



Material resources and well-being — Evidence from an Ethiopian housing lottery[☆]



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ABSTRACT

Do better material conditions improve well-being and mental health? Or does any positive relationship merely reflect that well-being promotes economic success? We compare winners and losers from a large Ethiopian housing lottery in a preregistered analysis. Winners gain access to better housing, experience a substantial increase in wealth, and report higher levels of overall life satisfaction and lower levels of financial distress. However, we find no average effects of winning on psychological distress. Our results suggest that not all aspects of well-being and mental health are equally sensitive to economic conditions.

1. Introduction

Ever since the United Nations included mental health and well-being among its Sustainable Development Goals, they have become a major policy concern internationally. Consequently, researchers increasingly emphasize the prevalence of common mental disorders (CMDs) and poor well-being in low- and middle-income countries and highlight poverty as both a cause and a consequence (Alloush, 2020; Deaton, 2008; Lund et al., 2010; Olesen et al., 2013; Patel et al., 2018; Ridley et al., 2020). However, the question remains as to the extent to which better material conditions reduce the prevalence of CMDs and improve well-being.

To inform this debate, we survey around 3000 winners and losers of an Ethiopian housing lottery two years after the draw. This lottery distributes purchase rights for new subsidized apartments to low- and middle-income households in Addis Ababa and is part of an ambitious urbanization program. Given that winning is random, we interpret the differences between winners and losers as the causal effect of winning the lottery. While winners gain access to better housing, they also experience a substantial increase in wealth through the ownership of real estate. According to our estimates, winners are on average 20 times wealthier than losers two years

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after the lottery. This scheme gives us an opportunity to study how winning the lottery and becoming substantially richer affects people's mental health and well-being in a low-income context.

In addition to standard socioeconomic variables, we measure overall life satisfaction using standard questions from the World Values Survey, and psychological distress using the Kessler psychological distress scale (K10) (Kessler et al., 2002; 2003).¹ We also include a set of survey questions to measure financial distress.

We find that winning the lottery increases overall life satisfaction by 0.2 standard deviations on average. This increase appears mostly driven by greater satisfaction with housing, neighborhood, and personal finances. Winners also report significantly lower levels of financial distress. More specifically, they are less likely to have inadequate means to cover household expenses, to have outstanding bills, and to have recently experienced financial difficulties more generally. However, we find no average effect of winning on psychological distress. In fact, the point estimate is remarkably close to zero and sufficiently precise that we can reject an effect of just 0.1 standard deviations.

These findings are robust to the inclusion of a large set of control variables, as well as the use of machine learning to select optimal controls. The results are also robust to different coding choices, and a bounds analysis — accounting for possible selective nonresponse — does not alter our main conclusions.

The lottery we study is clearly different from a randomized controlled trial where some individuals win cash and others do not. Through the lottery, winners simultaneously become wealthier and obtain access to better housing, and we cannot fully disentangle the effects of these changes.² When we exploit the fact that only a minority of winners had relocated into the apartment won at the time of the interview, we find that the estimates for overall life satisfaction are very similar for both movers and nonmovers. We also find that both movers and nonmovers are more satisfied with their houses, neighborhoods, and financial situation. Of course, we must interpret this finding with caution given the risk of selection bias, but it nevertheless suggests that greater wealth rather than better housing drives our results.

In further trying to understand the mechanisms behind the effects, we first conduct a mediation analysis that shows that the share of the total effect on life satisfaction that is mediated by wealth is very high (range, 62–73 percent). The same analysis also shows that parts of the effects are mediated by financial distress, while there is no evidence of the effects being mediated by moving to the new property. We also test for heterogeneous effects of winning. One noteworthy finding is that poor individuals, but not the poorest, are more positively affected by winning the lottery both in terms of psychological distress and life satisfaction. This pattern may be explained by the fact that winners must make a down payment to receive their apartment. This upfront payment, as well as the monthly mortgage payments, may be associated with more distress for the poorest individuals. Despite experiencing lower financial distress on average, winners have higher debt and report having more difficulty in raising additional money for unexpected emergencies, which is likely because they have already borrowed to make the down payment.

The positive correlation between economic resources and life satisfaction and well-being is an almost universal finding (Clark, 2017; Deaton, 2008; Diener et al., 2010; Frijters et al., 2006; 2004; Haushofer and Fehr, 2014; Howell and Howell, 2008; Killingsworth, 2021). There is also increasing evidence of the negative association between poverty and mental health (Karimli et al., 2019; Ridley et al., 2020; Schilbach et al., 2016; Tampubolon and Hanandita, 2014). Nonetheless, existing evidence highlights that income is more strongly correlated with so-called *evaluative* measures of well-being, such as life satisfaction, than with more *affective* measures, such as questions about the frequency of various positive or negative feelings (Kahneman and Deaton, 2010). In analyzing the effects on different subindices of life satisfaction, we see that the positive effects are concentrated in the financial and physical environment (neighborhood, home, and leisure) domains. Hence, the difference in results across life satisfaction and psychological distress in our study may not be due to a difference between *evaluative* and *affective* measures but rather to a difference between satisfaction with financial status (and other material dimensions) and more intangible dimensions, including psychological distress.

Our findings provide causal evidence on the relationship between material conditions and mental health and well-being. Nevertheless, this is not the first analysis to move beyond descriptive correlations to make causal claims. Likewise, other studies have exploited variations in economic resources from natural experiments. For example, using tax rebates, Lachowska (2017) finds that increased income reduces stress and worry in the US. Also in the US, Schwandt (2018) employs stock price fluctuations and finds that increases in wealth improve mental health. There is also evidence of mental health effects from variations in income from casinos among Native Americans (Costello et al., 2003; 2010; Wolfe et al., 2012).

Other studies have also used lotteries to investigate the effects of monetary gains on well-being and mental health. The best evidence from lotteries to date is from Sweden, where Lindqvist et al. (2020) compare winners with equal probabilities of winning in a large sample using a preregistered analysis. They find a persistent positive relationship between the lottery amount won and overall life satisfaction. However, they similarly show no significant effects on mental health. Gardner and Oswald (2007) and Apouey and Clark (2015) in the UK and Lindahl (2005) in Sweden find that large lottery wins lead to improvements in mental health. However, these studies compare winners from different lotteries and lack information about how often people played. It is therefore unclear whether the winners of different amounts are drawn from the same populations. The sample sizes in these studies are also small (ranging from just 137 to 674 winners). In contrast, Kuhn et al. (2011) find no effect on happiness of winning in a

¹ We use the Amharic version of the K10, tested and used in Ethiopia by Fekadu et al. (2014); Tesfaye et al. (2010, 2016), and which Charlotte Hanlon and Markos Tesfaye graciously shared with us.

² Better housing and neighborhood quality have been repeatedly identified as associated with a lower prevalence of CMDs and better well-being (Abas and Broadhead, 1997; Alloush and Bloem; Amoran et al., 2005; Cattaneo et al., 2009; Danaci et al., 2002; Gureje et al., 2007; Kim et al., 2002; Ludwig et al., 2012; Lund et al., 2010; Patel et al., 2006; 1998; Sabin et al., 2003).

Dutch lottery where they were able to compare 223 winners and 477 losers in the same lottery, even though they were unable to reject large effects. We are also aware of an unpublished working paper using data from an earlier Ethiopian housing lottery, in which Franklin (2019) investigates the demand for state subsidized housing in Ethiopia. In the Appendix, the author also reports exploratory results for well-being and mental health among lottery participants (in Appendix Table A.26). He finds that winning reduces a composite index of anxiety and depression among winners, but the effect of -0.11 is only statistically significant at the 10 percent level.³

Given the context of our study, we also contribute to the research on the relationship between economic resources and mental health in low-income countries, where most of the causal evidence comes from cash transfer programs.⁴ In a recent meta-analysis of 38 cash transfer studies covering the period 2000–2020, McGuire et al. (2020) find a positive effect of 0.1 standard deviations on a composite index of mental health and well-being, whereas the effect is smaller for mental health in isolation. The fact that the main source of heterogeneity in the effects is the size of the transfer highlights the need for studies of more radical changes in economic conditions, such as those presented here. Ridley et al. (2020) focus on mental health and also include poverty-alleviating programs other than cash transfers.⁵ As in McGuire et al. (2020), they find an overall positive effect of about 0.1 standard deviations.⁶ Romero et al. (2021) conduct a systematic review of 57 studies that investigate the effect of economic interventions on well-being. They also find that the average effect is 0.1 standard deviations. Interestingly, they include an analysis of 10 housing voucher programs, all of which are from the US and nine of them study *moving-to-opportunity* programs. These programs have a meta-analytic effect on mental health outcomes of 0.07 standard deviations. Finally, Zimmerman et al. (2021) conduct a meta-analysis of the effects of cash transfers on the mental health of children and young adults. Their target population is different from ours, and from the two earlier reviews, but their focus on mental health is relevant to this study. They find substantial heterogeneity between studies and conclude that cash transfers have no impact on depressive symptoms.

The present study differs from this literature along several dimensions. As mentioned, the lottery winners in our sample see an exceptionally large increase in wealth, which is presumably permanent and relatively certain given the stability of the real estate market in a fast-growing city such as Addis Ababa. This contrasts with the relatively small short-term income changes induced by temporary cash transfers. As well-being and mental health are influenced by uncertainty and worries (Ridley et al., 2020), a permanent increase in wealth could exert even stronger effects on well-being and mental health than could temporary transfers. The fact that we observe a reduction in financial distress among winners also suggests that we could expect a beneficial effect from fewer worries. In light of this, our null result on psychological distress (and the nonfinancial and physical environment aspects of life satisfaction) is quite stark. One important difference as compared with the cash transfer literature is that our lottery induced people to borrow and make down payments, which may have offsetting effects for the poorest individuals in our sample. The fact that we find larger effects on life satisfaction, as well as significant improvements in psychological distress, for the poor, yet not the poorest, is consistent with such an interpretation.

The remainder of the paper is structured as follows. We describe the lottery and the context in Section 2 and present the data in Section 3. We describe our empirical strategy and discuss the main results in Section 4. We discuss plausible mechanisms and conduct additional exploratory analyses in Section 5. We summarize the study and provide concluding remarks in Section 6.

2. The lottery

The housing lottery we consider is part of a large-scale urbanization policy known as the Integrated Housing and Development Programme (IHDP), which aims to facilitate access to quality housing for low- and middle-income groups in Addis Ababa, Ethiopia. The apartments are sold at highly subsidized prices and home-buyers are given access to finance through the Commercial Bank of Ethiopia (CBE). Given the excess demand for housing at subsidized prices, condominium apartments are distributed through a computer-based lottery among eligible applicants.

Eligibility for the lottery is based on three requirements: (i) having resided in Addis Ababa for at least the previous two years, (ii) not having any other house or lease land registered (in one's own or a spouse's name), and (iii) having opened a savings account at the CBE and deposited the required monthly savings for at least 29 months (with no breaks in saving longer than six months).

The IHDP is a large-scale and comprehensive program. During the initial registration in 2005, more than 300,000 households in Addis Ababa signed up for the program, corresponding to roughly half of the city's population. When registering for the program, applicants must select the desired apartment type (studio, one-, two-, or three-bedroom apartments). As supply and demand varies by unit type, separate lotteries are held for each type of apartment. Within each lottery, quotas exist for women, the disabled, and government employees. First, 30 percent of the winners are drawn from among female applicants. Then 20 percent of the winners

³ Note that this analysis was not included in the 2018 version of the paper and was not one of the main preregistered outcomes. In addition, the statistical power to detect an effect of 0.1 is only 0.47 given the sample size in that study.

⁴ Studies that assess the effects of cash transfers on psychological well-being and mental health include Alzua et al. (2019); Angeles et al. (2019); Baird et al. (2013); Bando et al. (2020); Blattman et al. (2020, 2017); Chen et al. (2019); Egger et al. (2019); Galama et al. (2017); Galiani et al. (2016); Han and Gao (2020); Haushofer et al. (2020a,b); Haushofer and Shapiro (2016, 2018); Heath et al. (2020); Hjelm et al. (2017); Hussam et al. (2021); Kilburn et al. (2018, 2019, 2016); Macours et al. (2012); Ohrnberger et al. (2020a,b); Ozer et al. (2011); Paxson and Schady (2010); Salinas-Rodríguez et al. (2014); Schatz et al. (2012). Rather than discussing all of these, we refer the interested reader to recent reviews by McGuire et al. (2020), Ridley et al. (2020), Romero et al. (2021), and Zimmerman et al. (2021).

⁵ Their meta-analysis includes 12 cash transfers and six multifaceted antipoverty programs.

⁶ Our study is also designed to detect an effect of 0.1 standard deviations with a power of 0.8 at the 0.05 level of significance.

are drawn from among government employees. Finally, there is a five percent quota for those with physical disabilities. All quotas are decided upon after registration but before the lottery draw.

Currently, there have been two rounds of registrations and 13 lotteries. We focus on the first round of registration and the 11th lottery rounds, which took place in 2016.⁷

Lottery winners must pay at least 20 percent of the apartment price up-front and are offered access to finance for the remaining 80 percent through the CBE. Given this payment scheme, the program has been labeled the “20/80 program.”

The 11th round of the lottery distributed the purchase rights for 12,027 apartments (excluding three-bedroom units).⁸ Only individuals who had registered in 2005 were included in the draw. Upon winning the lottery, prospective homeowners were required to make the 20 percent down payment before they could sign the contract and receive the keys to their apartment. Around 95 percent of the winners initially drawn were able to do this. They are then free to rent out their apartment but are not allowed to sell it within the first five years.⁹ At the time of the survey, two years after the lottery, 30 percent of the winners had moved into their apartment, 31 percent were renting it out, 32 percent were currently empty, but with the owner planning to move in (21 percent) or rent it out (11 percent), and in two percent of the cases, the apartment was used on a rent-free basis by relatives.

3. Data

We designed and collected survey data for the lottery winners and losers in collaboration with the Ethiopian Development Research Institute (EDRI). We sampled applicants who registered in the first round (in 2005) for a studio, a one-, or a two-bedroom apartment, and who were eligible for the 11th lottery in 2016. As noted, there were special quotas for women, government employees, and people with physical disabilities. Therefore, we needed to obtain information on these variables.

There are two different administrative lists pertaining to the lottery: one for winners and one for losers. Therefore, EDRI obtained two types of lists from the Addis Ababa Housing Development and Administration Agency: one for winners and one for losers. Starting with the winners, we randomly sampled 2200 individuals on this list who had unique telephone numbers and who had not won a three-bedroom apartment. For this “winners’ sample,” we have information about the apartment type, gender, and public sector employment at the time of the registration. We also have information about the location of the apartments won. We did not have information about physical disability status at registration, so we had to ask them about this separately during the survey.

EDRI also obtained the list of individuals who registered in 2005 and qualified for the 11th lottery, but who did not win it (and did not win the 12th lottery either, which was held between the 11th lottery and our survey). This list includes information about the type of apartment the individuals applied for and about physical disability status. We obtained employment status and gender data during the survey.¹⁰ We also ranked all individuals on this list randomly and then selected a random sample of 2200 losers (stratified by gender within each apartment type). This is our “losers’ sample.” We then aggregated the winners’ and losers’ samples and randomized the order again. We created a new ID variable and keep only the people’s IDs, names, and phone numbers before sending the list to the data collection team. In this way, the individual’s status (i.e., winner or loser) is blinded for the enumerators, and we avoid issues with confounding factors because of different timing and different enumerators. EDRI interviewed the sampled individuals by phone using the survey questionnaire developed by the research team. The survey took around 20 minutes to complete, and the respondents were given ETB 50 in compensation. EDRI was told to stop after around 3000 completed interviews. The survey respondents were paid with mobile money directly after the interview was conducted.

3.1. Survey measures

Our first two outcome variables measure psychological well-being. In addition, we examine the effects on financial distress and also collect data on features that serve as control variables. Next, we describe these variables.¹¹

Our first two outcomes are *overall life satisfaction* and *psychological distress*. For *overall life satisfaction*, we use the standard measure from the World Values Survey, which asks respondents: “Using a scale from 0 to 10, where 0 means ‘not at all satisfied,’ and 10 is ‘completely satisfied,’ how satisfied are you with your life as a whole these days?” We standardize the responses by subtracting the mean and dividing by the standard deviation (both from the losers group).

To further explore this dimension, we also include measures of domain-specific satisfaction. In particular, we question respondents about how satisfied they are with their health, leisure time, financial situation, friends, relatives, home, neighborhood, work, and with Ethiopian society. Responses are given on a scale from 0 to 5, where 0 is *very dissatisfied* and 5 is *very satisfied*. These variables are standardized in the same manner as the responses to the overall life satisfaction question.¹²

⁷ The 12th round, conducted in 2018, was unusually small with only 2607 apartments and the 13th round took place in March 2019 after data collection for the project was completed.

⁸ We excluded applicants for three-bedroom apartments because almost everyone in this group had received an apartment at the time of sampling.

⁹ A small share (four percent) of the winners in our sample managed to sell their apartment, despite these rules.

¹⁰ We first inferred the individual’s gender from their first name and later confirmed it during the interview.

¹¹ The full survey is available in Appendix Section.

¹² In the pre-analysis plan, we stated that we would dichotomize each variable by choosing the cut-off that would divide the losers group into two groups of as equal sizes as possible. We included these results in Appendix Section to show that it makes no qualitative difference to our estimates.

We measure *psychological distress* using the Kessler psychological distress scale (K10) (Kessler et al., 2002; 2003). The K10 scale contains 10 questions concerning experienced symptoms of depression and anxiety in the past 30 days. Respondents are asked how often they have felt:

- (i) ...tired out for no good reason;
- (ii) ...nervous;
- (iii) ...so nervous that nothing could calm them down;
- (iv) ...hopeless;
- (v) ...restless or fidgety;
- (vi) ...so restless they could not sit still;
- (vii) ...depressed;
- (viii) ...that everything was an effort;
- (ix) ...so sad that nothing could cheer them up;
- (x) ...worthless.

Responses are given on a five-point scale ranging from *none of the time* to *all of the time*. The range of scores is between 10 and 50, where higher scores indicate higher distress (Andersen et al., 2011; Andrews and Slade, 2001). The K10 scale is used widely, including in the World Mental Health Survey, and has been translated and validated in many different contexts, including in Ethiopia (Fekadu et al., 2014; Tesfaye et al., 2010; 2016).¹³ The K10 scale is highly correlated with other screening scales for CMDs (Patel et al., 2008) and has the advantage of being short and concise. The internal consistency of the index is high. We obtain a Cronbach's alpha of 0.9 using our data, which exactly matches the value reported by (Tesfaye et al., 2010). For comparability, we standardize the overall K10 score in the same way as for the life satisfaction question. To explore various aspects of distress, we also report effect estimates for the individual items on the scale (also standardized).

In the literature, it is common to use cut-off scores to separate the levels of distress. Suggested score categories are: 10–19 (individual is likely well), 20–24 (indicating mild mental disorder), 25–29 (indicating moderate mental disorder), and 30–50 (indicating severe mental disorder). According to these cut-off scores, 78 percent of the losers show no signs of mental disorder, 14 percent have mild mental disorders, and eight percent suffer from moderate to severe mental disorders. The literature has emphasized that women bear a disproportionate share of the burden of mental illness (James et al., 2018), and this is also the case in our sample, where the shares of women falling into each category of mental disorder are 73, 15, and 12 percent, whereas the corresponding shares for men are 81, 13, and six percent, respectively. We did not prespecify the use of cut-off scores, but in Appendix Section, we show that our conclusions are the same when applying thresholds. We also show that alternatively using the Kessler K6 scale — nested in the K10 scale but including only six of the above 10 items — does not affect our conclusions either.

To assess the effect of winning the lottery on economic resources, we measure the *wealth* and experienced *financial distress* of respondents. Based on the reported asset values (including real estate) and liabilities, with all currency values in Ethiopian birr (ETB), we calculate their housing-related wealth and net wealth.¹⁴ At the time of the survey in 2018, ETB 1000 was equivalent to around USD 36. We also asked respondents about whether they were richer today than five years ago, whether they expected to be richer five years from now, and whether they perceived themselves as richer, equally rich, or poorer than other Ethiopians. In addition, we constructed an asset index based on whether the households owned a radio, TV, refrigerator, car, computer, tablet, satellite dish, smartphone, or an electric mitad (a common cooking appliance like a grill in Ethiopia).

Finally, because economic distress may be an important channel through which economic circumstances affect well-being, we include four commonly used measures of financial distress. We first ask “If you suddenly ended up in an unforeseen situation, where you must raise ETB 20,000, would you be able to?” We code the response as a binary indicator equal to one if the answer is *no*. We then ask three questions about the economic situation of each respondent's family during the last six months. Specifically, we ask whether they have had inadequate money to cope with family expenses (*never, rarely, sometimes, or always*), if they have delayed the payment of bills because of financial difficulty (*never, rarely, sometimes, or always*), and what the economic condition of the family has been like (*no-, some-, considerable-, or much financial difficulty*).

For comparability with our main outcomes, we standardize each of the items relating to financial distress by subtracting the mean and dividing by the standard deviation of the losers group. We then construct a financial distress index by adding the four standardized items together and standardizing the sum in the same way. The four items are highly correlated, and the internal consistency of the index, as measured by Cronbach's alpha, is 0.81. We present the effect of winning on this financial distress index along with our main results because it is seen as a key channel for the effects of economic resources on distress.¹⁵

We also asked the respondents about demographic variables (ethnicity, religion, age, region of birth, and partner status) and earnings just before the lottery (in 2015) and at registration (in 2005) for themselves and their partners. The coding of the control variables is described in the Appendix Table.

¹³ We employ an Amharic version shared by Hanlon and Tesfaye.

¹⁴ The values for these variables are missing for about 40 and 60 percent of respondents because of missing or inconsistent information on one or more of the variables, respectively. As specified in the pre-analysis plan, we calculate the bounds on the effect of winning the lottery on wealth. Appendix Table shows that the difference in wealth between lottery winners and losers is still large and significantly different from zero, even if we make very extreme assumptions about the values of the missing observations.

¹⁵ In the pre-analysis plan, we stated that we would dichotomize each of the financial distress items and we show in Appendix Section that this makes no qualitative difference to our main results. We chose to present a standardized index in the main paper to ease comparisons across outcomes.

Table 1
Descriptive statistics.

	Total		Winner		Loser	
	Mean	SD	Mean	SD	Mean	SD
Winner	0.49	(0.50)	1.00	(0.00)	0.00	(0.00)
<i>Strata variables</i>						
Female	0.42	(0.49)	0.45	(0.50)	0.40	(0.49)
Government employee	0.22	(0.41)	0.30	(0.46)	0.14	(0.34)
Disabled	0.03	(0.17)	0.06	(0.23)	0.00	(0.06)
Studio	0.20	(0.40)	0.20	(0.40)	0.19	(0.39)
One bedroom	0.54	(0.50)	0.53	(0.50)	0.55	(0.50)
Two bedroom	0.26	(0.44)	0.26	(0.44)	0.26	(0.44)
<i>Other control variables</i>						
Age	42.81	(9.60)	43.38	(9.66)	42.26	(9.52)
Orthodox	0.76	(0.43)	0.77	(0.42)	0.74	(0.44)
Muslim	0.11	(0.32)	0.09	(0.29)	0.13	(0.34)
Protestant	0.12	(0.32)	0.12	(0.33)	0.11	(0.31)
Amhara	0.37	(0.48)	0.38	(0.49)	0.37	(0.48)
Gurage	0.17	(0.37)	0.15	(0.35)	0.18	(0.39)
Oromo	0.16	(0.37)	0.16	(0.36)	0.17	(0.38)
Tigray	0.08	(0.28)	0.09	(0.29)	0.07	(0.26)
Born in Addis Ababa	0.45	(0.50)	0.42	(0.49)	0.49	(0.50)
Born in Amhara	0.18	(0.38)	0.19	(0.39)	0.16	(0.37)
Born in Oromia	0.15	(0.36)	0.16	(0.36)	0.14	(0.35)
Born in SNNP	0.14	(0.35)	0.14	(0.34)	0.14	(0.35)
Born in Tigray	0.06	(0.24)	0.08	(0.27)	0.05	(0.22)
Earnings 2005 (at reg.)	5.13	(3.19)	5.22	(3.18)	5.05	(3.20)
Earnings 2015	7.05	(3.03)	7.14	(3.02)	6.97	(3.04)
Partner earnings 2005 (at reg.)	0.92	(2.47)	0.92	(2.45)	0.93	(2.48)
Partner earnings 2015	1.57	(3.25)	1.61	(3.28)	1.54	(3.21)
Partner 2005 (at reg.)	0.32	(0.46)	0.31	(0.46)	0.32	(0.47)
Partner 2015	0.50	(0.50)	0.49	(0.50)	0.52	(0.50)
N	3049		1485		1564	

Note: The table shows the means and standard deviations of individual characteristics over the whole sample and separately among the lottery winners and losers. An F-test of whether all “Other control variables” jointly predict winning after the strata variables are controlled for returned a value of 0.28 ($p = .60$).

3.2. Descriptive statistics and balance test

In this section, we describe the sample across some important dimensions and check whether we can identify any noteworthy differences between winners and losers prior to the draw. [Table 1](#) presents descriptive statistics for all individuals and for the winners and losers separately. We can see that 49 percent of the final sample are winners. Regarding the strata variables, 42 percent of the respondents are women, while the shares registered for a studio and a one- or two-bedroom apartment are 20, 54, and 26 percent, respectively.

Although we stratified the sample by gender, the share of women is slightly higher in the winner group (45 vs. 40 percent). This is because the gender inferred from respondent names is not always accurate and the gender was updated during the interview.¹⁶ As expected, given the quotas for these groups, the shares of government employees and those with physical disabilities are higher among the winners (30 and 5.8 percent, respectively) than among the losers (14 and 0.3 percent, respectively). Given that this information was not available beforehand, we could not stratify the sampling on these variables. We describe these issues in detail in Appendix Section, where we also show that alternative coding choices have little consequence for the main results.

The mean age of respondents is around 43 years (which implies that they were on average 29–30 years when they signed up in 2005), and the most common religions are Orthodox Christianity (76 percent), Protestantism (12 percent), and Islam (11 percent).¹⁷ The most common ethnic groups are Amhara (37 percent), Gurage (17 percent), Oromo (16 percent), and Tigray (eight percent), while the most common regions of birth are Addis Ababa (45 percent), Amhara (18 percent), Oromia (15 percent), Southern Nations, Nationalities, and People’s Region (SNNP) (14 percent), and Tigray (six percent).

We test for balance in the control variables across the winner and loser groups by regressing the “winner” variable on the control variables described, while controlling for the strata fixed effects S_i (gender, government employee, disabled, and apartment type). Based on the F-test (see note below [Table 1](#)), we reject the hypothesis that these variables jointly predict winning. In Table, we also present regressions of the treatment on each variable individually and together, while controlling for the strata variables. While the

¹⁶ If we instead use the gender variable based on the names (as we did for the sampling), we find that the shares are similar for both groups (44–45 percent).

¹⁷ For all categorical variables, we pool small groups accounting for less than five percent of the population.

F-test shows that there is balance in general, there are differences between the winners and losers on some variables. As explained in the following section, we therefore also present our results where we control for all control variables as well as for a subset of variables selected through a double robust LASSO procedure.

3.3. Attrition and nonresponse

EDRI was given a list of 4400 individuals in total; however, 1082 of the telephone numbers were invalid.¹⁸ There was no difference between winners and losers in the probability of having an invalid number. In total, EDRI called 3318 people and completed interviews with 3049 individuals (1,485 winners and 1564 losers). Therefore, the response rate is 92 percent. As seen in Table, the share of people declining to be interviewed (unwilling) is significantly larger among the winners. There is no difference between winners and losers in the share of people who moved abroad, were never available to answer the survey, had passed away, or for which the person answering said it was a wrong number.

The total response rate is statistically significantly different between winners and losers after controlling for gender and apartment type (the only strata variables available for both winners and losers not answering the survey). In Appendix Section A2a, we present the results from a pre-specified bounds analysis and show that our main results are robust to reasonable assumptions about the potential values of the missing observations.

We also have missing values for some of the covariates. Among the prespecified controls, we have complete information about all but four: earnings in 2005, earnings in 2015, partner earnings in 2005, and partner earnings in 2015. These are recall questions and some respondents could not remember the answers. In the Appendix Table, we show that these missing values are not correlated with winning the lottery and that the lottery effect is not different for people with and without missing values. When we use these additional covariates in a regression, we use the missing-indicator method (White and Thompson, 2005): we add an indicator variable equal to one to the regression when the variable is missing and set the missing values to zero.¹⁹

4. Empirical strategy and main results

To test the effects of winning the lottery on individual i 's outcomes, we regress the outcome of interest Y_i on T_i , a dummy variable equal to one if the individual has won the lottery, while controlling for the set of strata covariates S_i (gender, public sector employment, disability, and apartment type):

$$Y_i = \beta T_i + \theta S_i + \varepsilon_i \quad (1)$$

This is our main specification as described in the pre-analysis plan.

We show that the results are robust to including the full set of control variables, as well as to a subset of control variables selected using the post double LASSO approach of Belloni et al. (2014).²⁰ Because the treatment is randomized at the individual level, we use robust standard errors without any clustering.

4.1. Effects of winning on wealth and disposable income

As noted, we interpret the effects of winning the lottery primarily in terms of a wealth effect. To substantiate this interpretation, we begin by showing the effect of winning on wealth.

We define *net wealth* as the total reported value of any real estate owned plus savings minus debt of any sort. According to this measure, lottery winners are clearly wealthier than losers. At the time of the interview (two years after the lottery), the average net wealth reported by winners is around ETB 450,000 (roughly USD 45,000 PPP adjusted). This is more than 20 times the amount reported by losers (ETB 20,000 or less than USD 2000 PPP adjusted), and the difference corresponds to around 15 years of average earnings in our data. The net wealth distribution for the two groups is illustrated in Fig. 1.

The main weakness of our wealth measures is missing values for part of the sample. This is because some respondents were unable to supply a specific market value for their real estate, and because some did not report their wealth during the interview. In Table 2, we report bounded estimates for the lottery effect on wealth. We obtain the lower bounds of the lottery effect by replacing missing observations among the winners (losers) by that group's mean value minus (plus) 0.20 standard deviations of the loser group. The upper bounds of the effects are constructed in a symmetrical fashion (also see Appendix 3.2). This exercise shows that winning reduces savings by ETB 4194 to ETB 12,800 (column 1) and increases debt by ETB 120,834 to 128,939 (column 2). However, this decrease in net savings is more than offset by the increase in housing wealth (defined as the respondent's expected selling price of any housing

¹⁸ This is unsurprising because the lottery participants registered in 2005, i.e., 13 years prior to the data collection. However, the fact that phone numbers on the participant lists are outdated does not imply that some of the winners miss out. Shortly after the lottery draws, which are subject to intense media coverage, the list of winners is published (both in print and online), so that winners can themselves contact the authorities to claim their apartment.

¹⁹ This method can lead to biased estimates in some cases (Jones, 1996). Fortunately, our estimates remain very stable whether we use this imputation method, only use the subsample with complete data, or do the estimations without controls.

²⁰ To the extent there is concern about imbalance, the LASSO selection approach is also helpful as it precisely selects those variables that are correlated with both the treatment and the outcomes.

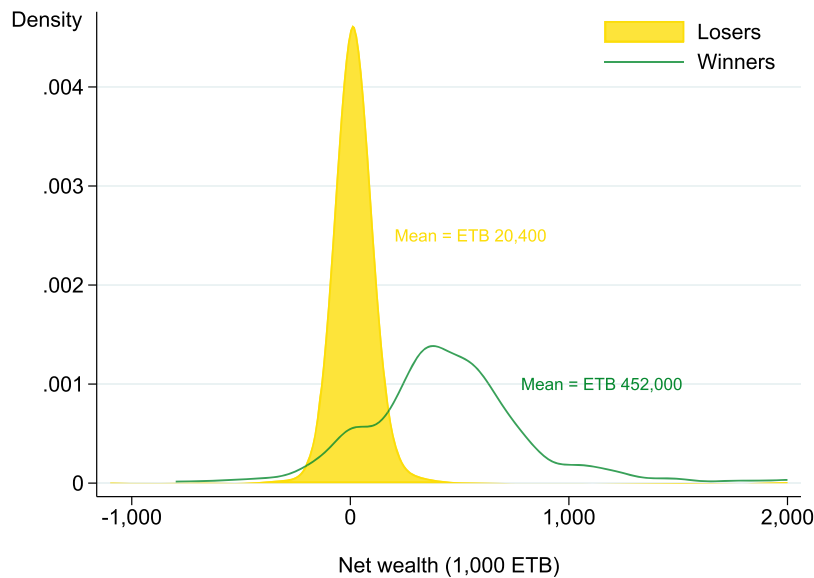


Fig. 1. Wealth distribution among losers and winners. *Note:* The figure depicts (Gaussian) kernel density estimates for the net wealth distribution of the losers and winners, respectively, at the time of the survey (i.e., two years after the lottery). Net wealth is calculated as the combined (self-reported) value of savings, real estate, and other assets minus bank debt and other liabilities.

Table 2
Effects of winning on wealth, mobility, and assets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total savings	Total debt	Housing wealth	Net wealth	Richer than 5 years ago	Richer in 5 years	Perceived position	Asset index
Winner					0.065*** (0.016)	0.014* (0.008)	0.104*** (0.017)	0.046 (0.034)
Lower bound	-12.800*** (1.045)	120.834*** (4.822)	563.533*** (8.133)	395.010*** (7.245)				
Upper bound	-4.194*** (1.047)	128.939*** (4.826)	588.187*** (8.149)	456.794*** (7.279)				
Mean (losers)	18.014	7.329	6.859	20.407	0.706	0.941	0.634	0.000
N	3049	3049	3049	3049	3049	3049	3049	3049

Note: The table reports the estimated effects of winning the lottery. Robust standard errors are in parentheses. We control for the stratification variables in all estimations. P-values are $\leq 0.01^{***}$, $\leq 0.05^{**}$, and $\leq 0.1^*$. Wealth-related variables in (1)–(4) are in ETB 1000 (ETB 1000 was equivalent to around USD 36 at the time of the survey, in 2018).

units owned), which increases by ETB 563,533 to ETB 588,187 (column 3). As a consequence, net wealth increases significantly by ETB 395,010 to ETB 456,794 (column 4).

Turning to the more qualitative aspects, Table 2 shows that winners also perceive themselves to be richer than five years ago (the estimated effect is 6.5 percentage points relative to a mean of 71 percent among the losers) and expect to become even richer over the next five years (by 1.4 percentage points). Finally, a larger share of winners perceives themselves to be as rich as or richer than Ethiopians in general (by 10 percentage points). This analysis suggests that winning the lottery has a substantial impact on self-assessed wealth and economic position.

We find no effects on household assets, perhaps because such an effect takes longer to materialize. Another explanation may be that winners have not invested in household assets because they spend a large share of their income on mortgage payments, and that their disposable income is almost unaffected by winning (at least in the short run). This is confirmed by Tables and in the Appendix, which show that winning increases both household expenditures and income.

To summarize, while winners gain the ownership of a house, they will often need to borrow money to finance the down payment as well as the mortgage payments. The economic impact of winning is therefore a massive increase in wealth but also reduced savings and increased debt. However, the net wealth effect of winning the lottery is substantial, corresponding to 15 years of average earnings, and winners are 20 times wealthier than losers on average. Of course, winners realize this disparity and are more likely than losers to report being wealthier than five years ago and being wealthier than other Ethiopians generally.

Table 3
Correlates of well-being.

	Overall life satisfaction		Financial distress		Psychological distress	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.170*** (0.051)	-0.145** (0.062)	0.280*** (0.050)	0.295*** (0.059)	0.216*** (0.052)	0.143** (0.060)
Public employee	0.046 (0.068)	0.025 (0.070)	-0.054 (0.072)	-0.004 (0.071)	-0.147** (0.068)	-0.110 (0.071)
Disabled	-1.477*** (0.260)	-1.495*** (0.207)	0.703** (0.317)	0.726*** (0.238)	1.294*** (0.411)	1.351*** (0.427)
One bedroom	0.250*** (0.068)	0.177*** (0.068)	-0.497*** (0.063)	-0.413*** (0.063)	-0.144** (0.069)	-0.120* (0.071)
Two bedroom	0.407*** (0.077)	0.307*** (0.078)	-0.851*** (0.073)	-0.718*** (0.076)	-0.301*** (0.075)	-0.260*** (0.079)
Age		-0.004 (0.003)		0.004 (0.003)		0.004 (0.003)
Orthodox		-0.510*** (0.190)		0.201 (0.146)		-0.036 (0.200)
Muslim		-0.540*** (0.202)		0.321** (0.163)		-0.116 (0.214)
Protestant		-0.188 (0.203)		0.128 (0.162)		-0.110 (0.211)
Amhara		0.039 (0.078)		0.011 (0.073)		-0.067 (0.076)
Gurage		-0.257*** (0.086)		0.163* (0.083)		0.117 (0.083)
Oromo		0.086 (0.088)		0.010 (0.079)		-0.053 (0.089)
Tigray		0.127 (0.155)		-0.044 (0.146)		0.036 (0.120)
Born in Addis		0.302* (0.166)		-0.227 (0.174)		-0.259 (0.234)
Born in Amhara		0.077 (0.175)		-0.006 (0.184)		-0.182 (0.243)
Born in Oromia		0.056 (0.177)		-0.061 (0.187)		-0.099 (0.247)
Born in SNNP		0.245 (0.187)		0.029 (0.195)		-0.097 (0.250)
Born in Tigray		0.289 (0.205)		-0.230 (0.227)		-0.271 (0.267)
Earnings 2005 (at reg.)		-0.014 (0.009)		0.010 (0.009)		0.003 (0.009)
Earnings 2015		0.032*** (0.010)		-0.053*** (0.010)		-0.033*** (0.011)
Partner earnings 2005 (at reg.)		-0.009 (0.015)		0.003 (0.014)		0.011 (0.016)
Partner earnings 2015		0.007 (0.011)		-0.037*** (0.010)		-0.008 (0.011)
Partner 2005 (at reg.)		-0.095 (0.084)		0.118 (0.075)		0.034 (0.081)
Partner 2015		0.087 (0.072)		0.164** (0.066)		-0.083 (0.067)
N	1564	1564	1564	1564	1564	1564

Note: The table shows ordinary least squares (OLS) estimates for the correlation between the main outcomes and baseline characteristics among the losers. Robust standard errors are in parentheses. P-values are ≤ 0.01 ***, ≤ 0.05 **, and ≤ 0.1 *. The dependent variables are standardized (a mean of zero and a standard deviation of one).

4.2. Main results

Having shown that treatment status appears to be randomly assigned conditional on the strata and that there is a substantial effect of winning on wealth, we now turn to our well-being outcomes. In addition to the prespecified primary outcomes of *life satisfaction* and *psychological distress*, we shall also present results on *financial distress*.

To obtain a first impression of the general correlates of well-being, Table 3 details how the outcomes correlate with the strata and other control variables among the lottery losers. As shown in column 1, overall life satisfaction tends to be lower for women and people with disabilities, whereas those who registered for larger and more expensive apartment units display higher levels of overall satisfaction. In column 2, we note that Orthodox Christians and Muslims are less satisfied than Protestants and other religious groups (the reference group). The same applies to individuals belonging to the Gurage ethnic group. Finally, there is a strong positive association between earnings prior to the lottery (in 2015) and overall life satisfaction.

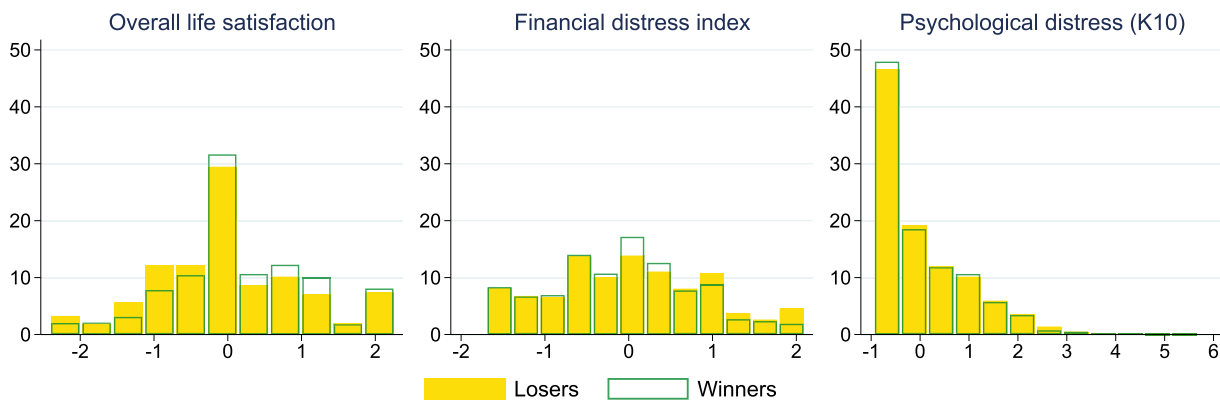


Fig. 2. Distribution of the main outcomes. *Note:* The figure depicts the distribution of the main outcome variables for winners and losers (in percentages). “Overall life satisfaction,” “Financial distress index,” and “Psychological distress (K10)” are standardized using the mean and standard deviations of the losers group.

Table 4
Effects of winning on well-being.

	Overall life satisfaction		Financial distress		Psychological distress	
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.190*** (0.036)	0.184*** (0.036)	-0.116*** (0.034)	-0.109*** (0.034)	-0.039 (0.036)	-0.036 (0.036)
Strata	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes
N	3049	3049	3049	3049	3049	3049

Note: The table details OLS estimates for the effect of winning the lottery on the main outcomes. Robust standard errors are in parentheses. P-values are $\leq 0.01^{***}$, $\leq 0.05^{**}$, and $\leq 0.1^{*}$. All regressions control for the strata fixed effects. The dependent variable is standardized using the mean and standard deviation of the loser group.

Columns 3 and 4 provide the correlates for financial distress and columns 5 and 6 provide those for psychological distress. These correlations are almost a mirror image of the results for life satisfaction, i.e., characteristics associated with lower levels of satisfaction are generally associated with higher levels of distress. However, the correlations appear weaker for psychological distress, which is not correlated with religion for instance. This suggests that the determinants of mental health to some extent may differ from those of life satisfaction and financial distress.

Our data point to a strong correlation between economic resources and well-being. But to what extent is this a causal relationship? [Fig. 2](#) depicts the distribution of the main outcome variables for winners and losers. We can see that winners tend to report higher life satisfaction than losers, whereas the reverse is true for financial distress. By contrast, the distributions for psychological distress are more similar across winners and losers.

However, there are major differences between the two groups, some of which (the strata variables) are correlated with the probability of winning. To properly account for such differences, [Table 4](#) provides treatment effect estimates for the main outcomes with and without controls. [Fig. 3](#) presents the effects on the same outcomes and subindices graphically.²¹

We first report the effect of winning the lottery on the standardized satisfaction outcomes. As shown, overall life satisfaction increases with winning by 0.19 standard deviations (column 1). This effect is significant and is, for instance, larger than the gender gap in satisfaction. Considering the subindices, we identify similar effects on financial and neighborhood satisfaction, but with a smaller effect on satisfaction with leisure, whereas the effect on the domain “home” is almost twice as large as the effect on overall satisfaction.

We now provide the results for financial distress, where the overall effect on the additive index is 0.12 standard deviations (column 3). In considering the subindices, we see that winning the lottery affects all four outcomes related to financial distress in that winners

²¹ In [Fig. 3](#), given the number of tests reported, we also adjust the confidence intervals for multiple hypothesis testing using the procedure of [Benjamini and Hochberg \(1995\)](#). We construct the adjusted confidence intervals based on adjusted critical values. With nine p-values, for example, the significance thresholds are 0.0055, 0.11, 0.017, ..., 0.05, instead of being 0.05 for all outcomes, and the corresponding critical values given by the normal distribution are 2.77, 2.54, 2.39, ..., 1.96, instead of 1.96 for all outcomes. We then define the adjusted 95% confidence interval as “estimate \pm (adjusted critical values) * standard error.” We perform the corrections using “family of outcomes.” We have three distinct families in the figure: i.e., the life satisfaction in different domains (from *health* to *work*), the financial distress measures (from *unforeseen situation* to *financial difficulties*) and the 10 components of the Kessler psychological distress scale (from *tired* to *worthless*).

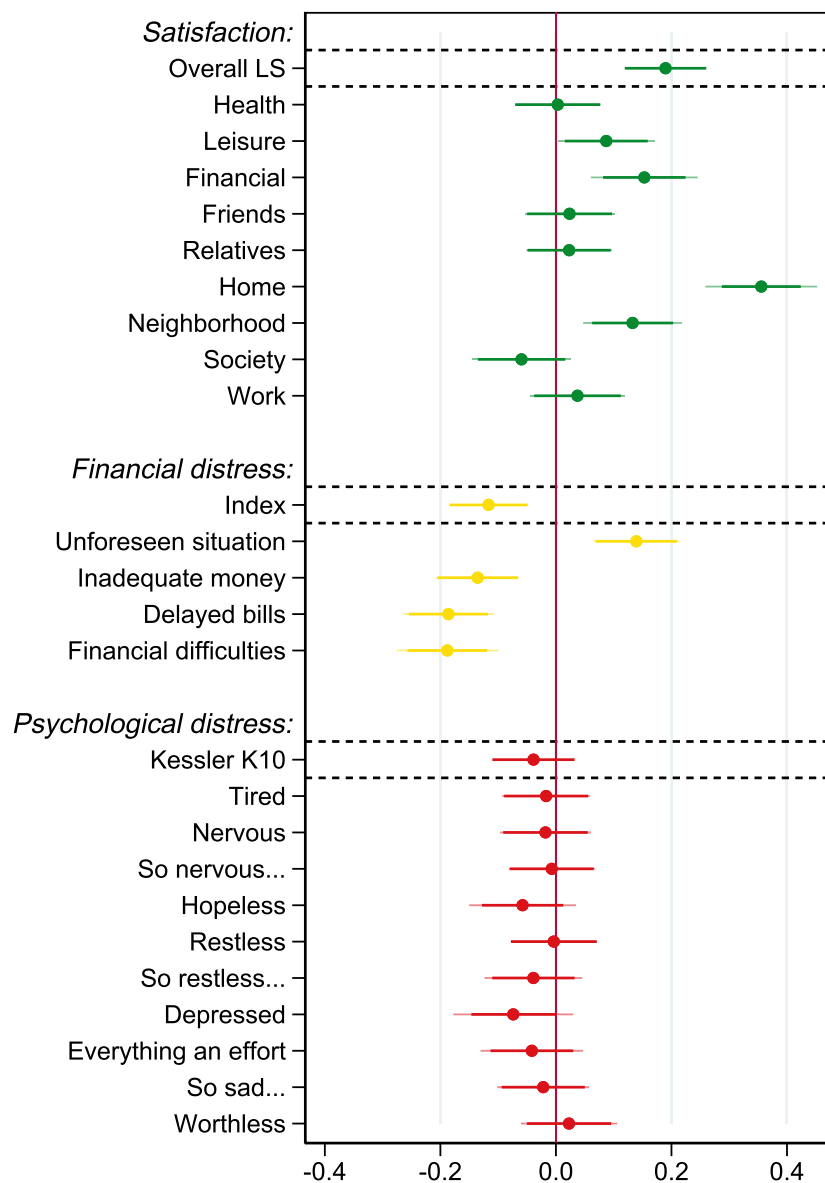


Fig. 3. Effect on the main outcomes and subindices. *Note:* The figure depicts the estimated effects of winning on the main outcomes and the subindices. The bars denote 95 percent confidence intervals around the point estimates (the shorter thicker intervals are not adjusted for multiple hypothesis testing and the longer thinner intervals are adjusted using the Benjamini–Hochberg procedure). All estimations include the strata variables but no additional controls.

are less likely to have inadequate money for household expenses, to have delayed bills, and to have experienced financial difficulty. However, on one outcome the effect goes in the opposite direction. When asked about whether they would be able to raise a large amount of money (ETB 20,000) in a brief period of time if needed, seven percent more winners than losers reported that they would be unable to raise money. Although this may seem contradictory at first, it is consistent with the observation in Table 2 that winners have lower savings and more debt than losers. Indeed, most winners have already raised money by borrowing from friends and relatives, whereas losers are preparing to finance the down payment in case they win a lottery in the future.

Finally, in columns 5 and 6 and in the lower part of Fig. 3, we show the effect of winning on the K10 scale. The effect on the overall score is negative but small and not statistically significantly different from zero. The same applies to most of the individual items. We also note that the confidence intervals are relatively precise. Using an equivalence testing approach of two one-sided t-tests, and a five percent significance level, we can reject reductions in the K10 index equal to or greater than 0.1 standard deviations. Furthermore, when we compare the levels on the K10 scale for winners and losers while controlling for the strata variables, we see that losers score 15.46 on the full index in the range of 10–50 while the winners score 15.24. These results are shown in Appendix Table, where we

can also see that the coefficients for winning on mild, moderate, and severe mental distress are also negligible. We note that adding all controls does not change any of these findings, and in Appendix Section we show that this is also the case when adding optimal controls.

4.3. Robustness

Overall, we can see that winning the lottery resulted in large increases in wealth, reduced financial distress, and greater life satisfaction, but had no effect on psychological distress. These results are robust to different sets of control variables and alternative coding choices and the conclusions are similar if we conduct a bounds analysis accounting for selective nonresponse by winners (see Appendix Sections C, and, respectively).

We can also adjust our p-values for the fact that we are testing multiple hypotheses. We test two main hypotheses in this paper, but we also use these data to test for the effects on five different attitudes in a separate paper (Andersen et al., 2020).²² We prespecified an adjustment of the p-values for multiple testing using the false discovery rate method developed by Benjamini and Hochberg (1995). Despite the outcomes of the various analyses being quite different, we believe that it is prudent to adjust the p-values based on all tests with the same treatment and this is what we prespecified. With seven primary outcomes and a five percent significance level, our result with the lowest p-value should have a p-value lower than 0.007 (0.05/7). Our p-value for life satisfaction has a p-value lower than 0.001.

5. Discussion of mechanisms

In this section, we further test the plausible mechanisms through which winning the lottery affects well-being. Given the existing evidence on the strong correlations between housing conditions and measures of well-being (see e.g. Ludwig et al., 2012; Patel et al., 2006), we first investigate the extent to which access to better housing can explain the effects that we observe (Section 5.1). We find that access to better housing does not seem to play an important role in explaining the lottery's effects because the effects are very similar for movers and nonmovers.

Second, we do a mediation analysis to estimate the importance of wealth, financial distress, and moving to a new house in explaining the effects of winning the lottery (Section 5.2). The analysis suggests that increases in wealth explain 62 percent of the total effects on life satisfaction, while reductions in financial distress explain 21 percent of the total effects. We find no mediation effect of moving.

Last, we explore the heterogeneity of the lottery's effects along several dimensions, including initial levels of wealth (Section 5.3). The analysis of heterogeneous effects also confirms the importance of changes in wealth in explaining the lottery effects. In particular, we find that winning the lottery has a strong effect on life satisfaction among the "poor" participants but not among the "very poor" nor the "richer" participants.²³

5.1. Movers and nonmovers

We mainly interpret the effects of winning the lottery in terms of a wealth effect. However, the observed effects on life satisfaction for the domains "home" and "neighborhood" suggest that moving to a better house may indeed drive part of the effect. To investigate this hypothesis further, Fig. 4 illustrates the treatment effect estimates for subgroups of winners: those who moved into their new apartment ("movers") and those who did not ("nonmovers").²⁴ Because moving is not random, and Table reveals that movers are less likely to be born in Addis Ababa and more likely to have a partner, we have included a version of this figure in the Appendix, where the full set or a subset of optimally chosen control variables are included in the regressions.

We can see that the effect of winning on overall satisfaction is almost the same for movers and nonmovers. We also observe similar effects on neighborhood satisfaction, while movers exhibit higher satisfaction with their home, and nonmovers — who generally rent out their units — have higher financial satisfaction. This result suggests that even though winners have different priorities and spend their economic resources in dissimilar ways, the effects on overall life satisfaction are the same. The fact that both groups of winners have higher satisfaction with their homes and neighborhoods could be a compositional effect driven by the least satisfied people moving, and becoming happier with their housing conditions, which would lead to the nonmoving group also having higher satisfaction with their homes than the losers.

With respect to financial and psychological distress, the effects for movers and nonmovers are even more similar. While being aware of the risk of self-selection bias, we believe these findings strengthen the interpretation that the effects of winning the lottery are driven primarily by the changes in wealth rather than by moving to better houses and neighborhoods.

²² This paper is part of a larger project focusing on different effects of the Ethiopian housing lottery. We document the effects of the lottery on views about inequality and on support for redistribution in Andersen et al. (2020).

²³ In Appendix Section, we also show the results of instrumental variable analyses where we use winning the lottery as an instrument for wealth or financial distress. The instrumental variable approach provides consistent evidence of substantial effects of wealth and financial distress. As the exclusion restriction is unlikely to hold in these analyses, i.e., as winning is likely to affect well-being in ways other than through wealth or financial distress, we emphasize that these results should be interpreted cautiously.

²⁴ "Movers" are all winners who actually moved into the apartment they won and "nonmovers" are all other winners, including those who chose to rent out the apartment they won.

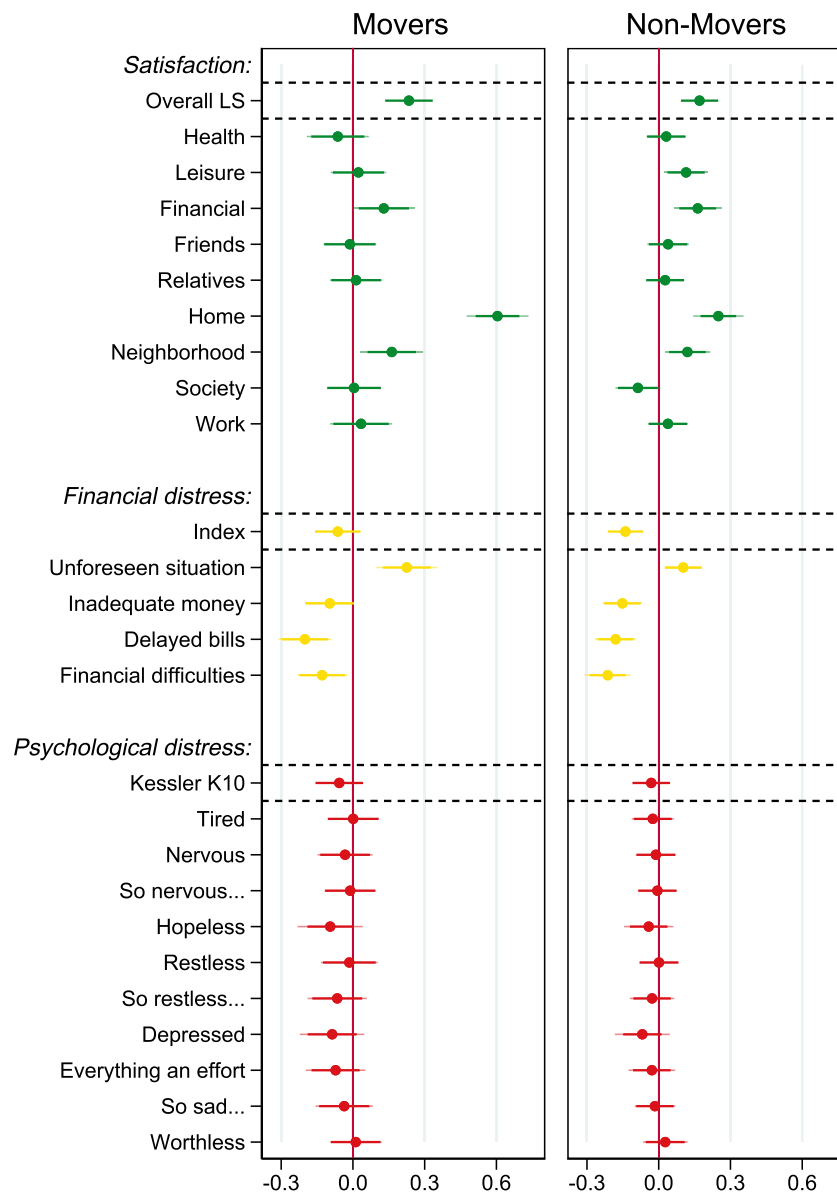


Fig. 4. Effect on the main outcomes and subindices by mover status. *Note:* The figure depicts the estimated effects of winning on the main outcomes and the subindices for movers and nonmovers, respectively. The bars denote 95 percent confidence intervals around the point estimates (the shorter thicker intervals are not adjusted for multiple hypothesis testing and the longer thinner intervals are adjusted using the Benjamini–Hochberg procedure). All estimations include the strata variables but include no additional controls.

5.2. Mediation analysis

To more directly test whether wealth and/or financial distress, as well as moving, are mediating the relationship between winning and well-being we conduct non preregistered mediation analyses. These analyses consist of estimating three sets of regressions: 1) the reduced form effect of winning on well-being; 2) the reduced form effect of winning on the mediator; and 3) the effect of winning on well-being while controlling for the mediator. Under the assumption that the error terms in 2 and 3 are uncorrelated (the *sequential ignorability assumption*) one can decompose the total effect in 1) into the direct effects of winning and the average causal mediation effect (ACME) (Imai et al., 2011). However, the sequential ignorability assumption is strong and not directly testable. The assumption implies that there should be no unobservable variable that affects both well-being and the mediators. For example, the assumption is violated in the analysis of wealth as a mediator if family background (which is not included in our model) affects both wealth and well-being. Hence, the results from the mediation analysis should be seen as suggestive and more descriptive than the reduced form results.

Table 5
Mediation analysis.

A. Wealth as mediator (N = 1533):			
Effect	Mean	[95% Conf. Interval]	
ACME	0.087	[0.013	0.163]
Direct Effect	0.053	[-0.080	0.193]
Total Effect	0.141	[0.026	0.258]
% of Total Effect mediated	0.618	[0.337	2.780]
B. Financial distress as mediator (N = 3049):			
Effect	Mean	[95% Conf. Interval]	
ACME	0.040	[0.016	0.064]
Direct Effect	0.149	[0.084	0.218]
Total Effect	0.189	[0.119	0.260]
% of Total Effect mediated	0.214	[0.155	0.338]
C. Moving as mediator (N = 3049):			
Effect	Mean	[95% Conf. Interval]	
ACME	0.019	[-0.013	0.050]
Direct Effect	0.171	[0.095	0.251]
Total Effect	0.190	[0.118	0.262]
% of Total Effect mediated	0.099	[0.071	0.158]

Note: The table shows the results of a mediation analysis where the total effect is divided into a direct effect and an ACME. The table also shows the percent of the total effect that is mediated by the mediator. All regressions control for the strata fixed effects. The dependent variable is overall life satisfaction standardized using the mean and standard deviation of the loser group.

We start with investigating how the effects of the lottery on satisfaction are mediated by wealth. In the sample with nonmissing wealth, the reduced form effect of winning is equal to 0.14. The average effect of winning the lottery on the outcome that operates through wealth is 0.09 (ACME). The estimate of the direct effect of winning the lottery is 0.05. These results are displayed in Table 5, panel A. The direct effect is not statistically significant and the share of the total effect that is mediated by wealth is high, at 62 percent. When we add the vector of baseline controls (Appendix Table), the direct effect estimate is even lower and the share of the total effect that is mediated by wealth rises to 73 percent.

Using financial distress as a mediator yields an ACME of 0.04 (Table, panel B). The direct effect is now statistically significant and the share of the effect that is mediated by financial distress is 21 percent. This share falls to 18 percent when we add the vector of control variables (Appendix Table).

In panel C, we use moving as a mediator. There is no statistically significant mediation effect. Hence, moving does not appear to be a mediator for the effect of winning on satisfaction. We do not report the tables for psychological distress as there is no average effect of winning that can be meaningfully decomposed.

5.3. Heterogeneous effects

Our findings have shown that winning the lottery improves overall life satisfaction, but that the effects on psychological well-being are less clear. A natural question to ask is whether these overall effects are driven (or concealed) by differential effects for different groups of winners. In this section, we test for heterogeneous treatment effects across pre-lottery earnings and the strata variables.²⁵ First, we split the sample by the median of earnings in 2015 (before the lottery). We create a dummy variable equal to 1 for the richest 50 percent and zero otherwise, and interact this dummy with winning. As seen in Table 6, richer people have significantly higher life satisfaction and lower psychological distress on average (columns 1 and 4). Winning the lottery increases overall life satisfaction by 0.218 standard deviations among below-median earners (the reference group). This roughly corresponds to the difference in satisfaction between above- and below-median earners (0.233). The sign of the interaction terms suggests the effect of winning is smaller among above-median earners, but it is not statistically significant. Indeed, we can reject that the effect is zero even for this group ($p = 0.049$). We observe no significant effects on psychological distress for either group.

To explore heterogeneity across more detailed earning categories we split the sample by earnings quartiles. We let the richest 25 percent be the baseline category and we interact the other categories with winning. We see several interesting patterns in columns 2 and 5. The effect of winning on satisfaction for the richest people is small (0.039) and not statistically significant. The quartile dummies indicate that the richest were more satisfied and less distressed than the lower quartiles, leaving less scope for improvements in this group. Interestingly, we find that winning increases satisfaction and lowers distress among the poor (quartile 2), but not the poorest (quartile 1). A plausible interpretation is that the poorest winners face additional liquidity constraints due to the down payment.

We also explore heterogeneity by interacting winning with our different strata variables (columns 3 and 6). Interestingly, we find that winning the lottery has particularly beneficial effects among disabled people, who otherwise exhibit much lower life satisfaction

²⁵ We also further explored heterogeneity using the “generic machine learning approach” in Chernozhukov et al. (2018). This method includes an omnibus test of heterogeneity in the treatment effects, and we cannot reject the null hypothesis that there is no heterogeneity overall.

Table 6
Heterogeneous treatment effects.

	Overall life satisfaction			Psychological distress		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.218*** (0.053)	0.039 (0.067)	0.051 (0.089)	-0.063 (0.059)	0.054 (0.060)	-0.065 (0.084)
Winner × Above median	-0.113 (0.074)			0.070 (0.075)		
Above median	0.233*** (0.055)			-0.162*** (0.054)		
Winner × Quartile 1		0.017 (0.101)			-0.019 (0.109)	
Winner × Quartile 2		0.318*** (0.099)			-0.191** (0.097)	
Winner × Quartile 3		0.145 (0.105)			-0.104 (0.092)	
Quartile 1		-0.367*** (0.076)			0.305*** (0.077)	
Quartile 2		-0.337*** (0.072)			0.157** (0.071)	
Quartile 3		-0.235*** (0.078)			0.120* (0.067)	
Winner × Female			0.057 (0.070)			-0.047 (0.072)
Winner × Public			0.034 (0.084)			-0.061 (0.085)
Winner × Disabled			1.226*** (0.253)			-0.906** (0.455)
Winner × One bedroom			0.124 (0.094)			0.082 (0.095)
Winner × Two bedroom			0.029 (0.104)			0.114 (0.103)
Female	-0.113*** (0.043)	-0.083* (0.043)	-0.131** (0.056)	0.152*** (0.042)	0.117*** (0.043)	0.128** (0.057)
Public	0.054 (0.043)	0.034 (0.043)	0.019 (0.068)	-0.167*** (0.042)	-0.148*** (0.042)	-0.095 (0.069)
Disabled	-0.312*** (0.099)	-0.279*** (0.098)	-1.431*** (0.233)	0.482*** (0.140)	0.450*** (0.139)	1.306*** (0.432)
One bedroom	0.225*** (0.048)	0.227*** (0.048)	0.188*** (0.068)	-0.062 (0.050)	-0.064 (0.049)	-0.117* (0.069)
Two bedroom	0.283*** (0.056)	0.275*** (0.056)	0.301*** (0.077)	-0.177*** (0.056)	-0.177*** (0.057)	-0.246*** (0.076)
Strata	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	3049	3049	3049	3049	3049	3049

Note: The table details OLS estimates for the effect of winning the lottery for different groups. Robust standard errors are in parentheses. P-values are $\leq 0.01^{***}$, $\leq 0.05^{**}$, and $\leq 0.1^*$. All regressions control for the strata fixed effects. The dependent variable is standardized using the mean and standard deviation of the loser group.

(by 1.47 standard deviations) and higher levels of psychological distress (by 1.29 standard deviations) than the general population. In this group, winning increases life satisfaction by 1.29 standard deviations and reduces psychological distress by 0.92 standard deviations ($p = 0.038$). We do not find any significant heterogeneity for the other strata variables.²⁶

6. Conclusion

The question of the extent to which material conditions affect well-being has a long history in the social sciences. On the one hand, economic resources can be used to obtain desired goods and services. It would seem obvious that they should increase well-being. On the other hand, not everything of value in life can be bought and humans have a remarkable ability to adapt to their material circumstances. Adding to the lack of clear theoretical predictions is that it is not straightforward whether material conditions affect well-being, whether well-being affects material conditions, or whether there is some third factor affecting both.

²⁶ In the pre-analysis plan, we also stated that we would use the variation in housing prices across areas to assess whether our results depend on the size of the wealth shock. However, this analysis has proven infeasible because 95 percent of the winners were assigned to only two areas, for which the estimated housing prices are almost identical. With such limited variation, using the dispersal across areas is not possible.

Moreover, there is currently much attention drawn to the prevalence of CMDs in low- and middle-income countries, which was ignored for a long time by the scientific community. There is growing, but still limited, evidence on the effects that poverty has on mental health in such contexts.

We identify the causal effects of winning a housing lottery in Ethiopia on different well-being dimensions. We first report the important effects that winning has on wealth. We then show that winning increases life satisfaction but does not affect psychological distress on average. Our estimates are very precise, and we can reject very small effects (0.1 standard deviations) on psychological distress. When we investigate subindices of life satisfaction, we see that the effects are driven by greater satisfaction with housing, neighborhood, and personal finances. We also find marked reductions in financial distress.

Winning the lottery has effects other than increasing wealth; it particularly also affects housing conditions and neighborhood characteristics. Given that only 30 percent of the lottery winners actually moved into their new property, and that we find similar results for both movers and nonmovers, we believe that the effects we identify on life satisfaction are due to a wealth effect. A mediation analysis indicates that most of the effect occurs via wealth, less of the effect occurs via financial distress. On the other hand, we cannot reject that moving does not explain the effects of winning.

Earlier studies that identified the effects of changes in material conditions mainly focus on rich countries (e.g. Apouey and Clark, 2015; Gardner and Oswald, 2007; Lachowska, 2017; Lindqvist et al., 2020; Schwandt, 2018) and generally find that material resources increase happiness and life satisfaction. In Sweden, Lindqvist et al. (2020) also find that winning a lottery does not improve mental health. The absence of effects on mental health in Sweden could be explained by the country's comprehensive welfare system, which guarantees economic security and high-quality health care to its citizens (Ridley et al., 2020). From this perspective, it is remarkable that we find qualitatively the same results in a context where there is no welfare state or economic security. Our evidence may hint at the presence of different factors determining mental health and life satisfaction, as also suggested in the literature (Kahneman and Deaton, 2010; Weich et al., 2011). In particular, life satisfaction has lower heritability; as such, it is more influenced by environmental factors than many other well-being dimensions (Bartels, 2015; Røysamb and Nes, 2018; Røysamb et al., 2018). The differences in these results may also be explained by winning "only" affecting material aspects of life satisfaction, as shown in analyses of subindices, while not affecting more intangible aspects of life satisfaction and psychological distress.

However, other studies from low-income countries have identified the positive effects of economic resources on mental health and well-being. These studies typically investigate the effects of cash transfers or antipoverty programs on the extremely poor (McGuire et al., 2020; Ridley et al., 2020; Zimmerman et al., 2021, for recent reviews, see). One important difference in our case is that the previously studied interventions are targeting very poor individuals. We also note that McGuire et al. (2020) document generally smaller effects on mental health than on life satisfaction. While our respondents are certainly not rich, they are neither among the poorest Ethiopians. In addition, we find that poor individuals, but not the poorest, experience the most positive effects of winning in our setting. This may hint at specific factors of our lottery being important for the results, such as winners having increased debt and more difficulty in borrowing (more) money in the case of an emergency. It is possible that the results on psychological distress would be larger if winning the lottery did not entail any down payment.

Policymakers may find our results useful. The fact that the benefits from the housing lottery seem to come from increases in (real estate) wealth, rather than from moving to a new house, is particularly relevant for social housing programs and formalization of property rights for example, two policies that have become increasingly important in low-income countries. Importantly, the lack of a general reduction in psychological distress, despite that large increase in wealth, in a population with a high prevalence of mild to severe mental disorders is worrying and calls for testing alternative policies to improve mental health in this context. We trust that future studies continue to investigate the effects of material conditions on mental health and well-being for different types of populations and different types of interventions so that we can reach a better understanding of this important relationship.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.jhealeco.2022.102619](https://doi.org/10.1016/j.jhealeco.2022.102619).

CRediT authorship contribution statement

Asbjørn G. Andersen: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Andreas Kotsadam:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Funding acquisition. **Vincent Somville:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Funding acquisition.

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