Consumption Responses to Income Shocks through Lottery Winning*

Seonghoon Kim+ and Kanghyock Koh§

April 28, 2018

Abstract

We study the effects of unearned income via lottery winning on consumption using newly available, nationally representative household survey data. We find that an $1 increase of a lottery prize in the last 12 months raises monthly total consumption expenditure by $0.09. This consumption response is mainly driven by increases in non-durables spending. Our heterogeneity analyses provide further evidence on possible mechanisms. The consumption responses to an $1 increase in lottery prizes are larger among households who have stronger liquidity constraints, shorter-term time horizon for financial planning, and are more risk averse.

Keywords: lottery, consumption, saving

JEL Codes: D12, D14

---

* We thank to Hyuk Son for research assistance. We are grateful to Hyojin Han, Nicolas Jacquet, and seminar participants for their valuable comments. This research uses data from the Singapore Life Panel® (SLP) conducted by the Centre for Research on the Economics of Ageing (CREA) at Singapore Management University. This research was supported by the Singapore Ministry of Education (MOE) Academic Research Fund (AcRF) Tier 1 grant. All errors are our own.

+ Kim: School of Economics, Singapore Management University, Email: seonghoonkim@smu.edu.sg

§ Corresponding author. Koh: School of Business Administration, Ulsan National Institute of Science and Technology, 50 UNIST-gil, Ulju-gun, Ulsan 44919, South Korea. Email: kanghyock.koh@unist.ac.kr

1. Introduction

Understanding the causal relationship between income changes and consumption spending are of great interest to policy makers and economists because it is critical in designing effective economic policies to maximize welfare of the society. For example, many governments have implemented one-off cash transfer programs to stimulate the economy during the recession (e.g., tax rebates of 2001 and 2008 in the U.S.). If such an increase in household income does not translate into an increase in consumption spending, the government's attempt to boost its economy would not be as effective as intended.

Economic theory predicts that an increase in income raises consumption expenditure, although the magnitude of the responses would vary depending on the nature of income changes (e.g., permanent vs transitory, expected vs unexpected, large vs small). Consistent with this prediction, cross-sectional gradients between income and consumption expenditure show that those two are highly positively correlated (Jappelli and Pistaferri, 2010). However, the estimated positive correlation between income and consumption expenditure even after controlling for observable characteristics cannot be interpreted as a causal parameter due to various confounding factors such as preference.

The most ideal approach to uncover the causal link between income and consumption spending would be to randomly assign income across households. Although the use of field experiments is increasingly popular in economics, it is extremely costly to conduct such a randomized controlled trial.[1] To overcome this identification challenge and investigate the consumption responses to income changes, previous studies either have employed statistical

[1] Exceptions are the U.S. Negative Income Tax Experiment (Moffitt, 2003) and unconditional cash transfer programs in a developing country setting (Baird, De Hoop, and Ozler, 2013; Haushofer and Shapiro, 2016).

decomposition by imposing a set of assumptions about income/consumption processes, preferences, and expectations (Hall and Mishkin, 1982; Blundell et al, 2008; Guvenen and Smith, 2014) or have exploited quasi-experimental variations in income such as changes in the public transfer policies and layoff (Agarwal, Liu and Souleles, 2007; Agrwal and Qian, 2014; Browning and Crossley, 2009; Johnson, Parker, and Souleles, 2006).

An alternative way to achieve the random assignment of income is to exploit lottery wins. Several recent studies have examined the effects of lottery winning to recover the causal effect of income on a variety of outcomes (Apouey and Clark, 2015; Kim and Oswald, 2018; Doherty, Gerber, and Green, 2006; Hankins and Hoekstra, 2011; Hankins, Hoekstra, and Paige, 2011; Lindh and Ohlsson, 1996; Lindahl, 2005; Kuhn et al., 2011). In particular, recent lottery studies using administrative data allow researchers to conduct richer analysis on labor supply, health and healthcare utilization, child development, and stock market participation (Imbens, Rubin, and Sacerdote, 2001; Picchio et al., 2017; Cesarini et al., 2016, 2017, and 2018).

However, there is relatively little knowledge about how lottery winners' consumption expenditure is affected by the income gain.[2] To the best of our knowledge, there are three studies investigating the effects of lottery wins on consumption behavior. First, Imbens, Rubin, and Sacerdote (2001) study the effects of the Massachusetts Megabucks lottery in the U.S. on lottery players' consumption expenditure on durables such as vehicles and housing and saving. They find evidence that propensity to save is sizable (about 16%) while marginal propensity to consume (MPC) is small (1.4-3.7%). The high marginal propensity to save is consistent with the

[2] In fact, a rational agent might not play a lottery. However, Chetty and Szeidel (2007) argue that playing a lottery could be a rational choice to have an opportunity of purchasing an expensive and indivisible good. For example, lottery players could have higher welfare by spending $1 on a lottery ticket with a small chance of winning a prize instead of spending the $1 on other goods such as food.

response implied by the permanent income hypothesis. Second, Kuhn et al. (2011) study the effects of the Dutch Postcode Lottery (PCL), which randomly assign a cash prize of 12,500 euros per ticket to all lottery participants in the winning postal code and a brand-new BMW car to one of the winners, on both durables and non-durables spending. They find that PCL winning increases consumption expenditure on durables such as car purchase but does not affect spending on non-durables.

These two studies use self-administered survey data and have the following limitations. First, Imbens, Rubin, and Sacerdote (2001) estimate MPC using information on the asset values of durables (housing and cars) instead of spending because consumption spending was not surveyed. In addition, marginal propensity to save is estimated based on the respondents' plan to save instead of actual saving amount.[3] Second, these studies could not study how households' responses to an income shock differ by household characteristics, which could provide evidence on mechanisms, due to the lack of detailed information on household characteristics (Parker, 2017). Finally, the sample sizes of these two studies tend to be small, around 500-600 observations.

Fagereng, Holm, and Natvik (2016) overcome these three limitations of measuring consumption by combining administrative tax data, which include lottery prize information, and find that MPC for every $1 lottery prize won is about 0.35.[4] However, they could not directly control for lottery ticket spending due to the lack of ticket spending data. Since individuals will

[3] "Considering your and your spouse's total after-tax income this year, what portion will you save or invest this year and next year? (please give a percentage)"

[4] The authors impute consumption spending as household income net of the first difference in asset values, and thus their consumption measure could suffer from severe measurement errors. For example, a household may not incorporate the price information of their assets. If there is a price hike in the local housing market, the econometrician might mistakenly treat the household decreases consumption.

be more likely to win a lottery prize when they buy more tickets, the lack of information on lottery ticket spending could bias the estimation results (Picchio, Suetens, and Van Ours, 2017). For example, individuals who have higher propensity to consume could spend more on lottery ticket purchase. Then, the effects of lottery wins on consumption without controlling for spending on lottery ticket purchase are likely to be over-emphasized.

In this paper, we overcome these unaddressed limitations in the previous literature by using large scale household survey data. First, our survey data provide detailed information on households' consumption spending and saving. Second, our data provides rich information on household characteristics which could be used to investigate mechanisms of consumption responses to an income shock. For example, we conduct heterogeneity analyses by liquidity constraints, time horizon of financial planning, risk preference, and subjective life expectancy. Third, our data has lottery ticket spending information, which is absent in other major household surveys. For example, the British Household Panel Survey (BHPS) and the German Socio-Economic Panel (SOEP) provide information on both consumption expenditure and lottery prize amount in addition to other household characteristics. However, these surveys do not provide information on lottery ticket spending, which could create the aforementioned omitted variable bias. We address this bias by using the newly available household survey data in Singapore, which allow us to directly control for lottery ticket spending amounts.

In the baseline analysis, we estimate that an $1 increase of a lottery prize in the last 12 months raises monthly total consumption expenditure by $0.09. The increase in consumption expenditure mainly come from an increase in non-durables. This finding is consistent with a model of consumption commitments in which there is a good with a high transaction cost like

housing (Chetty and Szeidl, 2007). In this model, relatively large income shocks affect durables spending, and relatively small income shocks only affect non-durables spending. The average size of lottery prizes in our study is about US$687, which is not large enough to consumption responses on durables.

We then study how the consumption responses vary by households characteristics. First, we study the role of a liquidity constraint. Households with a liquidity constraint could be more responsive to a temporary income shocks (Jappelli and Pistaferri, 2010). To proxy a liquidity constraint, we exploit a unique policy in Singapore which allows most residents to withdraw some portion of their public pension wealth (at least $5,000) upon reaching their 55th birthday. We find that households with a stronger liquidity constraint (i.e., aged below 55 years) are more responsive in terms of consumption expenditure than those with a weaker constraint (i.e., aged 55 years and over). We corroborate our evidence by alternatively measuring a liquidity constraint by households with negative net worth or a lower share of liquid assets out of net worth. We find that households with negative net worth or a lower share of liquidity asset more strongly respond to an income shock induced by the random assignment of lottery prizes.

Second, financial planning is known to be an important factor in consumption responses to an income shock (Reis, 2006; Parker, 2017). Using the information on the time horizon of financial planning, we examine whether households whose planning horizon is shorter have stronger responses. Consistent with existing research which shows those who do not make any financial plan have stronger consumption responses to income shocks, we find that those with shorter time horizon are more responsive to income shocks via lottery wins.[5]

[5] Reis (2016) shows that consumers optimally choose to become "inattentive" savers whose consumption closely follows income due to the optimization cost or information processing cost. An alternative interpretation of our

Third, under the life-cycle framework, a consumer who expects to live shorter than other households could be more responsive to an unanticipated increase in income because the remaining period to smooth out income changes is shorter. We do not find evidence that lottery winners who reports a lower subjective life expectancy conditional on age exhibit a stronger consumption response.

Finally, we study the role of risk-averseness on consumption response. Individuals' risk-averseness is highly positively correlated with intertemporal elasticity of substitution and prudence. More risk averse individuals are more likely to smooth consumption out of a transitory income shock over time. Risk averse individuals are also more likely to be prudent and thus have a stronger incentive for precautionary saving. These theoretical predictions imply that more risk averse households would have a weaker consumption response to an unanticipated increase in income. By using the data on a subjective measure of risk preference, we find that more risk averse households have weaker consumption responses to an income shock.

The remainder of this paper is structured as follows. Section 2 describes the data and presents summary statistics. In Section 3, we discuss the empirical strategy. Section 4 reports the regression results, and Section 5 concludes.

2. Data

result is that short financial planning horizon is a measure of present bias. Households with stronger present bias could exhibit large consumption responses to unanticipated, transitory income changes (Laibson, 1997).

We use data from the Singapore Life Panel (SLP) for empirical analysis.[6] The SLP is a monthly longitudinal survey of a nationally representative sample of Singaporeans who were mainly 50–70 years old as of July 2015 when it was launched. Since then, the SLP has been collecting rich information over a variety of social, demographic, and economic outcomes.

Core questions, such as family structure, labor market activities, consumption spending, health, healthcare utilization, and subjective wellbeing are asked every month. In addition, respondents are occasionally asked a new battery of questions depending on research needs. These topics cover a variety of areas, such as health literacy, internet usage, strategic sophistication, and trust.

To define a treatment variable, we use self-reported amounts of lottery prizes in Singapore dollars. In November 2016 and November 2017, the SLP asked its respondents questions about whether a respondent ever purchased a lottery ticket in the last 12 months, the frequency of such purchases, and the total dollar amount of lottery wins and the dollar-spending amount on lottery tickets in the last 12 months.[7] It is noteworthy that there is no subscription-based lottery product in Singapore, and lottery tickets are sold only over-the-counter or online. In addition, unlike the U.S. and European countries, Singapore does not sell annuity-like lottery products that pay out prizes in the form of installments. Hence, it is possible that the behavioral response from a one-time prize could be different from that of annual payouts.

[6] Details on the SLP are available at https://crea.smu.edu.sg/singapore-monthly-panel.
[7] Since the lottery-related questions are asked twice for each individual, some individuals who play lottery twice will be included in the sample (86% of our baseline sample). To adjust potential correlation of lottery winning prize within person, we cluster standard errors at the individual level.

To define dependent variables, we use information available in the SLP on consumption expenditure over 30 categories. First, we calculate total consumption expenditure by summing all expenditures over those categories. Next, we decompose total consumption expenditures into spending for durables and non-durables. Durable goods consumption expenditure is defined as the sum of spending on furniture and furnishings, home repair and maintenance, vehicle repair and maintenance, and home appliances (TV, refrigerator, washer, etc.). We do not include the consumption value of service flow of cars and housing because it is difficult to compute the consumption value of those goods. Non-durable goods consumption expenditure is defined as the total consumption expenditure net of the durables consumption expenditure. Finally, we calculate specific sub-categories of non-durables consumption expenditure that are discussed from the previous lottery studies, such as expenditures on food (Kuhn et al., 2011) and health care (Cesarini et al., 2016). Food consumption expenditure is the sum of spending on food and beverages (including alcohol), and dining/drinking out. Health care expenditure is the sum of inpatient services, outpatient services, other hospital services, home nursing, and prescribed and other medications.

We calculate household saving by subtracting the total expenditure from aggregate household disposable income. For households who dissave their assets for consumption spending, the value of household saving could be negative.[8]

To construct control variables, we use information on spending amounts of lottery ticket purchase. In addition, we include other variables to control for individual characteristics, such as

[8] Since lottery prize and spending in the last 12 months were surveyed in November, we use consumption and saving information in December as outcome variables.

age, age squared, education attainment-fixed effect, race-fixed effect, gender, marital status, and number of children, in the regression analysis.

It is noteworthy that the SLP sample consists of respondents and their spouses for married couples. However, our analysis is conducted at the household-level. Hence, the individual- and household-specific characteristics used in empirical analysis are based on the responses of the respondent who is most confident in answering questions regarding the household's finances in a household.[9]

Table 1 shows summary statistics of our sample respondents. Columns (1) and (2) show the means and standard deviations of explanatory and dependent variables of the samples who played lotteries at least once in the last 12 months and never played in the last 12 months, respectively. Column (3) reports the mean differences of those variables with *t*-statistics in parentheses. It shows that lottery players and non-players are different in several dimensions. Lottery players are more likely to be male, and Chinese, older, and less educated. In addition, lottery players have a lower household income, have larger consumption expenditures with lower saving.

Table 2 reports summary statistics of lottery-related variables among lottery players. It shows that about 64% of lottery players purchase lottery tickets on a regular basis. Almost half of lottery players purchase lottery tickets every week. They spend on average S$2,220 (or US$1,672) a year per player.[10] This lottery ticket spending is larger than that of European countries. For example, Picchio, Suetens, and van Ours (2017) report annual lottery expenditure of 224 euros (US$265) per player. However, Picchio, Suetens, and van Ours (2017) only cover

[9] Unlike some other surveys, the SLP does not have a designated person as a household head.
[10] S$1 was US$0576 on April 26, 2018. For notational convenience, we use $ to denote Singapore dollar hereafter.

spending on the subscription-based lottery tickets, and thus underestimate the lottery ticket spending to the extent that their sample individuals buy lottery tickets via other channels, such as over-the-counter purchases. In addition, the significant lottery ticket spending in the SLP is consistent with the fact that Singapore has the largest spending per capita on the lottery in the world (La Fleur, 2014). Kim and Oswald (2018) show that official Singaporean statistics on lottery-playing behavior are also matched with the SLP data.[11]

The distribution of lottery spending amounts shows that most of the respondents spend relatively small amounts of money to play the lottery. For example, the median spending amounts ($517) are significantly smaller than the average spending amounts ($2,220). In terms of lottery winning, about 46% of players report that they won a positive amount of lottery prizes in the last 12 months. The average prize size conditional on winning a prize is about $900. The distribution of lottery prizes conditional on winning a prize is also heavily skewed. The size of a lottery prize at the 5th percentile is about $10, and the median value is about $200. However, the 90th percentile prize is $2000, 10 times larger than the median, and the 95th percentile value is $4,970.

Lastly, Panel E shows that the ratio of a lottery prize over lottery ticket spending is about 64%. According to the 2017 financial statement of the Singapore Pools (Singapore Pools, 2018), a sole operator of legalized lotteries in Singapore, the proportion of prizes paid out of the lottery

[11] There are three legalized lotteries in Singapore. The most popular one is 4D® in which a player has to pick a four-digit number, with draws for winning numbers taking place three times a week. The second most popular lottery is TOTO® in which a player selects six numbers between 1 and 49, with draws taking place twice a week. The third and least popular one is Singapore Sweep® in which a player buys a ticket with a given number, with draws taking place once a month. The 2014 National Gambling Participation Survey (NGPS) reports that "44% of Singapore residents aged 18 and above reported that they have participated in at least one form of gambling activity in the last 12 months" (NCPG, 2015, p.2). Of the 44% who participated in any kind of gambling activities, 79.5% participated in 4D®, 61.3% participated in TOTO®, and 36.4% participated in Singapore Sweep®.

turnover is 69.1%, which is similar to our estimate. This provides further evidence that the self-reported lottery information in SLP is reliable.

3. Empirical Strategy

To estimate the causal effects of income via lottery winning on consumption expenditures, we consider the following linear regression model by pooling data from 2016 November and 2017 November:

$$CONSUMPTION_i = \beta_0 + \beta_1 PRIZE_i + \beta_2 TICKET_i + \gamma X_i + \varepsilon_i \qquad (1)$$

where i indicates a household represented by a person who is most confident in answering household finance-related questions such as household consumption; $CONSUMPTION$ indicates measures of consumption expenditures; $PRIZE$ and $TICKET$ indicate dollar amounts of lottery prize and lottery ticket spending, respectively. X includes characteristics of the financially representative person, such as age, age squared, education attainment-fixed effect, race-fixed effect, gender, marital status, number of children, and year-fixed effect. Our coefficient of interest is β_1, which captures the effects of an \$1 increase in a lottery prize on monthly consumption spending or saving.

The key identification assumption is that the size of lottery prizes is randomly determined. Figure 1, however, shows that a player can win more and/or larger prizes in dollar amounts if s/he buys more tickets. We include $TICKET$ to control for this selection bias. The direction of bias will depend on correlations between $TICKET$ and $CONSUMPTION$. If

households with larger consumption are more (less) likely to spend on lottery ticket purchase, the effects of $PRIZE$ on $CONSUMPTION$ will be over(less)-emphasized.

To indirectly test whether a lottery prize is randomly determined conditional on a player's lottery ticket spending, we estimate the relationship between the ratio of lottery prize over lottery ticket spending amounts and individual characteristics. If the lottery prize were purely randomly determined conditional on lottery ticket spending, none of individual characteristics would be able to predict the ratio.

Table 3 presents the regression results of the ratio of lottery prizes over lottery ticket spending amount. As expected, most of the individual coefficient estimates is statistically significant except for marital status, and the p-value of the F-test of joint significance of all covariates is 0.370. This result confirms that the variation in lottery prizes conditional on ticket spending in the SLP data is randomly determined.

4. Results

Table 4 reports estimated effects of lottery winning on consumption expenditures and saving by using the regression specification (1). In panel A, column (1) shows that an $1 increase in lottery prize in the last 12 months raises total monthly consumption expenditure by about $0.09, which is statistically significant at the 5-percent level. A potential criticism of the use of lottery winning to isolate an exogenous variation of income is that the behavioral response of a lottery prize could be different from other sources of exogenous income variation, e.g., a public transfer program. Interestingly, Agrawal and Qian (2014) estimate that the unexpected, one-off increase

in unearned income via the public cash transfer program in Singapore leads to an increase of $0.08 in monthly spending for every $1 received. Although the sources of the variation are different, the estimated consumption responses of an $1 increase in unearned income are similar. Our finding is also similar to the findings of the U.S. studies estimating the effects of fiscal stimulus package (tax rebates) on household consumption responses (Johnson et al., 2006; Parker et al., 2013). This implies that the effects of a lottery prize on consumption and saving may not be very different from the impacts of public transfer programs on consumption and saving behaviors.

Columns (2)−(5) of Panel A show the estimated effects of lottery winning on sub-categories of household consumption expenditure. In column (2), we find that an $1 increase in lottery prize raises monthly consumption expenditure on durables by $0.0003. The magnitude of the coefficient estimate is very small and it is statistically insignificant. Column (3) shows that an $1 increase in lottery prize raises monthly consumption expenditure on non-durables by $0.09, and it is statistically significant at the 5-percent level. These results suggest that the majority of the transitory income impact on consumption spending operates through non-durables. This finding is similar to those of Agrwal and Qian (2014), who find that consumption responses to the public transfer payments mainly through non-durables, and other studies estimating the consumption responses to fiscal stimulus payments (Kaplan and Violante, 2014). However, our results are inconsistent with Kuhn et al. (2011) in the sense that the authors find a significant increase in durable goods consumption such as car purchase upon winning a lottery prize, but find little impact on non-durable goods consumption. Chetty and Szeidl (2007) provide a useful theory to reconcile those differences in the results. Commitment goods such as

housing or vehicles are infrequently transacted only when there are relatively large wealth shocks due to a high transaction cost. Thus, for small shocks, the consumption responses are concentrated on non-durables only. The average size of lottery prizes in our study is far insufficient to purchase a car in Singapore. Lottery winners earn on average about US$687 but a brand-new Toyota Camry in Singapore would cost over US$0.1 million due to very stiff taxes, which is at least 3 times more expensive than the price in the U.S.[12] However, lottery winners in Kuhn et al. (2011) earn about US$23,000 on average.

Consistent with this conjecture, column (4) shows that an $1 increase in lottery prize statistically significantly raises monthly consumption spending on foods and beverages by $0.01. Although Kuhn et al. (2011) find marginal effects of lottery winning on food consumption (MPC of $0.003 per every $1 won), we find much larger effects of lottery winning on food expenditure.

Column (5) shows that lottery winners increased the expenditure on health care by $0.01 for every $1 lottery prize won, but the estimate is statistically insignificant. This result is similar to the finding of Cesarini et al. (2016) and Cheng, Costa-Font, and Powdthavee (2018) who show an insignificant impact of winning a lottery prize on health care utilization.

Finally, column (6) shows that household saving increases by $0.06 for every $1 received, which is statistically significant at the 10 percent level. Unlike findings from Imbens, Rubin, and Sacerdote (2001) who report much higher marginal propensity to save than marginal propensity to consume, our estimated marginal propensity to save is similar to the marginal propensity to consume. In combination with column (1), the column (6) result implies that

[12] The price information of Camry in Singapore is found at the following website: https://www.toyota.com.sg/showroom/new-models/camry(accessed on 12 April, 2018). The U.S. price is around US$32,350 based on the search result from the US.News. The price information in the U.S. is found at the following website: https://cars.usnews.com/cars-trucks/toyota/camry (accessed as of 12 April, 2018).

Singaporean households may not spread out additional income gain as much as what Imbens, Rubin, and Sacerdote (2001) find. This is difficult to explain under the standard life-cycle framework. However, as stated in the Introduction, Imbens, Rubin, and Sacerdote (2001) estimate the marginal propensity to save based on the response to a question about households' saving plan "Considering your and your spouse's total after-tax income this year, what portion will you save or invest this year and next year? (please give a percentage)". Hence, the respondent's plan or belief could deviate from their actual saving behavior in the following year. [13]

In panel B, we estimate the equation (1) without controlling for the amounts of lottery ticket spending as in Fagereng, Holmand, and Natvik (2016). We find that the effects of a lottery prize on consumption are larger than those in Panel A. For example, the effect of lottery winning on total consumption expenditure without controlling for lottery ticket spending in panel B is about 25% larger than the effects on total consumption with controlling for lottery ticket spending in panel A. This result implies that it is important to control for lottery ticket spending when estimating the causal impacts of an income shock induced by lottery winning.

To examine the sensitivity of the baseline results in Panel A, we conduct additional checks. In panel C, we drop all control variables except for the lottery prize and lottery ticket spending variables. If the size of a lottery prize conditional on lottery ticket spending is randomly assigned, we would find similar estimates after excluding control variables. Consistent with the

[13] There are other possible explanations. First, individuals might have hyperbolic time discount rate (Laibson, 1997) and apply very high time discount rate at the first few years and then apply low time discount rate for later years. Second, the disbursement of a lottery prize in Singapore is different from that of the Massachusetts Megabucks lottery studied in Imbens, Rubin, and Sacerdote (2001) whose sample consists of lottery winners whose prizes are paid out in annual installments over 20 years. On the other hand, there is no installment payout of a lottery prize in Singapore. That is, lottery prizes are paid in full immediately after the draw.

findings from Panel A, we find that our results are generally robust although the estimates are slightly larger.[14]

In panel D, we estimate the baseline specification after excluding prizes over $10,000 to study whether our results are sensitive to the exclusion of big prize winners (Picchio, Suetens, and Van Ours, 2017). We find that the results are similar to the results reported in panel A, suggesting that the baseline results in panel A are not entirely driven by few big winners. However, the coefficient estimates on total consumption expenditure or non-durables consumption expenditure become statistically insignificant as the variation of the treatment variable decreased due to the sample restriction.

To examine possible mechanisms, we study heterogeneous responses of consumption and saving by liquidity constraints,time horizon in terms of financial planning, subjective life-expectancy, and risk-preference. First, under the standard life-cycle framework, households with liquidity constraint more strongly respond to unanticipated income gains than their counterpart without liquidity constraint. By the same token, those without liquidity constraint are more likely to save unanticipated income gains. It is difficult to measure the degree of household-level liquidity constraint in survey data. To overcome this limitation, we exploit a unique public pension wealth withdrawal policy in Singapore. Upon reaching their 55th birthday, most Singaporeans can withdraw their retirement savings account balance called the Central Provident Fund after setting aside the minimum amount pre-determined by the government or at least $5000 if they cannot meet the minimum amount.[15] We consider that a household is

[14] For example, the magnitude of the coefficient estimate on total consumption expenditure become about 10% larger.

[15] In general, employees contribute about 25% of their gross salary and the employer contribution is about 15%. The details can be found at https://www.cpf.gov.sg/Members/Schemes/schemes/retirement/withdrawals-of-cpf-savings-from-55.

relatively more liquidity constrained if i) the respondent is younger than 55 years when s/he is single or ii) both husband and wife are younger than 55 years if the respondent is married.[16] Columns (1) and (2) of Table 5 show that the consumption response to lottery winning is stronger for households with tighter liquidity constraint than those with weaker constraint. The estimated effects for households who cannot withdraw pension wealth (i.e., aged below 55 years) are, more than twice larger than those of households who can withdraw their pension wealth (i.e., aged 55 years and over). These estimates are statistically significant at the the 10 percent level only for the latter. Columns (3) and (4) show that the estimated saving response is larger among households with a weaker liquidity constraint than those with a stronger liquidity constraint, although estimates are not very precise. The patterns of consumption responses by liquidity constraints are robust when we further restrict the sample to households with more similar characteristics, i.e., +/- 3 years around the eligibility age cutoff.

In addition, we corroborate the above evidence by measuring a liquidity constraint using household net worth. We consider that a household is liquidity-constrained if the household's net worth is negative or the household's ratio of liquid financial net worth (stocks, bonds, checking account balance, etc.) over total net worth is below 5% even if the household has positive net worth. Kaplan and Violante (2014) show that a household with enough net worth could exhibit strong consumption responses to a transitory income shock if the household has little liquid assets due to a large transaction cost to liquidate wealth.[17] Columns (1) and (2) of Table 6 show that households with a smaller share of liquid wealth exhibit almost twice stronger consumption responses to an income shock than those with a larger share of liquid wealth. Consistent with this

[16] The SLP does not collect age information of other household members.
[17] We choose 5% as a reference number to divide the sample into two groups with a similar sample size.

finding, columns (3) and (4) show that the saving response is smaller for those with a smaller share of liquid wealth.

Third, financial planning is known to be an important factor in consumption responses to an income shock (Reis, 2006; Parker, 2017) due to several reasons. First, households with different time preferences could have different time horizon on financial planning. Those with a higher time discount rate might plan financial allocation over a shorter time window, and thus show stronger consumption response to an increase in income (Hong and Hanna, 2014). Second, households with more present bias or with inconsistent time preference could have shorter time horizon on financial planning, and thus have stronger consumption responses to an unanticipated increase in income. Finally, households who pay higher costs to decide optimal consumption over longer periods are more likely to have shorter time horizon on financial planning, thus they might show stronger consumptions to an increase in income (Reis, 2006). We use the survey question about financial planning: "In planning your (family's) saving and spending, which of the following time periods is most important to [you/you and your spouse]?" The respondent can choose one of 5 options: the next few months, the next year, the next few year, the next 5-10 years, and longer than 10 years. Using the information on the time horizon of financial planning, we examine whether households whose planning horizon is shorter have stronger consumption responses. We divide the sample into two groups who plan shorter than for the next 5 years and longer than for the next 5 years.[18] Columns (1) and (2) of Table 7 show that, households with a shorter time horizon (i.e., financial planning horizon is shorter than the next 5 years) consume almost 3 times more than players who are planning in a longer term perspective. Consistent with

[18] We use 5 years as a reference to divide the sample with similar sample size.

the consumption responses, Columns (3) and (4) indicate that lottery players with the longer time horizon save a greater portion of the lottery prize than lottery players with the shorter time horizon, although the effects are imprecisely estimated.

Fourth, under the life cycle model with a finite time horizon, a consumer whose remaining time horizon is shorter exhibit stronger consumption responses to an income shock. To proxy the remaining time horizon among households with the same age, we use information on respondents' subjective belief about his/her life expectancy. The SLP asks its respondents a subjective probability of living past a certain age.[19] We divide the sample whose reported probability is 50% or less and more than 50% to have similar sample size between two groups. Columns (1) and (2) of Table 8 show that households with shorter life expectancy slightly have larger consumption response to an increase in income, but the difference is relatively small. On the other hand, columns (3) and (4) show that the estimated saving responses are about twice larger for those with longer life expectancy. However, the results are imprecisely estimated, so the interpretation should be taken with a grain of salt.

Finally, we study the role of risk-averseness on consumption response. Households' risk averseness is positively correlated with intertemporal elasticity of substitution. Thus, more risk averse households could have a stronger incentive to smooth consumption over time. In addition, households' risk averseness is positively correlated with prudence. Under the precautionary saving theory, individuals with higher prudence will have a weaker consumption response to an income shock as they have a stronger incentive to accumulate precautionary saving (Japelli and

[19] The wording of the question depends on the age of a respondent. For example, to those between 50-65, the SLP asks "what is the percent chance that you will live to be 75 or more?" To those between 65-69, it asks "what is the percent chance that you will live to be 80 or more?" To those between 70-74, it asks "what is the percent chance that you will live to be 85 or more?"

Pistaferri, 2010).[20] To proxy households' risk averseness, we use the subjective response to a question about risk attitude. We use the subjective response to the following question in the SLP: "Are you generally a person who tries to avoid taking risks or one who is| fully prepared to take risks? Please rate yourself from 0 to 10, where 0 means 'not at all willing to take risks' and 10 means 'very willing to take risks'".[21] Consistent with the predictions, columns (1) and (2) of Table 9 show that more risk averse households show weaker consumption responses to an income shock. Consistent with these consumption responses, columns (3) and (4) show that more risk averse households are more likely to save the additional increase in income.

5. Concluding Remarks

Household's consumption responses to income shocks are of great interests to economists and policy makers. However, it is typically difficult to isolate an exogenous variation in income. Although recent empirical studies have exploited random assignments of lottery prizes to understand the causal impacts of unearned income on a variety of outcomes, there has been insufficient knowledge on consumption responses.

We study the effects of income via lottery wins on consumption behavior. To control for lottery ticket spending, we use newly available, nationally representative survey data from Singapore. To study possible mechanisms, we utilize rich information about household

[20] An implicit assumption we make is that risk preference is positively correlated with intertemporal elasticity of substitution and prudence as in the case when the utility function has the CRRA form.

[21] Dohmen et al. (2005) validated the use of this subjective general risk attitude question through a field experiment with real money at stakes upon a random subsample of the German SOEP respondents. They show that the subjective general risk attitude question is highly predictive of actual risk taking behavior, and conclude that the response to the subjective risk attitude question is the "best all-around measure" of risk preference.

characteristics and estimate heterogeneous consumption responses. The baseline analysis shows that an $1 increase in unearned income through winning a lottery prize in the last 12 months increases monthly consumption expenditure by $0.09. The consumption responses to an $1 increase in lottery prizes are larger among households who have stronger liquidity constraint, shorter-term time horizon for financial planning, and are more risk averse.

These findings provide the following policy implications. First, our baseline findings imply that fiscal stimulus policies or other public transfer programs could be an effective means of boosting consumption spending of the economy. Second, our findings on the heterogeneous consumption responses by liquidity constraint imply that the effects of those stimulus payments on consumption would be larger among households with stronger liquidity constraint. Third, our findings on the heterogeneous consumption responses by financial planning horizon and risk-averseness suggest that the effects of government policies could be affected by individuals' behavioral aspects. To design optimal government stimulus programs, incorporating those behavioral aspects could be useful (Madrian, 2014).

We acknowledge several limitations that are not fully addressed in this paper. First, some of the recent studies have used administrative lottery-related data because such data tend to have a much larger sample size and little measurement error (Cesarini et al., 2017; Picchio, Suetens, and Van Ours, 2017). However, we use the self-reported survey data on lottery prizes and lottery ticket spending. Thus, our estimates are not free from measurement error. To the extent that such potential measurement error is random, our estimation would provide conservative estimates due to attenuation bias. Second, we should be cautious about extrapolating our results to other contexts. Due to the differences in sample characteristics between lottery players and

non-players reported in Table 1, it is not straightforward to generalize the results from lottery players to the entire population in Singapore. In fact, Japelli and Pistaferri (2010) argue that the main limitation of the quasi-experimental estimation of the consumption responses to an income shock is that it offers little guidance about how consumers would act differently to different types of shocks. Nevertheless, our estimates are similar to those of Agrawal and Qian (2014), which estimate the effects of public transfers on consumption spending in Singapore using another dataset. This implies that the results of this paper using lottery players could be applicable in analyzing or designing other cash transfer policies in Singapore. Cross-country heterogeneity could also limit the external validity of the findings. Interestingly, our results are also similar to those of the U.S. studies estimating the effects of fiscal stimulus payments on household consumption responses (Johnson et al., 2006; Parker et al., 2013). This similarity implies that our results are not necessarily confined only to the Singapore context. Finally, we could not address dynamic effects of lottery wins on consumption responses due to short survey history. Investigating dynamic consumption response in longer periods would be a good avenue for the future research to study to what extent households smooth consumption over time after an income shock (Fagereng, Holmand, and Natvik; 2016).

References

Agarwal, S., Liu, C., and Souleles, N. 2007. The Reaction of Consumer Spending and Debt to Tax Rebates—Evidence from Consumer Credit Data. *Journal of Political Economy, 115*(6), 986-1019.

Agarwal, Sumit and Pan, Jessica, and Qian, Wenlan. 2016. Age of Decision: Pension Savings Withdrawal and Consumption and Debt Response.

Agrawal, Sumit and Qian, W. 2014. Consumption and Debt Response to Unanticipated Income Shocks: Evidence from a Natural Experiment in Singapore. *American Economic Review*. 104(12): 4205-4230.

Apouey, B. and Clark, A. E. 2015. Winning Big But Feeling No Better? The Effect of Lottery Prizes on Physical and Mental Health. *Health Economics*, 24, 516–538.

Baird, Sarah J., Jacobus De Hoop, and Berk Ozler. 2013. Income Shocks and Adolescent Mental Health. *Journal of Human Resources.* 48, 370– 403.

Blundell, Richard, Luigi Pistaferri, and Ian Preston. 2008. Consumption Inequality and Partial Insurance. *American Economic Review*, 98 (5): 1887-1921.

Browning, M. and T. Crossley. 2009. Shocks, Stocks, and Socks: Smoothing Consumption Over a Temporary Income Less. *Journal of the European Economic Association*. 7(6): 1169-1192.

Cesarini, D., Lindqvist, E., Östling, R., and Björn Wallace. 2016. Wealth, Health, and Child Development: Evidence from Administrative Data on Swedish Lottery Players, *The Quarterly Journal of Economics*. Volume 131, Issue 2, 1 May 2016, Pages 687–738.

Cesarini, David, Erik Lindqvist, Matthew J. Notowidigdo, and Robert Östling. 2017. The Effect of Wealth on Individual and Household Labor Supply: Evidence from Swedish Lotteries. *American Economic Review*, 107 (12): 3917-46.

Chetty, R. and Szeidl, A., 2007. Consumption Commitments and Risk Preferences. *The Quarterly Journal of Economics*, *122*(2), pp.831-877.

Cheng, Terence C., Joan Costa-Font, and Nattavudh Powdthavee. 2018. Do You Have to Win It to Fix It? A Longitudinal Study of Lottery Winners and Their Health-Care Demand. *American Journal of Health Economics*. 4:1, 26-50

Doherty, D., Gerber, A.S., and Green, D.P. 2006. Personal Income and Attitudes toward Redistribution: A Study of Lottery Winners. *Political Psychology.* 27: 441-458.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, Gert G. Wagner; 2011. Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences, *Journal of the European Economic Association*, Volume 9, Issue 3, Pages 522–550,

Fagereng, Andreas, Martin B. Holmand, and Gisle J. Natvik. 2016. MPC Heterogeneity and Household Balance Sheets. Statistics Norway Discussion Papers No. 852.

Guvenen, F. and Smith, A. A. 2014. Inferring Labor Income Risk and Partial Insurance From Economic Choices. *Econometrica*, 82: 2085-2129.

Hall R. E., F. Mishkin. 1982. The Sensitivity of Consumption to Transitory Income: Estimates from Panel Data on Households. *Econometrica* 50:461–81.

Hankins, S., and Hoekstra, M. 2011. Lucky in Life, Unlucky in Love? The Effect of Random Income Shocks on Marriage and Divorce. *Journal of Human Resources.* 46, 403-426.

Hankins, S., Hoekstra, M., and Paige, M. 2011. The Ticket to Easy Street? The Financial Consequences of Winning the Lottery. *Review of Economics and Statistics.* 93, 961-969.

Haushofer, J., Shapiro, J., 2016. The Short-term Impact of Unconditional Cash Transfers to the Poor: Experimental Evidence from Kenya. *Quarterly Journal of Economics*. 131(4).

Hong, Eunice and Hanna, Sherman D., 2014. Financial Planning Horizon: A Measure of Time Preference or a Situational Factor? *Journal of Financial Counseling and Planning*, Vol. 25, No. 2, 184-196.

Imbens, G.W., Rubin, D.B., and Sacerdote, B.I., 2001. Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players. *American Economic Review*. 778–794.

Jappelli, Tullio and Luigi Pistaferri, 2010. The Consumption Response to Income Changes. *Annual Review of Economics*. 2:479-506.

Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. 2006. Household Expenditure and the Income Tax Rebates of 2001. *American Economic Review.* 96 (5): 1589–610.

Kaplan, Greg, and Giovanni L. Violante. 2010. How Much Consumption Insurance beyond Self-Insurance? *American Economic Journal: Macroeconomics*, 2 (4): 53-87.

Kaplan, G. and Violante, G. L. 2014. A Model of the Consumption Response to Fiscal Stimulus Payments. *Econometrica*, 82: 1199-1239.

Kim, S., Oswald, A.J., 2018. Does Winning the Lottery Make People Happier? Working Paper.

Kuhn, P., Kooreman, P., Soetevent, A., and Kapteyn, A., 2011. The Effects of Lottery

Prizes on Winners and their Neighbors: Evidence from the Dutch Postcode Lottery. *American Economic Review*. 101(5), 2226–2247.

Laibson, D. 1997. Golden Eggs and Hyperbolic Discounting. *Quarterly Journal of Economics*. 112:443-77.

La Fleur, 2014. La Fleur's World Lottery Almanac Reports Worldwide Lottery Sales Total $284 Billion. April 11.

Lindahl, M. 2005. Estimating the Effect of Income on Health using Lottery Prizes as Exogenous Source of Variation in Income. *Journal of Human Resources*. 40, 144-168.

Lindh, T. and Ohlsson, H. 1996 Self-Employment and Windfall Gains: Evidence from the Swedish Lottery. *Economic Journal*. 106, 1515-1526.

Moffitt, R.A., 2003. The Negative Income Tax and the Evolution of US Welfare Policy. *Journal of Economic Perspective*. 17 (Summer), 119–140.

NASPL, 2017. North American Association of State and Provincial Lotteries. http://www.naspl.org/faq (accessed April 4, 2017).

Parker, Jonathan A. 2017. Why Don't Households Smooth Consumption? Evidence from a $25 Million Experiment. *American Economic Journal: Macroeconomics*, 9 (4): 153-83.

Parker, Jonathan A., Nicholas S. Souleles, David S. Johnson, and Robert McClelland. 2013. Consumer Spending and the Economic Stimulus Payments of 2008. *American Economic Review.* 103 (6): 2530-53.

Picchio, M., Suetens, S., and Van Ours, J.C. 2017. Labour Supply Effects of Winning a Lottery. *Economic Journal*. Forthcoming.

Reis, Ricardo. 2006. Inattentive Consumers. *Journal of Monetary Economics*. 53 (8):

1761–1800.

Robins, P. 1985. A Comparison of the Labor Supply Findings from the Four Negative Income Tax Experiments. *Journal of Human Resources*. 20(4), 567–582.

Singapore National Council on Problem Gambling, 2015. Report of Survey on Participation in Gambling Activities among Singapore Residents, 2014. February.

Singapore Pools, 2017. Toto Prize Structure. https://online.singaporepools.com/lottery/en/article/toto-prize-structure (accessed 03.04.17).

World Lottery Association, 2017. https://www.world-lotteries.org/about-us/about-the-wla (accessed 04.04.17).

Tables and Figure

Table 1. Summary Statistics by lottery participation status

	Players	Non-players	Difference
Age	60.98	60.53	0.447***
	(6.23)	(6.44)	(3.54)
Male	0.54	0.42	0.112***
	(0.50)	(0.49)	(11.33)
Chinese	0.94	0.76	0.182***
	(0.23)	(0.43)	(26.17)
Malay	0.01	0.13	-0.123***
	(0.07)	(0.33)	(-24.60)
Indian	0.04	0.08	-0.045***
	(0.19)	(0.27)	(-9.58)
Completed Secondary education	0.43	0.38	0.055***
	(0.50)	(0.48)	(5.67)
Completed Tertiary education	0.35	0.42	-0.074***
	(0.48)	(0.49)	(-7.64)
Married	0.75	0.72	0.029***
	(0.43)	(0.45)	(3.28)
Number of children	3.87	4.02	-0.150***
	(1.23)	(1.37)	(-5.79)
Total Consumption Expenditure (monthly)	3,779	3,632	147.1
	(4,708)	(4,831)	(1.55)
Durables Consumption Expenditure (monthly)	237.0	186.7	50.3***
	(843.3)	(647.9)	(3.4)
Non-durables Consumption Expenditure (monthly)	3,313	3,199	114.3
	(4,048)	(4,127)	(1.40)
Food Consumption Expenditure (monthly)	658.2	594.7	63.43***
	(531.2)	(552.3)	(5.88)
Health expenditure (monthly)	149.0	119.9	29.15**
	(685.8)	(504.4)	(2.47)
Saving Amount (monthly)	1,505	1,758	-252.5**
	(4,876)	(5,635)	(-2.27)
Observations	5541	4650	

Notes: Monetary units are in 2016 Singapore dollars. Standard errors are reported in parentheses in column (1) and (2). t-statistics are reported in parenthesis in column (3). *denotes significance at 0.10; **at 0.05; ***at 0.01.

Table 2. Lottery-related Characteristics (lottery players only)

A. Lottery ticket purchase frequency	
Weekly	46.6%
Monthly	14.8%
Quarterly	2.4%
Irregularly	36.3%
B. Annual spending on lottery tickets	2,220
5th percentile	15.0
10th percentile	29.8
25th percentile	100
50th percentile	517
75th percentile	2,080
90th percentile	5,169
95th percentile	7,800
C. Pr(lottery prize>0)	45.8%
D. Annual lottery winnings (>0)	912.4
5th percentile	9.9
10th percentile	19.9
25th percentile	49.7
50th percentile	198.8
75th percentile	500
90th percentile	2,000
95th percentile	4,970
E. Ratio of lottery prize over lottery ticket spending	0.637

Note: Monetary units are in 2016 Singapore dollars.

Table 3. Estimation Results of the Regression of Lottery Prize Ratio on Covariates

Covariates	Dep. Var.: Ratio of lottery prize over ticket spending
Age	0.030
	(0.073)
Age-squared	-0.048
	(0.061)
Completed secondary education	0.197
	(0.192)
Completed tertiary education	-0.174
	(0.202)
Chinese	-0.529
	(0.686)
Malay	-1.073
	(0.702)
Indian	-0.585
	(0.709)
Male	0.152
	(0.200)
Married	0.199**
	(0.095)
Number of children	0.001
	(0.045)
1[Year=2017]	0.137
	(0.196)
Constant	0.785
	(2.398)
Observations	5,5412
R-squared	0.001
F-test of joint significance of all covariates (p-value)	1.08 (0.370)

Notes: Standard errors reported in parentheses are clustered at the individual level and corrected for heteroscedasticity. * denotes significance at 0.10; ** at 0.05; *** at 0.01.

Table 4. Effects of Lottery Prize on Household Consumption Expenditure and Saving

Dep. Vars.	Consumption Expenditure					Saving
	Total	Durables	Non-Durables	Foods	Health Care	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Baseline						
Lottery Prize	0.087**	0.0003	0.086**	0.009**	0.009	0.082
	(0.038)	(0.006)	(0.036)	(0.005)	(0.008)	(0.054)
Observations	5,541	5,541	5,541	5,541	5,541	5,210
R-squared	0.202	0.020	0.203	0.193	0.009	0.043
B. w/o Lottery Ticket Spending as a control variable						
Lottery Prize	0.110***	0.003	0.102***	0.011**	0.011	0.074
	(0.040)	(0.006)	(0.037)	(0.005)	(0.008)	(0.054)
Observations	5,541	5,541	5,541	5,541	5,541	5,210
R-squared	0.198	0.0183	0.201	0.190	0.007	0.043
C. w/o Controls						
Lottery Prize	0.101**	0.001	0.098***	0.012**	0.009	0.094*
	(0.041)	(0.0061)	(0.038)	(0.006)	(0.008)	(0.057)
Observations	5,541	5,541	5,541	5,541	5,541	5,210
R-squared	0.006	0.0017	0.006	0.0051	0.002	0.0014
D. Excluding Prize > $10,000						
Lottery Prize	0.097	-0.005	0.100	0.019**	-0.007	0.182*
	(0.066)	(0.009)	(0.061)	(0.008)	(0.004)	(0.099)
Observations	5,520	5,520	5,520	5,520	5,520	5,189
R-squared	0.200	0.020	0.201	0.192	0.008	0.044

Notes: All specifications include age, age squared, education attainment-fixed effect, race-fixed effect, year-fixed effect, gender, marital status, number of children, and spending on lottery tickets purchased. Standard errors clustered at the individual level and corrected for heteroscedasticity are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Effects of Lottery Prize on Household Consumption Expenditure and Saving by Public Pension Wealth Withdrawal Eligibility Status

Dep. Vars.	Total Consumption Expenditure		Saving	
	Age < 55th Birthday	Age >=55th Birthday	Age < 55th Birthday	Age >=55th Birthday
	(1)	(2)	(3)	(4)
Lottery Prize	0.183	0.071*	-0.067	0.097*
	(0.184)	(0.036)	(0.155)	(0.059)
Observations	760	4,781	724	4,486
R-squared	0.186	0.203	0.042	0.046

Notes: All specifications include age, age squared, education attainment-fixed effect, race-fixed effect, year-fixed effect, gender, marital status, number of children, and spending on lottery tickets purchased. Standard errors clustered at the individual level and corrected for heteroscedasticity are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Effects of Lottery Prize on Household Consumption Expenditure and Saving by Ratio of Financial Wealth over Total Wealth

Dep. Vars.	Total Consumption Expenditure		Saving	
	Less than 5% (or negative net worth)	5% and over	Less than 5% (or negative net worth)	5% and over
	(1)	(2)	(3)	(4)
Lottery Prize	0.110*	0.067	0.005	0.122*
	(0.062)	(0.048)	(0.079)	(0.069)
Observations	2,557	2,984	2,372	2,838
R-squared	0.161	0.209	0.032	0.055

Notes: All specifications include age, age squared, education attainment-fixed effect, race-fixed effect, year-fixed effect, gender, marital status, number of children, and spending on lottery tickets purchased. Standard errors clustered at the individual level and corrected for heteroscedasticity are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Effects of Lottery Prize on Household Consumption Expenditure and Saving by Financial Planning Time Horizon

Dep. Vars.	Total Consumption Expenditure		Saving	
	Less than 5 years	More than 5 years	Less than 5 years	More than 5 years
	(1)	(2)	(3)	(4)
Lottery Prize	0.153**	0.053	0.032	0.062
	(0.065)	(0.047)	(0.058)	(0.056)
Observations	2,940	2,313	2,765	2,176
R-squared	0.1801	0.165	0.038	0.041

Notes: All specifications include age, age squared, education attainment-fixed effect, race-fixed effect, year-fixed effect, gender, marital status, number of children, and spending on lottery tickets purchased. Standard errors clustered at the individual level and corrected for heteroscedasticity are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. Effects of Lottery Prize on Household Consumption Expenditure and Saving by Subjective Life Expectancy

Dep. Vars.	Total Consumption Expenditure		Saving	
	50% and below	Above 50%	50% and below	Above 50%
	(1)	(2)	(3)	(4)
Lottery Prize	0.094	0.072	0.051	0.102
	(0.057)	(0.051)	(0.071)	(0.076)
Observations	2,699	2,842	2,534	2,676
R-squared	0.176	0.231	0.040	0.049

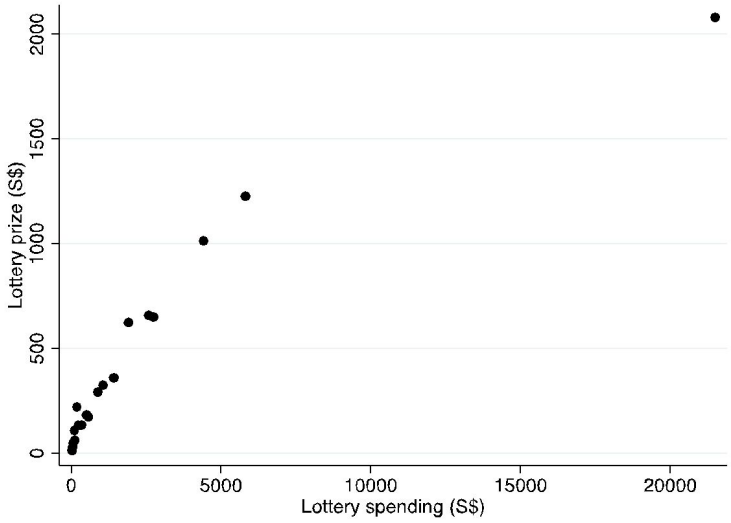
Notes: All specifications include age, age squared, education attainment-fixed effect, race-fixed effect, year-fixed effect, gender, marital status, number of children, and spending on lottery tickets purchased. Standard errors clustered at the individual level and corrected for heteroscedasticity are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Effects of Lottery Prize on Household Consumption Expenditure and Saving by Risk Preferences

Dep. Vars.	Total Consumption Expenditure		Saving	
	More Risk Averse	Less Risk Averse	More Risk Averse	Less Risk Averse
	(1)	(2)	(3)	(4)
Lottery Prize	0.040	0.0996	0.194***	0.081
	(0.051)	(0.065)	(0.062)	(0.083)
Observations	2,625	2,457	2,464	2,314
R-squared	0.201	0.178	0.051	0.042

Notes: All specifications include age, age squared, education attainment-fixed effect, race-fixed effect, year-fixed effect, gender, marital status, number of children, and spending on lottery tickets purchased. Standard errors clustered at the individual level and corrected for heteroscedasticity are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1. Relationship between Lottery Ticket Spending Amount and Prize Amount



Note: To plot Figure 1, we constructed 20 equal-sized bins and calculated averages of the lottery ticket spending and lottery prize in each bin.