[4]Since the log transformation is undefined for zero values, we add the constant 1 to these two measures.

2,000 TWD would be recorded in the administrative dataset, winners with prizes below 2,000 TWD are treated as zeros and not distinguished from non-winners. Since winning prizes beyond 2,000 TWD can be viewed as a low-probability event, our sample thus consists of a substantial amount of zero values. To explore whether our estimates are biased by the large amount of zeros, we drop the observations who had never won the RL all over the sample period. This reduces our sample number from 91,444,059 to 11,585,049, which amounts to a decrease by 87.3%.

It can be observed from Table B.1 that removing observations largely draws closer groups who have never won the RL and won at least once during the sample period. Especially, the average total net wealth and average total financial assets between the two groups are now fairly comparable. Notably, however, the average total income of those who had never won any prizes increases by 18% from 203,782 TWD to 240,406 TWD. This leads to the average total income of non-winner group by about 10% higher than the group of lottery winners, opposite to the case when the full sample is used. Panel A of Table 5 shows the regression results after dropping the individuals who had never won the RL all over the sample period. The estimates closely resemble those in the Column 4 of Table 4, whereas the baseline mean shares declines by 11%.

Since the sample used for main results focus on the single individuals aged from 20 to 75, we then consider two alternative samples, age within 20-70 and 20-80, respectively. As can be seen from Panels B and C of Table 5, we yield fairly similar estimates comparable to the main results. Furthermore, in addition to single individuals, we add couples into the sample for the robustness check. Panel D of Table 5 shows that the baseline average rate of stock participation increases from 0.175 to 0.288, whereas the coefficient on the windfall gains decreases by 64.4% and becomes less statistically significant. This suggests that couples have higher stock participation rate but lower effect of windfall gains on stock participation as compared to single individuals. Likewise, coefficients on the RL prize for stock types and shares also present the increase of baseline means but the decrease in coefficients.

Taken together, our evidence shows that couples are less financially constrained from stock participation than single individuals.

Although our sample is well representative of the population by construction using the complete administrative dataset. Table 2 suggests that the RL winners and non-winning participants slightly differ along net wealth, financial assets, and income. To further investigate this issue, we use the propensity score matching for estimation. The matched sample is constructed based on characteristics including gender, age, total wealth, and total income. Table B.2 shows the receipt prize winners are closely matched with the non-winning participants across characteristics. The matching estimates are presented in Panel E of Table 5, where the magnitude of estimates almost doubles. Most importantly, coefficients are qualitatively similar to the main findings in Table 2. This greatly alleviates the concern about the potential sample selection. Overall, the results from the matched sample demonstrate the robustness of our estimates for windfall gains.

5.3 Heterogeneous Effects

In this section, we investigate the wealth effect heterogeneity based on the household characteristics and financial status. One of the important explanations for stock market nonparticipation is the participation costs, including one-time fixed costs and ongoing participation costs. Therefore, the various wealth effects in different groups could be due to different participation costs. In addition, instead of investing in the stock market, individuals could invest in other assets after they receive the windfall gains, which can directly affect the wealth effect on the stock market participation.

5.3.1 Effects by Demographic Characteristics

Table 6 reports the estimated effect of windfall gain on the stock market participation in subsamples categorized by household age, gender, and presence of children. To analyze the

effect across different ages, we split the sample into two groups: young (with age below 40) and old (with age above 40) generations. Columns (1) and (2) of Table 6 indicate that young people are more likely to participate in the stock market than old people after they receive the same amount of windfall gains. This result can be supported by the theory of one-time fixed entry costs since young people with longer life expectancy can benefit more from participating in the stock market if they only need to pay the one-time participation costs. However, if the participation costs should be paid in each period, the wealth effects should be indifferent across people of varying ages.

Columns (3) and (4) of Table 6 show that women have the slightly larger effects from the windfall game than men. Notably, women also have larger stock market participation rates. If we assume that the participation costs should be similar across gender, the result can also be explained as the unobserved expensive durable goods consumption by men, such as the purchase of new cars.

Columns (5) and (6) show that the estimated wealth effect on the stock market participation probability of individuals without children is larger, compared to that for those with children. This could be explained by the choice of other investments after the windfall gains since people with children might want to keep the money for the future spending on their children.

5.3.2 Effects by Household Financial Status

Since our main result shows that the stock market participation increases with wealth, Table 7 reports the effect under different wealth levels. We split the sample[5] by the amount of wealth, financial assets[6], and real estate ownership. First, the results in Columns (1) and (2) show that an individual with lower wealth level (below three million TWD) has a larger

[5]To avoid the effect of receiving prizes on wealth levels, we split the sample based on the previous period variable.

[6]Here, the financial assets include not only the assets in the stock market but also the deposits in the bank and bonds.

wealth effect, compared to the one with higher wealth level (above three million TWD). Similarly, Columns (3) and (4) indicate that people with lower financial assets (less than 0.5 million TWD) are more likely to participate in the stock market after they receive the windfall gains, especially for those stock market nonparticipants.

In addition, people who receive the windfall gains might also want to invest in the housing market, so we split the sample according to the real estate ownership. Columns (5) and (6) show that an individual without having a house is more likely to invest in the stock market after she receives the windfall gain. One potential explanation is that the receipt lottery winners without owning a real estate property are less likely to use the prize for paying back the mortgage loan. In sum, an individual who has lower wealth level, less financial assets, and no real estate has the larger wealth effect from winning RL.

5.3.3 Effects by Prize Size

Because the RL prize varies from two thousand TWD to ten million TWD, the wealth effect of one million TWD on the stock market participation could be nonlinear over the size of prize. We expect that the wealth effect of large prizes should be much larger than that from small windfall gains. Instead of specifying a linear wealth effect in equation (1) in this section, we replace the variable of lottery prize size by two dummy variables that indicate that the small (below one million TWD) and large (above one million TWD) prizes, and the control group refers to those with zero prize.

Column (1) of Table 8 shows that a large windfall gain increases the stock market participation probability by around 5.11 percentage points, which is much larger than that from a small windfall gain (0.13 percentage points). In addition, we use the same framework to look at the intensive margins. Column (2) of Table 8 shows that a large windfall from the RL increases the number of stocks an individual holds by around 6.16%, while a small windfall just increases the number of stocks an individual holds by 0.22%. Similarly, the number of shares an individual holds increases with the size of windfall gains. The effect by the large

windfall gain is around 50%, while the effect is only 1% for the small windfall gain.

6 Comparison to Previous Literature

Since our data also includes the individuals who win the public welfare lottery (PWL), which is similar to the lotteries used in previous literature, we can compare the results between the RL and PWL and link our findings to the existing literature. Before showing the comparison, we first discuss the possible bias from the typical lotteries.

Using windfall gains from typical lotteries as exogenous wealth shocks create several identification issues. First, people who participate in the lottery games but not win the prizes are not observed from the data, so they are mixed with those who do not participate in the lottery. That is the major reason why all of the literature uses lottery winners as the sample to explore the conditional results of wealth shocks; however, ignoring the participants who do not win the lottery could potentially induce the selection bias. Second, the amount of prizes is not randomly assigned since lottery winners will get more if they purchase more lottery tickets. The frequency of their purchases is correlated with unobserved risk preferences that may also affect their stock market participation and thus generate the positive bias on the estimates for windfall gains. Third, since many lottery participants may have already joined the stock market, the estimates for windfall gains could be underestimated. The above-mentioned identification issues create the unpredictable direction of bias. Our identification strategy are immune from these issues as we capture the pure windfall gain effect on stock market participation.

Similar to the literature, when estimating the PWL effect on stock market participation, we drop the individuals who had never won the PWL over the sample period. Also, to make it comparable to our main results, we exclude the PWL winners whose amount of prizes over 10 million TWD since the maximum amount of prizes in the RL is 10 million TWD. Column (1) of Table 9 reproduces the result from the RL for better comparison (the one reported in

Panel A of Table 4). For the results of the PWL, Column (2) of Table 9 indicates that one million TWD windfall gain increases the stock market participation probability by around 0.59 percentage points, which is 22.36% lower than that from the RL.[7] This implies that using the framework from typical lotteries may cause a negative bias.

For better comparison with the results in the literature, we use the results in Table 8 as the benchmark. The average amount of the large prizes in Table 8 is around four million TWD (approximately 142,000 USD), and the stock market participation probability is increased by around 5.11 percentage points. In Briggs et al. (2021), they find that each 150,000 USD windfall increases the probability of stock ownership by 4 percentage points, which is smaller than our estimate. This is consistent with the comparison between the RL and PWL, which implies that the previous literature may underestimate the effect of windfall gains on stock market participation when using a typical lottery to create an exogenous wealth shock.

7 Conclusion

Using the pure windfall gains induced by universal receipt lottery and high-quality administrative data from Taiwan, this paper examines the effect of wealth on stock market participation. We find that per million TWD (around 35,000 USD) windfall gain increases the stock market participation probability by around 0.76 percentage points, which amounts to 4.34% of the average level of stock market participation. Furthermore, individuals not only increase the number of stocks they hold to diversify their portfolios but also purchase more stocks after they receive a certain amount of windfall gains. Overall, our results provide the first clean causal evidence that financial constraints do limit the stock market participation.

We also find a substantial wealth effect heterogeneity across household characteristics and financial status. The wealth effect is stronger among younger generations aged below 40.

[7] If we keep the individuals who had never won the PWL, we get a larger estimate, 0.62 percentage points (significance at 1% level), based on 95,039,220 observations. This estimate is 18.42% lower than that from the RL.

Younger generations expect to live longer and thus benefit more from the stock market participation on average. This is consistent with the one-time entry costs of stock participation hypothesis in the literature. Females still show slightly higher interests in stock participation upon windfall gains than male counterpart, even though women have higher stock participation rate already. Childbearing, however, may crowd out stock investment. Our results show that individuals with lower wealth level, less financial assets, and real estate ownership are incentivized more to participate in stock investment upon the windfall gains. Finally, the wealth effect is not linear with respect to the level of windfall gains. Winning lottery prizes over one million TWD can result in the wealth effect on stock participation about 50 times as large as that by winning prizes below. Together, these subgroup analyses further substantiate the role of financial constraints in impeding the stock investment decisions.

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Tables

Table 1: An Example of the Winning Numbers

Prizes (in TWD)		Matching Winning Number
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: The information is from Ministry of Finance.

Table 2: Summary Statistics between Nonwinners and Winners

Variables	All Sample	Nonwinners	Winners
Individual characteristics			
Average age	38.73	38.74	36.08
Female ratio	0.5124	0.5098	0.6202
Ratio of having children	0.3311	0.3312	0.3199
Financial status			
Average wealth (in million TWD)	3.0340	3.0380	2.3050
Average financial assets (in million TWD)	0.7514	0.7522	0.6174
Average income (in TWD)	203,850	203,782	216,073
Average real estate ownership rate	0.2366	0.2337	0.2252
Stock market participation			
Average participation rate	0.1751	0.1750	0.1924
Average number of stocks an individual holds	0.9123	0.9117	1.0299
Average number of shares an individual holds	6,982	6,990	5,563
Number of observations	91,444,059	90,936,628	507,431

Note: This table shows the mean of individual characteristics between nonwinners and winners. Each observation refers to an individual in a particular year. The sample period is from 2005 to 2016.

Table 3: Frequencies and Average Prizes of Taiwan Receipt Lottery

	Taiwan Receipt Lottery	
Prizes	Frequencies	Mean Prizes
2,000 - 4,000	11	2,779
4,000 - 10,000	455,044	4,058
10,000 - 40,000	46,839	10,240
40,000 - 200,000	4,721	40,739
200,000 - 1M	501	204,154
More than 1M	315	4,054,102
1M - 2M	33	1,000,303
2M - 10M	197	2,000,122
More than 10M	85	10,000,094
Total	507,431	7,682

Note: This table shows the distribution of RL frequencies and mean prizes. Since the prizes are fixed which show in Table 1 and the taxable prizes are above $2,000, the prizes concentrate more on $4,000 instead of $2000 to $4,000.

Table 4: Effect on Stock Market Participation

	(1)	(2)	(3)	(4)
A. Stock market participation				
Prizes (in million TWD)	0.0194***	0.0216***	0.0210***	0.0076***
	(0.0048)	(0.0049)	(0.0047)	(0.0024)
Baseline Mean		0.175		
B. Number of stocks an individual holds				
Prizes (in million TWD)	0.0285***	0.0330***	0.0320***	0.0109***
	(0.0093)	(0.0094)	(0.0092)	(0.0037)
Baseline Mean		1.078		
C. Number of shares an individual holds				
Prizes (in million TWD)	0.1640***	0.01838***	0.1780***	0.0758***
	(0.0437)	(0.0438)	(0.0428)	(0.0246)
Baseline Mean		7,495		
Number of observations		91,444,059		
Year fixed effects	Yes	Yes	Yes	Yes
Age of household	No	Yes	Yes	Yes
Financial control	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes

Note: This table shows the empirical results from equation (1). The dependent variable in Panel A is an indicator of stock market participation, and the dependent variables in Panels B and C are the logarithm of two measures: the number of stocks an individual holds in her portfolio (Panel B), and the number of shares for an individual in the stock market (Panel C). All specifications are OLS models. In Column (4), we include year fixed effects, individual fixed effects, and the individual time-varying characteristics, such as the age, wealth, income, and financial assets of individuals. Robust standard errors in parentheses are clustered at the individual level. *, **, and *** represent statistical significance at 10%, 5%, and 1% level, respectively.

Table 5: Robustness Checks

	Dependent Variables		
	Stock market participation	Log number of firms an individual invests	Log number of shares an individual holds
	(1)	(2)	(3)
Panel A. Eliminating the person never won the receipt lottery			
Prizes (in million TWD)	0.0081***	0.0115***	0.0828***
	(0.0025)	(0.0039)	(0.0254)
Baseline mean	0.217	1.1728	6,663
Number of observations		11,585,049	
Panel B. With age from 20 to 65			
Prizes (in million TWD)	0.0074***	0.0105***	0.0755***
	(0.0025)	(0.0038)	(0.0252)
Baseline mean	0.175	1.0596	7,324
Number of observations		84,010,559	
Panel C. With age from 20 to 80			
Prizes (in million TWD)	0.0075***	0.0111***	0.0770***
	(0.0024)	(0.0037)	(0.0246)
Baseline mean	0.1736	1.0691	7,465
Number of observations		94,977,286	
Panel D. Including Couple			
Prizes (in million TWD)	0.0027*	0.0055**	0.0368**
	(0.0015)	(0.0027)	(0.0157)
Baseline mean	0.288	2.304	20,497
Number of observations		138,312,304	
Panel E. Based on PSM matching			
Prizes (in million TWD)	0.0145***	0.0246***	0.1488***
	(0.0028)	(0.0047)	(0.0286)
Baseline mean	0.206	1.332	7,126
Number of observations		4,777,438	
Year fixed effects	Yes	Yes	Yes
Age of household	Yes	Yes	Yes
Financial control	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes

Note: This table presents the results for the robustness checks using equation (1). The dependent variable used in Column (1) is an indicator of stock market participation. The dependent variable used in Column (2) is the logarithm of the number of stocks an individual holds. The dependent variable used in Column (3) is the logarithm of the number of shares for an individual holds. Panel A reports the regression results using the sample constructed by dropping the observations who had never won the receipt lottery all over the sample period. Panels B and C report the results using the sample where two age cutoffs for individuals are applied, respectively. Panel D reports the results where couples are added into the sample selection. Panel E reports the results using propensity score matching estimation. All specifications are OLS models that include year fixed effects, individual fixed effects, and the individual time-varying characteristics, such as the age, wealth, income, and financial assets of individuals. Robust standard errors in parentheses are clustered at the individual level. *, **, and *** represent statistical significance at 10%, 5%, and 1% level, respectively.

Table 6: Effects by Household characteristics

	Age		Gender		With Children	
	Young	Elderly	Male	Female	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)
Prizes (in million TWD)	0.0103***	0.0021	0.0066*	0.0085***	0.0091***	0.0041*
	(0.0037)	(0.0016)	(0.0038)	(0.0030)	(0.0034)	(0.0025)
Baseline mean	0.136	0.233	0.141	0.207	0.166	0.194
Number of observations	54,660,195	26,783,864	44,589,489	46,854,570	61,165,485	30,278,574
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Age of household	Yes	Yes	Yes	Yes	Yes	Yes
Financial control	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows the empirical results for equation (1) in different subgroups. The dependent variable is an indicator of stock market participation. Columns (1) and (2) refer to the young (with age below 40) and old (with age above 40) generations, respectively. Columns (3) and (4) report the results for male and female, respectively. Columns (5) and (6) report the results for individuals without and with children, respectively. All specifications are OLS models that include year fixed effects, individual fixed effects, and the individual time-varying characteristics, such as the age, wealth, income, and financial assets of individuals. Robust standard errors in parentheses are clustered at the individual level. *, **, and *** represent statistical significance at 10%, 5%, and 1% level, respectively.

Table 7: Effects by Financial Status

	Wealth		Financial Assets		Real Estate Ownership	
	Low	High	Low	High	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)
Prizes (in million TWD)	0.0151***	0.0047	0.0140***	0.0076	0.0100***	0.0040*
	(0.0030)	(0.0039)	(0.0030)	(0.0054)	(0.0030)	(0.0021)
Baseline mean	0.129	0.364	0.106	0.4863	0.131	0.321
Number of observations	73,454,361	17,989,698	74,729,963	16,714,096	70,079,336	21,364,723
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Age of household	Yes	Yes	Yes	Yes	Yes	Yes
Financial control	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows the empirical results for equation (1) in different subgroups. The dependent variable is an indicator of stock market participation. Columns (1) and (2) refer to individuals with low (below 3M TWD) and high (above 3M TWD) wealth level, respectively. Columns (3) and (4) refer to individuals with low (below 0.5M TWD) and high (above 0.5M TWD) financial assets, respectively. Columns (5) and (6) report the results for individuals without and with houses, respectively. All specifications are OLS models that include year fixed effects, individual fixed effects, and the individual time-varying characteristics, such as the age, wealth, income, and financial assets of individuals. Robust standard errors in parentheses are clustered at the individual level. *, **, and *** represent statistical significance at 10%, 5%, and 1% level, respectively.

Table 8: Effects by Prize Size

	Dependent Variables		
	Stock market participation	Number of stocks an individual holds	Number of shares an individual holds
	(1)	(2)	(3)
Relative to nonwinners, winners with prizes			
below 1M TWD	0.0013***	0.0022***	0.0114***
	(0.0003)	(0.0005)	(0.0027)
above 1M TWD	0.0511***	0.0616***	0.4996***
	(0.0148)	(0.0215)	(0.1353)
Number of observations		91,444,059	
Year fixed effects	Yes	Yes	Yes
Age of household	Yes	Yes	Yes
Financial control	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes

Note: This table presents the effects by the size of prize. The dependent variable used in Column (1) is an indicator of stock market participation. The dependent variable used in Column (2) is the logarithm of the number of stocks an individual holds. The dependent variable used in Column (3) is the logarithm of the number of shares for an individual holds. The dummy variables for the small (below 1M TWD) and large (above 1M TWD) prizes are included. All specifications are OLS models that include year fixed effects, individual fixed effects, and the individual time-varying characteristics, such as the age, wealth, income, and financial assets of individuals. Robust standard errors in parentheses are clustered at the individual level. *, **, and *** represent statistical significance at 10%, 5%, and 1% level, respectively.

Table 9: Comparison Between Receipt Lottery and Public Welfare Lottery

	RL	PWL
	(1)	(2)
Prizes (in million TWD)	0.0076***	0.0059***
	(0.0024)	(0.0009)
Baseline mean	0.175	0.222
Number of observations	91,444,059	15,180,210
Year fixed effects	Yes	Yes
Age of household	Yes	Yes
Financial control	Yes	Yes
Individual fixed effects	Yes	Yes

Note: This table presents the comparison of the estimates from two different samples: one is from the RL (same as Column (4), Panel A of Table 4), and the other one is from the public welfare lottery. For the sample from the public welfare lottery, we exclude the persons who never won the lottery. As the counterpart for Column (1), we also exclude those lottery winners whose prize amounts over 10 million TWD. The dependent variable is an indicator of stock market participation. All specifications are OLS models that include year fixed effects, individual fixed effects, and the individual time-varying characteristics, such as the age, wealth, income, and financial assets of individuals. Robust standard errors in parentheses are clustered at the individual level. *, **, and *** represent statistical significance at 10%, 5%, and 1% level, respectively.

Figures

Figure 1: An Example of the Taiwan Receipt Lottery

Notes: The eight digits in the red square is receipt lottery number.

Online Appendix: For Online Publication

A Public Welfare Lottery and Taiwan Sport Lottery

A.1 Public Welfare Lottery

Public Welfare Lottery was initiated by the Ministry of Finance in 1999. The government uses the revenue from selling lottery tickets to raise funds for public welfare schemes. During our sample period, there are three types of lottery games: (1) Computer-drawn games, (2) scratch-card games, and (3) Keno games. Each type of game has a variety of ways to play. For the computer-drawn games, in general, a player needs to choose a set of numbers, and the goal is to match those to the numbers drawn by the computer.[8] The scratch card games usually require a player to match a set of symbols from some slots to win the prize for that symbol. The common rule of Keno games is that a player chooses one of ten games and then selects 20 numbers, ranging from 1 through 80. The payouts are different depending on the game play and the numbers a player chooses.

A.2 Taiwan Sport Lottery

Taiwan Sports Lottery started in 2008 and is the only source of legal betting on sports in Taiwan. There are over 10 types of sports and 20 kinds of methods, including MLB baseball and NBA basketball from the United States, the major European soccer leagues, Asian baseball, tennis, golf, and the Olympics. According to the games on which one chooses to bet, the odds will be different.

[8]For example, Lotto 6/49 is one of the richest computer-drawn games in Taiwan. Players choose six numbers (1-49) at a cost of TWD 50 per bet. The jackpot is hit if all six numbers are matched by the player, so the probability of winning a jackpot is very low. The jackpots keep growing until someone wins.

B Additional Tables

Table B.1: Summary Statistics After Eliminating Individuals who Never Won

	All Sample	Nonwinners	Winners
Individual characteristics			
Average age	37.07	37.11	36.08
Female ratio	0.5646	0.5621	0.6202
Ratio of having children	0.3275	0.3279	0.3199
Financial status			
Average wealth (in million TWD)	2.5408	2.5561	2.3050
Average financial assets (in million TWD)	0.6861	0.6893	0.6174
Average income (in TWD)	239,340	240,406	216,073
Average real estate ownership rate	0.2394	0.2400	0.2252
Stock market participation			
Average participation rate	0.2172	0.2183	0.1924
Average number of stocks an individual holds	1.1728	1.1793	1.0299
Average number of shares an individual holds	6,663	6,713	5,563
Number of observations	11,585,049	11,077,618	507,431

Note: The total number of sample only contains single male and single female.

Table B.2: Summary Statistics After Matching

	All Sample	Nonwinners	Winners
Individual characteristics			
Average age	36.90	37.00	36.08
Female ratio	0.6267	0.6275	0.6202
Ratio of having children	0.3341	0.3358	0.3199
Financial status			
Average wealth (in million TWD)	2.6482	2.6860	2.3050
Average financial assets (in million TWD)	0.7160	0.7209	0.6174
Average income (in TWD)	231,728	233,392	216,073
Average real estate ownership rate	0.2457	0.2480	0.2252
Stock market participation			
Average participation rate	0.2062	0.2077	0.1924
Average number of stocks an individual holds	1.1371	1.1489	1.0299
Average number of shares an individual holds	6,630	6,751	5,563
Number of observations	4,777,438	4,270,007	507,431

Note: Using propensity score matching to choose control group who does not win RL with a likelihood is closed to the odds for the treatment group of winning RL prize by the characteristics of gender, age, wealth, and income. Age are separated into 11 groups by each 5 year olds. Wealth groups include total wealth is less and equal to zero, above zero and less than 2 million, and above 2 million. Income groups contain total income is equal to zero, above zero and less than 200 thousand, and above 200 thousand. We compute the likelihood and decide the control groups.

Table B.3: Frequencies and Average Prizes of Public Welfare Lottery

	Public Welfare Lottery	
Prizes	Frequencies	Mean Prizes
2,000 - 4,000	173,190	3,187
4,000 - 10,000	315,570	5,242
10,000 - 40,000	213,723	19,017
40,000 - 200,000	73,021	87,187
200,000 - 1M	17,968	414,080
More than 1M	8,360	7,371,881
1M - 2M	4,108	1,324,334
2M - 10M	3,761	4,661,857
10M - 50M	363	16,969,656
50M - 100M	24	60,289,368
100M - 300M	73	150,576,336
More than 10M	491	78,727,739
Total	801,832	101,900

Note: This table shows the distribution of PWL frequencies and mean prizes.