Your Gain Is My Pain: Negative Psychological Externalities of Cash Transfers*

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Abstract

We use a randomized controlled trial of unconditional cash transfers in Kenya to study the effects of exogenous changes in the wealth of neighbors on psychological wellbeing, consumption, and assets. We find that increases in neighbors' wealth strongly decrease life satisfaction and moderately decrease consumption and asset holdings. The decrease in life satisfaction induced by transfers to neighbors more than offsets the direct positive effect of transfers, and is largest for individuals who did not receive a direct transfer themselves. We find evidence of hedonic adaptation, in that the negative spillover effect of transfers to neighbors decreases over time, at a rate similar to that of direct transfers.

JEL Codes: C93, I14, I31, O12

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1 Introduction

The idea that relative income affects consumption and welfare has a long tradition in economics.[1] Thorstein Veblen famously argued that increases in neighbors' consumption could lead to increases in own consumption (Veblen 1899). Similarly, Duesenberry (1949) argues that individual utility is negatively affected by the income and consumption of others; this claim is known as the *Relative Income Hypothesis*. This paper presents an empirical test of this latter hypothesis.

Empirically, it has been difficult to document a negative effect of the income of others on own wellbeing, and in particular, to establish causality. Even in the correlational domain, the evidence is contradictory: the early work of Easterlin suggested that the correlation between income and happiness was high within countries, but low across countries (Easterlin 1974; Easterlin 1995; Easterlin 2001), raising the possibility that relative considerations, with compatriots as the reference group, matter for happiness. However, apart from the fact that the correlational nature of the data limits the interpretability of this analysis, recent work by Stevenson & Wolfers has demonstrated that a correlation exists even across countries (Stevenson and Wolfers 2008; Sacks, Stevenson, and Wolfers 2012). Others have reported similar findings using panel data from Europe (Ferrer-i Carbonell 2005; Veenhoven 1984; Stadt, Kapteyn, and Geer 1985; Senik 2004; Clark and Oswald 1996), the US . Other observational studies on the relationship between income and self-reported wellbeing are similarly inconclusive. Using US panel data, Blanchflower and Oswald (2004) find a negative but insignificant effect of per capita state income on happiness. McBride (2001) also finds weak evidence of a relative income effect on self-reported happiness. Tomes (1986) find conflicting results using Canadian data on income and self-reported wellbeing, with negative effects of relative income on wellbeing on some scales but not others, and different effects for men and women. Luttmer (2005), using data from the National Survey of Families and Households (NSFH), shows that earnings increases of neighbors negatively affect individuals' self-reported happiness. To deal with bias from local omitted variables, Luttmer uses predicted local earnings based on the local industry x occupation composition and national industry x occupation earnings trends. This leaves open the possibility that unobserved local characteristics such as housing prices drive the results; Luttmer controls for housing prices, but one might expect other local-level unobserved variables to be unaccounted for. For instance, it might be the case that neighbors to which the focal individual compares herself are less pro-social the richer they are, and that this factor affects happiness of the focal individual. In addition, one might worry about reverse causality, i.e. happiness might drive earnings, rather than vice versa (Oswald, Proto, and Sgroi 2009).

Thus, the results of the correlational literature are inconclusive[2]. The ideal experiment to establish

[1] Apart from its intrinsic interest, relative utility is important because it has implications for optimal taxation(Layard 1980; Oswald 1983; Boskin and Sheshinski 1978; Seidman 1987; Ireland 1998; Lindeman et al. 2000; Ljungqvist and Uhlig 2000), public spending (Ng 1987), and asset pricing (Abel 1990). For theoretical formulations of utility functions that incorporate social considerations, see Becker (1974), Charness and Rabin (2002), Fehr and Schmidt (1999).

[2] The evidence for the effect of relative income on consumption is generally better than for that on wellbeing;

causality would be one in which a subset of individuals in different localities receive transfers such that there is variation in the average transfer across localities. Kuhn et al. (2011) come close to this ideal by capitalizing on the fact that in the Dutch postcode lottery, all participating households in a winning postcode receive a payment. Combining data on the winning postcodes with household-level survey data, they study the effect of lottery winnings on consumption and wellbeing of lottery participants and non-participants. They find no effect of neighbors' lottery winnings on happiness, and some increase in conspicuous consumption (car ownership, renovations, donating the survey compensation to charity). However, even in this study, selection into treatment is endogenous.

We report here on a randomized controlled trial in Kenya in which poor rural households received unconditional cash transfers. The experiment contained two crucial elements, which together allow us to study the effect of changes in relative income on psychological and economic outcomes. First, we survey not only recipient households, but also non-recipients. Second, the experiment induced random variation in treatment intensity at the village level, such that we can compare outcomes of individuals (both recipients and non-recipients) in villages where the average transfer was large vs. small. Together, this design allows us to obtain a rigorous answer to the question whether relative income affects wellbeing and economic outcomes.

We find large effects of relative income on psychological wellbeing. Specifically, a USD 100 increase in village mean wealth causes a 0.09 standard deviation decrease in life satisfaction, significant at the 5 percent level. The magnitude of this effect is noteworthy, as this is more than four times the magnitude of the effect of a change in own wealth by the same amount. We also find small decreases in consumption and asset holdings as village mean wealth increases.

The paper makes three further contributions. First, we take care to distinguish different facets of psychological wellbeing. In particular, psychologists have long distinguished between affective and cognitive components of psychological wellbeing (Diener 2000; Veenhoven 1984), with the former referring to experiences of positive vs. negative affect, such as happiness or sadness, and the latter referring to overall evaluations of one's life. The justification for this distinction is mainly theoretical, although in factor analysis of survey questions on subjective wellbeing, negative affect, positive affect, and life evaluation emerge as distinct factors (Beiser 1974); in addition, measures of affective vs. cognitive wellbeing have different correlates (e.g. income vs. health, respectively; Kahneman and Deaton 2010). We find relative income effects on life satisfaction, but not on happiness or other psychological variables, suggesting that relative income affects the cognitive, but not the affective component of psychological wellbeing.

Second, our design alllows us to study the effect of exogenous changes in village-level inequality on psychological wellbeing. Inequality has recently received increased attention from economists (Piketty and Ganser 2014; Piketty and Saez 2003), and correlational evidence shows that it is negatively related to happiness. For instance, Alesina, Di Tella, and MacCulloch (2004) report a

for instance, Angelucci and De Giorgi (2009) use a randomized experiment of a cash transfer program to show that transfers increase the consumption of ineligible households; Roth (2015) finds similar results for conspicuous consumption.

negative correlation between income inequality and happiness in Europe and the United States; Wu and Li (2013) find a negative correlation between local income inequality and life satisfaction in China; and Oishi, Kesebir, and Diener (2011) reports a similar finding for happiness in the US. Our design allows us to study the question causally, because due to variation in the mean relative position of transfer recipients across villages, we induced random variation in changes in village-level inequality. We find no effect of changes in village-level inequality on psychological wellbeing or economic outcomes, suggesting that the degree to which inequality affects wellbeing *above and beyond own income and relative income* may be limited.

Finally, our design also allows us to study the temporal evolution of the effect of changes in relative income on wellbeing. We find evidence for hedonic adaptation, in that the effect of recent changes in neighbors' wealth on wellbeing is much larger than that of less recent changes. The rate of decline over time of the relative income effect is similar to that for direct transfers.

The remainder of the paper is structured as follows. Section 2 describes the experimental design and the econometric approach; Section 3 presents the results; and Section 4 concludes.

2 Design and Econometric Approach

2.1 Experimental design

The data used in this study derives from a randomized controlled trial conducted in collaboration with *GiveDirectly, Inc.* (GD; www.givedirectly.org), a not-for-profit organization which makes unconditional cash transfers to poor households in Kenya and Uganda. In this section, we discuss the details of GiveDirectly's protocol for making cash transfers, design of the experiment, and data collection methods. Further details on study design can be found in the paper reporting the main treatment effects of the program (Haushofer and Shapiro 2013). The analyses described below were pre-specified in a Pre-Analysis Plan (PAP) written and published before analysis began (https://www.socialscienceregistry.org/trials/17); deviations from the analysis plan are indicated below.

2.1.1 The *GiveDirectly* Unconditional Cash Transfer Program

GiveDirectly is an international NGO founded in 2010, whose mission is to make unconditional cash transfers to poor households in developing countries.[3] *GD* began operations in Kenya in 2011 (Goldstein 2013). *GD* selects poor households by first identifying poor regions of Kenya according to census data. In the case of the present study, the region chosen was Rarieda, a peninsula in Lake Victoria west of Kisumu in Western Kenya. Following the choice of a region in which to operate,

[3] We note that Jeremy Shapiro, an author of this study, is a co-founder and former Director of *GiveDirectly* (2009-2012).

GD identifies target villages. In the case of Rarieda, this was achieved through an estimation of the population of villages and the proportion of households lacking a metal roof, which is *GD*'s targeting criterion. The criterion was established by *GD* in prior work as an objective and highly predictive indicator of poverty. Villages with a high proportion of households living in thatched roof homes (rather than metal) were prioritized.

Within each village, a subset of households were randomly chosen to receive a transfer. Each selected household was then visited by a representative of *GD*. The *GD* representative asked to speak to the member of the household that had been chosen as the transfer recipient *ex ante* (for the purposes of the present study, the recipient was randomly chosen to be either the husband or the wife, with equal probability). A conversation in private was then requested from this household member, in which they were asked a few questions about demographics, and informed that they had been chosen to receive a cash transfer of KES 25,200 (USD 404). The recipient was informed that this transfer came without strings attached, that they were free to spend it however they chose, and that the transfer was a one-time transfer and would not be repeated. The control group were told that they would not receive any transfers, even in the future.

Recipients were also informed about the timing of this transfer; for the purposes of the present study, 50 percent of recipients were told that they would receive the transfer as one lump-sum payment, and the remaining 50 percent were told that they would receive the transfer as a stream of nine monthly installments. The timing of the transfer delivery was also announced. In the case of monthly transfers, the first installment was transferred on the first of the month following the initial visit, and continued for eight months thereafter. In the case of lump-sum transfers, a month was randomly chosen among the nine months following the date of the initial visit.

For receipt of the transfer, recipients were provided with a SIM card by Kenya's largest mobile service provider, *Safaricom*, and asked to activate it and register for *Safaricom's* mobile money service *M-Pesa* (Jack and Suri 2014). *M-Pesa* is, in essence, a bank account on the SIM card, protected by a four-digit PIN code, and enables the holder to send and receive money to and from other *M-Pesa* clients. Prior to receiving any transfer, recipients were required to register for *M-Pesa*. For lump sum recipients, a small initial transfer of KES 1,200 was sent on the first of the month following the initial *GD* visit as an incentive to prompt registration. Registration had to occur in the name of the designated transfer recipient, rather than any other person. The *M-Pesa* system allows *GD* to observe the name in which the account is registered in advance of the transfer, and transfers were not sent unless the registered name had been confirmed to match the intended recipient within the household. In our sample, all but 18 treatment households complied with these instructions. To avoid biasing our treatment effect estimates, we use a conservative intent-to-treat approach and include data from these 18 non-compliant households in the treatment group.[4] Transfers commenced on the first of the month following registration. Each transfer was announced with a text message to the recipient's SIM delivered through the *M-Pesa* system. However, receipt of

[4] In a few additional cases, delays in registration occurred due to delays in obtaining an official identification card, which is a prerequisite for registering with *M-Pesa*.

these text messages was not necessary to ensure the receipt of transfers; recipients who did not own cell phones could rely on the information about the transfer schedule given to them by *GD* to know when they would receive transfers, or insert the SIM card into any mobile handset periodically to check for incoming transfers. To facilitate easier communication with recipients and reliable transfer delivery, *GD* offered to sell cell phones to recipient households which did not own one (by reducing the future transfer by the cost of the phone).

Withdrawals and deposits can be made at any *M-Pesa* agent, of which *Safaricom* operated about 11,000 throughout Kenya at the time of the study. Typically an *M-Pesa* agent is a shopkeeper in the recipient's village or the nearest town (other types of businesses that operate as *M-Pesa* agents are petrol stations, supermarkets, courier companies, "cyber" cafes, retail outlets, and banks). *GD* estimates the average travel time and cost from recipient households to the nearest *M-Pesa* agent at 42 minutes and USD 0.64. Withdrawals incur costs between 27 percent for USD 2 withdrawals and 0.06 percent for USD 800 withdrawals, with a gradual decrease of the percentage for intermediate amounts. *GD* reports that recipients typically withdraw the entire balance of the transfer upon receipt.

2.1.2 Sample selection

The study was a two-level cluster-randomized controlled trial. In collaboration with *GD*, we identified 120 villages from a list of villages in Rarieda district of Western Kenya. In the first stage of randomization, 60 of these villages were randomly chosen to be treatment villages. Within all villages, we conducted a census with the support of the village elder, which identified all eligible households within the village. As described above, eligibility was based on living in a house with a thatched roof. Control villages were only surveyed at endline; in these villages, we sampled 432 households from among eligible households. We refer to these households as "pure control" households.

In treatment villages, we performed a second stage of randomization, in which we randomly assigned 50 percent of the eligible households in each treatment village to the treatment condition, and 50 percent to the control condition. This process resulted in 503 treatment households and 505 control households in treatment villages at baseline. We refer to the control households in treatment villages as "spillover" households.

As described above, due primarily to registration issues with *M-Pesa,* 18 treatment households had not received transfers at the time of the endline; thus, only 485 of the treatment households had in fact received transfers. As described above, in the analysis we use an intent-to-treat approach to account for this fact.

Because the fact that the "pure control households" were only surveyed at endline generates potential bias from survey effects, in the following analysis we focus on the within-village randomization, i.e. we restrict the sample to the treatment and spillover households. See Haushofer and Shapiro (2013) for a discussion of results that include the pure control group.

2.1.3 Treatment arms

Within the treatment group, three additional cross randomizations occurred: we randomized the gender of the transfer recipient; the temporal structure of the transfers (monthly vs. lump-sum transfers); and the magnitude of the transfer. In the present paper, we do not distinguish between these transfer arms; details are available in Haushofer and Shapiro (2013).

2.1.4 Data collection

In treatment villages, on which we focus in the present paper, we surveyed treatment and control households both at baseline and endline. In each surveyed household, we collected two distinct modules: a household module, which collected information about assets, consumption, income, food security, health, and education, administered to either the primary male or female member of the household; and an individual module, which collected information about psychological wellbeing, intrahousehold bargaining and domestic violence, and preferences. Additionally, we measured the height, weight, and upper-arm circumference of the children under five years who lived in the household. The two surveys were administered on different (usually subsequent) days. The household survey was administered to any household member who could give information about the outcomes in question for the entire household; this was usually one of the primary members. The individual survey was administered to both primary members of the household, i.e. husband and wife, for double-headed households; and to the single household head otherwise. During individual surveys, particular care was taken to ensure privacy; respondents were interviewed by themselves without the interference of other household members, in particular the spouse. All questionnaires are available at http://www.princeton.edu/∼joha/.

In addition to questionnaire measures of psychological wellbeing, we also obtained saliva samples from all respondents, which were assayed for the stress hormone cortisol. We obtained two saliva samples from each respondent, at the beginning and at the end of the individual survey, using the *Salivette* sampling device (*Sarstedt, Germany*). The salivette has been used extensively in psychological and medical research (Kirschbaum and Hellhammer 1989), and more recently in developing countries in our own work and that of others (Chemin et al. 2013; **?**). It consists of a plastic tube containing a cotton swab, on which the respondent chews lightly for two minutes to fill it with saliva. Due to the non-invasive nature of this technique, we encountered no apprehension among respondents. The saliva samples were labeled with barcodes and stored in a freezer at $-20\,\deg$ C, and were later centrifuged and assayed for salivary free cortisol using a standard radio-immunoassay (RIA) on the *cobas e411* platform at *Lancet Labs*, Nairobi.

2.2 Outcome measures

Our main outcomes of interest are measures of psychological wellbeing. These measures include four subjective measures: the "happiness" and "life satisfaction" questions from the World Values

Survey; the total score on the Center for Epidemiologic Studies Depression scale (CESD) (Radloff 1977); and total score on the Perceived Stress Scale (PSS)(Cohen, Kamarck, and Mermelstein 1983). Each of these outcome variables is standardized by subtracting the control group baseline mean and dividing by the baseline control group standard deviation[5]. We also analyze log levels of salivary cortisol, measured and transformed using the method described in Haushofer and Shapiro (2013). As outlined in our pre-analysis plan, we construct two index variables from the above measures, one including and one excluding cortisol levels, following the method outlined in Anderson (2008) (for details see Appendix A.7). However, because the results were similar between both, we only report the index including cortisol in the main tables.

Finally, we analyze several economic outcomes: self-reported household consumption, self-reported household assets, and measures of wage labor and enterprise activities. Each of these variables is collected as described in Haushofer and Shapiro (2013).

2.3 Absolute wealth, relative wealth, and inequality: sources of variation and measures

2.3.1 Absolute wealth

To isolate exogenous variation in absolute wealth, we use the total amount of the transfer received by each household. Since households were assigned to a control condition or to receive small or large transfers, this variable takes a value of USD 0, USD 404, or USD 1525. Approximately 50 percent of households in the sample received USD 0, 36 percent received a USD 404 transfer, and 14 percent received USD 1525. We report all effect sizes per USD 100 of transfer to the household. Thus, when both the primary male and primary female were surveyed, we consider both of them transfer recipients, even though only one was designated as the primary recipient of the transfer.[6]

2.3.2 Relative wealth

To isolate exogenous variation in relative wealth by village, we use variation in the treatment intensity across villages. The variation in this measure stems from two sources: first, the proportion of treated households varied around the targeted 50 percent across villages, leading to differences in the average transfer amount across villages. While the original intent of the program was to treat exactly 50 percent of eligible households in each village, some variation still exists. This is largely due to the fact that in many villages only a small number of households were eligible, and often the number of eligible households was odd, precluding a clean split. Thus the proportion of eligible households receiving a transfer ranges from 40 percent to 75 percent.

[5]Note that we standardize by the baseline instead of the endline because there is no clear control group in the treatment villages at endline

[6]In Haushofer and Shapiro (2013), we find few differences in expenditure when transfers go to the primary male vs. the primary female; thus, the transfers are likely shared on average and it is reasonable to consider both household members recipients. However, note that such unitary outcomes are consistent with e.g. a dictator husband.

Second, the proportion of households receiving large (as opposed to small) transfers varied randomly across villages. After being selected to receive a transfer, 137 households were then randomly designated to receive a large transfer, without enforcing an equal split by village. Table A.1.4 in the Appendix details the proportion of treated households in each village receiving large transfers. The mean across villages was 27 percent, ranging from 0 percent to 57 percent.

As indicated in our pre-analysis plan, our primary specification analyzes the mean treatment amount disbursed to eligible (thatched roof) households at the village level. We calculate this value as

$$\triangle\bar{T}_v = \frac{\sum_{i=1}^{H} \triangle T_{hv}}{H}$$

where $\triangle T_{hv}$ is the assigned transfer amount for household h in village v, and H is the total number of eligible households in the village (assigned to either treatment or control conditions.) We divide levels by 100 so that all results are per USD 100 increase in village mean wealth. Note that we calculate levels based on an intent-to-treat approach, so that all *intended* transfers are included in this measure, whether or not they were actually delivered.[7]

As a result of the two sources of variation described above, the change in village mean wealth varied significantly across villages, depicted in Figure 1. Using the first method described above, village mean wealth increased by an average of USD 357 relative to a baseline mean of USD 379 (i.e. a 94 percent increase on average), with the increase ranging from 37 percent to 218 percent.

To ensure robustness, we confirm the results using a number of alternate measures. First, in the above measure, transfers to the focal household are included in calculating the village mean wealth change for that household. In the Appendix, we also report results for a version of this measure excluding a household's own wealth change.

Second, since only thatched-roof households were included in the study, the above measure leaves out a significant proportion of the population of each village. We have no information about the wealth of non-surveyed households; however, we know their number. We therefore also calculate the same average using an estimate of the total population of the village in the denominator. Given this is a much larger population, increases in mean wealth range from USD 1 to USD 101. We have no *prima facie* reason to believe the reference group for economic comparisons for individuals in the study is more likely to be the entire population of the village than just the thatched-roof subset, and thus no reason to prefer one measure over the other, but reporting both ensures robustness. However, note that the total village figures are provided by village elders at the time of the baseline survey and therefore may not be exact.

Third, we calculate an estimated measure of the change in village mean wealth by exploiting only the variation across villages that is due to differences in the proportion of treated households receiving large transfers. As pointed out above, in theory the cash transfer program was designed to treat

[7] As mentioned above, 18 treatment households did not receive transfers because they failed to sign up for *M-Pesa* in time.

exactly half of eligible households in each village. Thus, if execution had been perfect, all variation between villages would stem from differences in the proportion of large transfers, which was chosen at random across all treatment households. However, in practice, the proportion of eligible households treated varied from 40 percent to 75 percent, explaining a significant part of the difference in average transfer amount across villages. The main specification outlined above uses both sources of variation, while the robustness check isolates the variation from the propostion of households in the village receiving large transfers. The motivation to include this robustness check is that large transfers are likely to have been more visible (or at least more difficult to conceal) than small transfers. As an example, note the large increase in metal roof ownership among households receiving large compared to small transfers observed by Haushofer and Shapiro (2013). This variation may thus have a stronger impact on our outcome measures than the variation induced by differences in the proportion of treatment households across villages. To preserve the same unit of measurement as above, we estimate the mean change in village wealth based only on the variation from large vs. small transfers as

$$\triangle\hat{\hat{T}}_v = \frac{1}{2}\left[\gamma_v \cdot 1525 + (1-\gamma_v)\cdot 404\right]$$

where γ_v is the proportion of households within village v assigned to the large transfer condition (USD 1525), and $1-\gamma_v$ is proportion of households within village v assigned to the small transfer condition (USD 404). This method enforces proportions of exactly 50 percent of eligible households within each village in the treatment condition and 50 percent in control condition. Thus, all variation in village mean wealth will result from randomly induced differences across villages in the proportion of households assigned to receive large transfers.

2.3.3 Inequality

To isolate exogenous variation in the dispersion of wealth by village, we calculate the change in the village-level inequality level induced by the transfers. The variation in inequality arises from the fact that significant variation exists in the average baseline wealth (as measured by self-reported total assets) of households selected to receive a transfer by village. As shown in Figure A.1.3 in the Appendix, the village-level average of the asset holdings of treated households ranged from USD 136 to USD 1026 (mean USD 383). Due to random assignment of treatment among these households, in some villages the mean baseline wealth level of treated households is relatively low, while in others it is relatively high. If more of the relatively poor households in a village receive transfers, then inequality within the sample population is likely to decrease. Conversely, if the mean baseline wealth level of treated households in a village is relatively high, then inequality in the sample population is likely to increase.

Following our pre-analysis plan, we use two alternate measures of inequality. Our primary measure is the change Gini coefficient calculated using PPP adjusted total household nondurable assets for thatched roof households in each village. Following Sen (1997), we estimate Gini using the following formula:

$$G_{vt} = \frac{1}{H^2} \frac{\sum_{j=1}^{H} \sum_{i=1}^{H} |Y_{ivt} - Y_{jvt}|}{2\bar{Y}_{vt}}$$

where G_{vt} is the Gini coefficient for village v before transfers ($t = B$) or after transfers ($t = B + \tau$). N is the total number of surveyed households in village v. Y_{ivt} and Y_{jvt} are total assets for household $i = 1...N,\ j = 1...N$ in village v before or after transfers. $\bar{Y}_{vt}$ is the village mean household assets of village v before or after transfers. Our primary measure of inequality is the change in village-level Gini calculated as $\triangle G_v = G_{vB} - G_{v(B+\tau)}$.

As a secondary measure of inequality to ensure robustness, we calculate the coefficient of variation for the village:

$$C_{vt} = \frac{1}{H} \frac{\sqrt{\sum_{i=1}^{H} \bar{Y}_{vt} - Y_{ivt}}}{\bar{Y}_{vt}}$$

where C_{vt} is the coefficient of variation for village v before transfers ($t = B$) or after transfers ($t = B + \tau$). H is the total number of surveyed households in village v. Y_{it} and Y_{jt} are total assets for household $i = 1...H,\ j = 1...H$ in village v before or after transfers. $\bar{Y}_{vt}$ is the village mean household assets of village v before or after transfers. We compute the change in the village-level coefficient of variation as $\triangle C_v = C_{vB} - C_{v(B+\tau)}$.

The variability in the baseline wealth of treated households is reflected in the range of changes observed in village level Gini coefficients shown in Figure 1. The average baseline Gini coefficient was 0.43, and the average absolute magnitude of the change in Gini was 0.075, ranging from a decrease of 0.17 to an increase of 0.21 (note that some villages may be outliers due to the relatively small number of households included in the sample).

2.3.4 Temporal evolution of effects

We exploit variation in the timing of transfers to study the temporal evolution of the effect of transfers on psychological well-being. Individuals in both the monthly treatment arm and the large transfer treatment arm received their transfers over the course of several months. Additionally, the month in which treatment households assigned to the lump sum arm of the study was randomly selected from the 15 months of the study. This variation allows us to study the effect of the timing of the transfers both at the household and village level.

To examine difference in transfers at different points of the program, we consider the effect of transfers made in each month of the study. We calculate change in own wealth, village wealth and inequality from transfers occurring in overlapping subsets of the period: the 1 month before endline, the 2 months before endline, etc., up through the full 15 months before endline. We then the assess the impact of changes in each of these periods on our outcomes of interest. Note that each of these periods is subsumed by the next, so they are not independent measures. However, the findings reported below clearly indicate that the more recent transfers were more important for psychological well-being.

2.4 Robustness of measures

2.4.1 Representativeness of measures

One caveat about the measures described above is that they are not fully reflective of changes for the full village population, due to the fact that the sample was restricted to households with thatched roofs at baseline. In our evaluation of the impact of changes in relative wealth, this difference is unlikely to be material because change in the mean wealth calculated among eligible households is related monotonically to changes in mean wealth of the entire village. As discussed above, we can verify this relationship by calculating changes in the mean both for sample households and for the village as a whole to determine whether our results are robust to each of these measures.

The relationship between inequality measured across sample households and inequality measured across all households in a village is not as clear cut. Since households were selected to receive transfers precisely because they were relatively poorer than the rest of the village, we might expect the transfers to uniformly decrease the level of inequality in a village by bringing these poorer households closer to the level of wealth of the rest of the village. However, depending on the size of the village, even this approach can potentially increase inequality, e.g. if the richest eligible households are treated and very few households in the village are ineligible. To determine to what extent changes in inequality in the observed sample of the village reflect actual changes in inequality in the entire village, we report a number of simulations in Appendix A.2 exploring the relationship. Overall, we find (as we must mechanically) that the relationship between observed and unobserved inequality is positive and linear. Thus, while our measure of village-level change in inequality is likely inexact, it is still useful for comparing changes in inequality.

2.4.2 Correlation between measures

Although the random variation discussed in Section 2.3 should in theory allow us to generate measures of change in own wealth, mean wealth, and inequality that are orthogonal to one another, in reality there is likely to be some correlation between them. Appendix Table A.3.1 reports the correlation between our primary measures, showing that it is small but significant. The reason for this result lies in the relatively small number of sample households in each village, which implies that changes to own wealth are also reflected in village-level measures such as change in average wealth and inequality. For instance, if an individual receives a large transfer, then this is directly reflected in a higher level of change in village mean wealth. The same reasoning holds for the correlation between change in Gini and change in mean wealth: a village in which more individuals receive large transfers will see both a larger increase in mean wealth and a greater change in the wealth difference between treated households and untreated households, reflected in a larger change in Gini.

We do not consider this correlation a major threat to the validity of our analysis, for four reasons. First, the correlation is of relatively small magnitude. Second, while these variables are correlated with each other, they are uncorrelated with unobserved variables by design because all of the variation in them comes from randomization, as detailed above. Thus, bias from unobservables is unlikely to be a problem. Third, we check for robustness by reporting effects for measures of change in mean wealth and change in Gini both including and excluding changes to a household's own wealth (see Appendix Table A.5.3.) In this case, changes in own wealth and changes in mean wealth will be negatively correlated, allowing us to bound the effect of the correlation. Finally, we check for robustness by reporting the effects when mean wealth change is calculated across the entire village, rather than just sample households. As show in Appendix Table A.3.1, the correlations between this measure and both change in own wealth and change in Gini are much lower. Nonetheless, our main effects are still significant.

2.5 Econometric Specifications

2.5.1 Primary treatment effect

To capture the effect of changes in absolute wealth, relative wealth, and inequality on psychological wellbeing, our primary econometric specification is

$$\Psi_{ihvE} = \beta_0 + \beta_1 \triangle T_{hv} + \beta_2 \triangle \bar{T}_v + \beta_3 \triangle G_v + \delta_1 \Psi_{ihvB} + \delta_2 M_{ihvB} + \varepsilon_{ihvE} \quad (1)$$

where Ψ_{ihvE} is the outcome of interest measured at the level of the individual respondent i in household h in village v measured at endline ($t = E$). $\triangle T_{hv}$ is the transfer amount assigned to household h in village v (taking values USD 0, USD 404, or USD 1525). $\triangle \bar{T}_v$ is the average transfer amount per household for village v. $\triangle G_v$ is the change in the Gini Coefficient (or coefficient of variation) due to the treatment. ε_{ihv} is an idiosyncratic error term. Standard errors are clustered at the village level.

Following McKenzie (2012), we condition on the baseline level of the outcome variable when available, Ψ_{vhiB}, to improve statistical power. To include observations where the baseline outcome is missing, we code missing values as zero and include a dummy indicator that the variable is missing (M_{vhiB}).

Thus, β_1 identifies the treatment effect of a USD 100 transfer on treated relative to control households. β_2 is the effect of a USD 100 change in the average wealth at the village level due to treatment.

β_3 identifies the effect of a one-unit change in the village-level Gini coefficient due to differentially treating rich vs. poor households.

We also report a second specification controlling for a number of household-level and village-level covariates:

$$\Psi_{ihvE} = \beta_0 + \beta_1 \triangle T_{hv} + \beta_2 \triangle \bar{T}_v + \beta_3 \triangle G_v + \delta_1 \Psi_{ihvB} + \delta_2 M_{ihvB} + X'_{\{i\}\{h\}v}\gamma + \varepsilon_{ihvE} \tag{2}$$

Here, X_{ihv} is a vector of individual, household and village levels covariates for the individual respondent i in household h in village v. Covariates include pre-specified individual and household characteristics: respondent age, respondent age squared, z-score adjusted years of education for the respondent, an indicator for whether the respondent was married at baseline, total number of household members, and total number of household children. We also include household economic characteristics: measures of baseline household assets and total consumption, and indicators for whether wage labor is the household's primary source of income, whether a farm owned by the household is the primary source of income, whether a non-farm business is the household's primary source of income, and whether the household owns a non-farm business. Village-level covariates include two indicators of village development – the presence of a primary school in the village, and the presence of a secondary school in the village – and a measure of the distance of the village from the primary metropolitan center in Western Kenya (Kisumu).

2.5.2 Heterogenous effects

Although not specified in our pre-analysis plan, the effect of changes in relative wealth and inequality could be different for particular subpopulations of our sample, and we therefore examine several possible dimensions of heterogeneity. First, we calculate heterogenous effects for individuals below the sample median level of household assets at baseline to determine whether effects are larger for poorer individuals:

$$\begin{aligned}\Psi_{ihvE} = {} & \beta_0 + \beta_1 \triangle T_{hv} + \beta_2 \triangle \bar{T}_v + \beta_3 \triangle G_v + \beta_4 L_{hv} \times \triangle T_{hv} + \beta_5 L_{hv} \times \triangle \bar{T}_v + \beta_6 L_{hv} \times \triangle G_v + \beta_7 L_{hv} \\ & + \delta_1 \Psi_{ihvB} + \delta_2 M_{ihvB} + X'_{\{i\}\{h\}v}\gamma + \varepsilon_{ihvE}\end{aligned}$$

Here, L_{hv} is an indicator for whether household h in village v is the below the sample median baseline wealth. $L_{hv} \times \triangle T_{hv}$ is an interaction between the indicator and the change in household's own wealth. $L_{hv} \times \triangle \bar{T}_v$ is an interaction between the indicator and the change in village mean wealth. $L_{hv} \times \triangle G_v$ is an interaction between the indicator and the change in village Gini coefficient.

Thus β_1, β_2 and β_3 identify the main effect of changes in own wealth, village mean wealth, and inequality, and β_4, β_5, and β_6 identify the heterogenous effect for poorer households. The hypothesis

$H_0 : \beta_1 + \beta_4 = 0$ tests the significance of the effect of change in own wealth on poorer households. The hypothesis $H_0 : \beta_2 + \beta_5 = 0$ tests the significance of the effect of change in village mean wealth on poorer households. The hypothesis $H_0 : \beta_3 + \beta_6 = 0$ tests the overall significance of the effect of a change in village inequality on poorer households.

Similarly, we evaluate the heterogenous effect for households that did not receive transfers (spillover) using the following specifications:

$$\begin{aligned}\Psi_{ihvE} = \beta_0 + \beta_1 S_{hv} + \beta_2 S_{hv} \times \triangle\bar{T}_v + \beta_3 T_{hv} \times \triangle\bar{T}_v + \beta_4 S_{hv} \times \triangle G_v + \beta_5 T_{hv} \times \triangle G_v \\ + \delta_1 \Psi_{ihvB} + \delta_2 M_{ihvB} + X'_{\{i\}\{h\}v}\gamma + \varepsilon_{ihvE}\end{aligned} \tag{3}$$

Here, S_{hv} is an indicator variable taking a value of 1 if household h in village v was assigned to be a control household and 0 if assigned to be a treatment household. T_{hv} is an indicator variable taking a value of 1 if household h in village v was a treatment household and 0 if assigned to be a spillover household. $\triangle\bar{T}_v$ is the change in village mean wealth in village v minus the average of the change in village mean wealth across all treatment villages. Thus $S_{hv} \times \triangle\bar{T}_v$ is an interaction between a household's status as a control household in a treatment village and the total change in village mean wealth among eligible households. $S_{hv} \times \triangle G_v$ is an interaction between a household's status as a control household in a treatment village and the change in village-level Gini coefficient. $T_{hv} \times \triangle\bar{T}_v$ is an interaction between a household's status as a treatment household and the total change in village mean wealth among eligible households. $T_{hv} \times \triangle G_v$ is an interaction between a household's status as a treatment household and the change in village-level Gini coefficient. We control for a vector of individual, household and village characteristics, as well as baseline levels of outcome variables. ε_{ihv} is an idiosyncratic error term. Standard errors are clustered at the village level.

In this specification, we demean $\triangle\bar{T}_v$ so that the comparison group (omitted category) is treatment households in villages at exactly the average level of change in village mean wealth across all villages. Thus β_1 identifies the average effect of a household's assignment to the control condition. β_2 identifies the effect for control households of a USD 100 increase in village mean wealth above the average change across all treatment villages. β_3 identifies the effect for treatment households of a USD 100 increase in village mean wealth above the average change across all treatment villages. β_4 identifies the heterogenous effect for control households of a change in village level Gini-coefficient from 0 to 1. β_5 identifies the heterogenous effect for treatment households of a change in village level Gini-coefficient from 0 to 1. To determine whether changes are significantly different for treated and untreated households, we report p-values from F-tests of equality between β_2 and β_3 and between β_4 and β_5 .

2.5.3 Temporal Variation

We explore the temporal evolution of the effect of transfers on subjective well-being using a series of models:

$$\Psi_{ihvE} = \beta_0 + \beta_1 \sum_{\tau=1}^{M} \triangle T_{hv,\tau} + \beta_2 \sum_{\tau=1}^{M} \triangle \bar{T}_{v,\tau} + \beta_3 \{G_{v,\tau=1} - G_{v,M+1}\} \quad (4)$$

$$+ \delta_1 \Psi_{vhiB} + \delta_2 M_{vhiB} + X'_{\{i\}\{h\}v}\gamma + \varepsilon_{ihvE} \quad (5)$$

where $M = 1, ..., 15$ is the number of months before the end of the program. We report the results for all 15 models graphically in Figure 2 with details on the coefficients of interested reported in Appendix Table A.4.2. In each model, we calculate the total amount of transfers to household h in village v as the sum of the transfers in the last month of the program ($\tau = 1$) through the change M months before the end of the program: $\sum_{\tau=1}^{M} \triangle T_{hv,\tau}$. Similarly, we calculate the change in the mean wealth of village v in the M months before the end of the program as the sum of the change in mean wealth in the last month of the program ($\tau = 1$) through the change M months before the end of the program: $\sum_{\tau=1}^{M} \triangle \bar{T}_{v,\tau}$. Finally we calculate the change in Gini coefficient in village v as the difference between the Gini coefficient in village v in the last month of the program and the Gini coefficient $M + 1$ months before the endline: $G_{v,\tau=1} - G_{v,M+1}$.

Thus, β_1 identifies the effect of a USD 100 increase in own wealth made within M months of the end of the program. β_2 identifies the effect of a USD 100 increae in village mean wealth within M months of the end of the program. β_3 identifies the effect of a change in village Gini coefficient from 0 to 1 between $M + 1$ months before the end of the program and the end of the program. Standard errors are clustered at the village level.

2.5.4 Accounting for multiple comparisons

Due to the multiple outcome variables in the present study, we employ three strategies to reduce the possibility that our results are false positives. First, we create standardized weighted-average indices of the variables of interest using the approach of Anderson (2008) as detailed in Appendix A.7.

Second, we report Family-Wise Error Rate (FWER) adjusted p-values calculated from among our outcome variables in a given family, excluding indices, using the step-down algorithm outlined in Anderson (2008) and detailed in Appendix A.8. This approach controls the probability of Type I errors across a group of coefficients.

Finally, we estimate the system of equations jointly using seemingly unrelated regression (SUR), allowing us to perform Wald tests of joint significance of the treatment coefficient across outcome variables. Again, index variables are excluded from this comparison.

3 Results

3.1 Absolute income

We report the outcome of the regressions in equations (1) and (2) in Table 1. Consistent with the findings of Haushofer and Shapiro (2013), Column (1) and (2) indicate that changes in own wealth have a strong positive effect on measures of psychological wellbeing, holding constant changes in village mean wealth and village inequality. A USD 100 increase in household wealth causes a 0.01 SD increase in happiness, a 0.02 SD increase life satisfaction, a 0.01 SD decrease in depression, and a 0.03 SD decrease in stress. At the mean transfer amount of USD 709, we would predict a 0.10 SD increase in happiness, a 0.13 SD increase in life satisfaction, a 0.09 SD decrease in depression, and a 0.19 SD decrease in stress. Each of these changes is significant at the 1 percent level using both naive and FWER adjusted p-values, with the exception depression, which is significant at the 5 percent level. We observe an increase of 0.03 SD on the psychological wellbeing index, corresponding to increase of 0.20 SD at the mean transfer amount of USD 709, significant at the 1 percent level. These outcomes are also jointly significant at the 1 percent level.

3.2 Relative income

Columns (3) and (4) of Table 1 show that exogenous changes in village mean wealth have a large negative effect on life satisfaction. Specifically, a USD 100 increase in village mean wealth causes a 0.09 standard deviation decrease in life satisfaction, significant at the 5 percent level when including controls. The magnitude of this effect is noteworthy, as this this is more than four times the magnitude of the effect of a change in own wealth by the same amount. Thus, at the average level of village wealth change (USD 354), an individual would report a decrease in life satisfaction of 0.33 SD. This is in comparison with an increase in life satisfaction of 0.13 SD at the average transfer amount (USD 709), implying a net decrease in life satisfaction for households that either did not receive transfers or that received small transfers, and a negation of the positive direct effect of transfers on households receiving large transfers. We note, however, that p-values after FWER adjustment are not significant at standard levels. We find no effects of changes in relative wealth on other psychological outcomes.

3.3 Inequality

We detect no statistically significant effect of a change in thatched village inequality on psychological wellbeing in the full sample population, as reported in columns (5) and (6). However, we cannot rule out the possibility that the present study is underpowered to detect these effects, or that these inequality measures do not accurately reflect the change in inequality for the entire village as discussed in Section 2.4.

3.4 Alternate Measures of Relative Wealth and Inequality

These effects are robust to alternative measures of relative wealth and inequality. Tables A.5.1, A.5.2, and A.5.3 in the Appendix report the results of regressions 1 and 2 using the alternative measures of village mean wealth described in Section 2.3.2. The magnitude of the effect a change in mean wealth on life satisfaction when calculated across the full village population reported in Appendix Table A.5.1 is nearly twice as large as the effect of a change in mean wealth on life satisfaction reported in Table 1. The effect reported in Table A.5.2, in which we isolate the variation caused by differences in the proportion of treated individuals receiving large transfers, is even more robust than that in the basic specification, retaining significance at the 10 percent level after FWER adjustment, at the 5 percent level for the index excluding cortisol, and at the 5 percent level in the joint test across variables. Finally, Table A.5.4 shows that the effect is robust to use of the coefficient of variation as a measure of inequality instead of the Gini coefficient.

3.5 Heterogenous effects

3.5.1 Does relative wealth matter more for untreated households?

An obvious question based on the results described above is whether the negative effect of changes in relative wealth on psychological wellbeing differ by treatment status: is it particularly painful for people to observe their neighbors getting transfers when they themselves are not receiving anything? Conversely, can transfers to the focal individual "undo" the negative psychological spillovers of transfers to their neighbors? Table 2 distinguishes the effect of a change in relative wealth and inequality for treated vs. untreated households, using regression specification (3). All comparisons in this specification are reported relative to individuals who received cash transfers living in village where the mean wealth change was exactly the cross-village average (the omitted category). Column 2 shows a decrease in life satisfaction of 0.11 SD for each USD 100 increase in village mean wealth among individuals in households that did not receive a cash transfer in comparison to this group, significant at the 5 percent level.[8] This coefficient is larger than that for all households reported in the previous section, -0.09, suggesting that the decrease in life satisfaction observed in the entire sample is driven mainly by non-recipient households. Indeed, for recipient households, column (4) of Table 2 shows that the coefficient on village mean wealth is 0.04, i.e. small and non-significant. Thus, the negative spillovers of transfers on psychological wellbeing are driven mainly by non-recipient households. However, we cannot reject equality across the two effects (Table 2 column (6)).

Although the effect of changes in the thatched village Gini coefficient on psychological wellbeing is not statistically significant for either treated or untreated individuals, the result of the F-test in column (7) indicate a statistically significant difference in how treated and untreated individuals

[8]Note that levels of change in village mean wealth are demeaned in this specification.

respond to changes in the dispersion of wealth. Specifically, life satisfaction seems to be higher, and depression appears to be lower, for individuals in treated households in villages that become more unequal. This pattern of results might reflect utility from getting ahead of one's neighbors.

3.5.2 Does relative wealth matter more for poor households?

Do changes in relative wealth affect poor households more than rich ones? Table 3 reports the results of our analysis for households below the sample median baseline wealth level. We see little evidence that the effect of changes in either absolute wealth or relative wealth are driven by poorer households. Column (2) reports the heterogenous effect of a change in own wealth for poorer households, but none of these results are statistically significant at standard levels. Additionally, column (4) reports the heterogenous effect of a change in village mean wealth for poorer households. Although the signs and magnitudes of the point estimates of the coefficients of the heterogenous effects on happiness, life-satisfaction, stress, cortisol and the well-being index suggest relative wealth has a somewhat stronger effect on poorer individuals, the results are not statistically significant at standard levels. The p-values of joint-tests reported in columns (7) and (8) show that the total effect on poorer households (average treatment effect plus heterogenous effect for poor households) of both changes in absolute wealth and changes in relative wealth are still significant for most of the expected outcomes. However, we cannot reject the null hypothesis that the effects are the same for richer and poorer households. Overall, these results suggest that the effects described above are not primarily driven by poorer households but rather common across households at various levels of baseline wealth. In part, this may reflect that the fact that all of the households included in the sample were relatively poor compared to the rest of their villages, as this was the criterion for eligibility.

However, we see weak evidence that poorer households may respond differently to changes in inequality. The magnitudes of the heterogenous effects reported in column (6) are much larger and often of opposite sign from the average effect of a change in Gini reported in column (5). The heterogenous effect of a change in Gini from 0 to 1 indicates an overall decrease in the well-being index among poor households by 1.42 SD, significant at the 10% level (as shown by the p-value of the joint test reported in column 9). Additionally, we see an overall increase in depression by 1.20 SD among poor households, also significant at the 10% level.

3.6 Hedonic adaptation

An important question in light of these results is how long the negative psychological externalities of cash transfers persist. As discussed in Section 2.3.4, we are able to exploit variation in the timing of transfers over the course of the study to determine the effects of transfers received closer to the endline survey. Since the study was scheduled to run for 15 months, we calculate changes in own wealth village mean wealth and village Gini due to transfers in the 1 month before endline, the

2 months before endline, etc., up through the full 15 months before endline. We then perform separate regressions to determine the effects of changes in each of these time periods. Note that these measures are overlapping (e.g., the transfers 1 month before endline are a subset of of the transfers 2 months before endline), so these measures are not fully independent.

However, the results depicted in Figures 2 and Appendix Table A.4 are illustrative of a clear trend. The values of change in household wealth and village mean wealth due to the most recent transfers show a much stronger effect on each measure of psychological well-being, with the effects diminishing as we begin to include transfers closer to the beginning of the period. For the well-being index, we see a point estimate for the negative effect of a USD 100 change in village mean wealth due to transfers in the 1 month before endline greater than 0.4 SD, but the point estimate is indistinguishable from 0 when we include transfers over the full 15 months. Similarly, a change in own wealth of USD 100 in the month before endline causes a nearly 0.2 SD increase in the psychological well-being index, but this effect decreases (though it remains positive and significant) when including the full 15 months. Similar results hold for the other variables, though many of the effects are quite noisy.

Overall, the fact that the effects of transfers early on in the program drown out the effects shortly before endline is evidence that the psychological effects of cash transfers diminish over time.

3.7 Economic outcomes

In Tables A.6.3, A.6.4, and A.6.5 we report the effect of changes in own wealth, mean wealth, and inequality on measures of household consumption, assets, and labor and enterprise activities, respectively. We observe a general trend towards lower levels of consumption as village mean wealth increases, reported in columns (3) and (4) of Table A.6.3, and no discernible impact of an increase in inequality, reported in columns (5) and (6). Specifically, we find that a USD 100 increase in village mean wealth results in a USD 7.23 decrease in total monthly non-durable consumption, significant at the 10 percent level. This effect is driven by a decrease in food spending of USD 5.56, significant at the 10% level, and, to a lesser extent, by a decrease in social expenditure of USD 0.49, significant at the 5 percent level. The exact mechanism explaining this decrease is not immediately apparent, as the decrease appears to be consistent across categories (other than marginal increases in alcohol and tobacco spending).

One possibility may be that as mean village wealth rises, households substitute away from consumption and towards investment. However, we also observe a decrease in overall asset levels, as reported in columns (3) and (4) of Table A.6.4, with a USD 100 increase in village mean wealth resulting in a USD 36 decrease in household assets, significant at the 10 percent level[9]. This decrease is mainly driven by (non-significant) decreases in livestock and durables holdings. One possible explanation

[9]At first glance it may appear as if the effect of own wealth changes on asset holdings is similar in magnitude to that of changes in village mean wealth; note, however, that the mean transfer to a household was about twice as large as the mean transfer to a village, and thus the indirect effect is smaller.

for this pattern of results is that households sell livestock and durables to transfer recipient households, who show large and significant increases in these outcomes. Note, however, that the changes in asset holdings are not jointly significant in the SUR analysis.

As village mean wealth rises, we also observe a large decrease in business expenditures and a smaller decrease in the proportion of individuals engaging in enterprise, reported in Table A.6.5. A USD 100 increase in village mean wealth translates into a USD 6 decrease in enterprise expenses, significant at the 5 percent level. Consistent with this decrease of investment in business, we also observe a decrease in the proportion of households with a non-farm business as their primary income by 2 percentage points, significant at the 10 percent level. However, again we note that none of these effects survive FWER adjustment, and the SUR joint test is not significant.

Finally, we also observe effects of changes in village-level inequality on labor and enterprise outcomes. As reported in columns (5) and (6) of Table A.6.5, as inequality rises, households are significantly less likely to engage in wage labor as their primary source of income. This effect is significant at the 5 percent level without controls, and with control is significant at the 1 percent level and at the 5 percent level after FWER correction. For a 0.07 change in the village-level Gini coefficient we predict a 4 percentage point decrease in the proportion of households whose main source of income is wage labor.

4 Conclusion

The goal of this study was to dissociate the effects of three changes in economic circumstances on psychological wellbeing. In particular, we distinguish between the effects of changes in *own* wealth, changes in *relative* wealth, and changes in *inequality* on life satisfaction, happiness, and other psychological outcomes. We study an unconditional cash transfer program in Kenya which made large, one-time transfers to a subset of poor households in a village. Our identification strategy capitalizes on three sources of exogenous variation: first, the magnitude of the transfers varied randomly across recipients, allowing us to identify the effect of transfers on the recipients themselves. Second, the mean transfer amount to the village as a whole varied randomly as a consequence of random variation across villages in the proportion of households receiving large rather than small transfers. This variation allows us to identify the effect of changes in village mean wealth on recipients and their peers. Third, differences in the baseline wealth of the recipients across villages induces random variation in the change of the village-level Gini coefficient as a result of transfers, allowing us to identify the effect of changes in inequality on wellbeing *above and beyond* absolute and relative income.

We find that changes in wealth have sizable effects on psychological wellbeing, in particular life satisfaction. We find that individuals are generally more satisfied with their life when their own wealth increases. They become, however, less satisfied when the average wealth of others in their village increases, and this effect might more than offset the direct impact from changes in their own wealth. We do not observe an additional impact of changes in inequality on life satisfaction above and beyond the impacts of changes in one's own wealth or the average wealth of the village. We find that the decrease in life satisfaction due to changes in village mean wealth dissipates quickly over time as we compare more recent with more distant changes in relative wealth.

We hasten to point out that these findings are not an indictment of cash transfers as a poverty alleviation intervention. First, our original paper (Haushofer and Shapiro 2013) reports a large number of beneficial effects of cash transfers. Second, similar negative externalities might be expected from any program that confers benefits to a group of recipients while not treating others; there is little reason to think that cash is unique in generating externalities. Third, we find negative externalities only for a small number of psychological outcome variables, while others show little movement. Fourth, cash transfers also have significant positive externalities; for instance, as we report in our original paper (Haushofer and Shapiro 2013), we find large positive spillovers on female empowerment, driven mainly by reductions in physical and sexual domestic violence. Although in the present paper we were specifically interested in psychological externalities, we repeated our main analysis for the domestic violence outcome variables, and report the results in Appendix Tables A.6.6, A.6.7, and A.6.8. We find large positive direct effects of cash transfers on domestic violence, and, importantly, large positive effects of changes in village mean wealth. These findings are an important counterpoint to the main findings reported above. Fifth, it is possible that losing a lottery is uniquely disappointing for households; while our analysis of changes in village mean wealth holds constant whether or not (and how many) comparison households won a lottery, losing the lottery may be differentially disappointing depending on the average transfer magnitude of recipient households. Thus, we might expect weaker negative externalities for changes in relative income that are not windfalls. Finally, we point out that *GiveDirectly* has now moved to a model in which *all* eligible households in a village receive transfers, rather than only a subset. Together, these considerations suggest that the negative psychological externalities of cash transfers we report here do not detract from the overall positive effects of *GiveDirectly*'s model, or cash transfers as a whole.

These findings contribute to several strands of literature. First, by exploiting fully exogenous changes in absolute wealth, relative wealth, and inequality, this study achieves good identification in establishing the causal link between wealth changes and psychological wellbeing, a relationship that has been the subject of many prior, often correlational, studies. In addition, in light of the random changes in the income distribution induced by the cash transfers, we are able to contribute similarly causal evidence to literature surrounding the causes and consequences of income and wealth inequality. Finally, our findings also have implications for social policy. As concern about increasing inequality grows around the world, we find that individuals do not appear to be harmed in terms of psychological wellbeing by increased inequality above and beyond the impact of changes in their own wealth and the average wealth of their peers. Therefore, policies aiming to rectify consequences of increased inequality might do better to focus on broad-based approaches that shift mean wealth, rather than concentrating on the tail of the distribution (potentially with more limited impacts on the mean). We hasten to add, however, that this argument might not hold for dimensions of welfare other than psychological wellbeing which we do not study here. In addition, the finding that the negative effects of increased average wealth can outweigh the direct benefits of increasing the wealth of a given individual has implications for the design of social protection and transfer policies, as does the finding that the poorest are most impacted in this regard. Transfer programs designed to increase welfare generally, of which psychological wellbeing is a part, should consider targeting and spillover effects in their design. A silver lining, perhaps, is apparent in our finding that individuals adapt to changes in their own and others' wealth: it may be possible to increase the wealth of many through transfers, without reducing life satisfaction of non-recipients in the long term.

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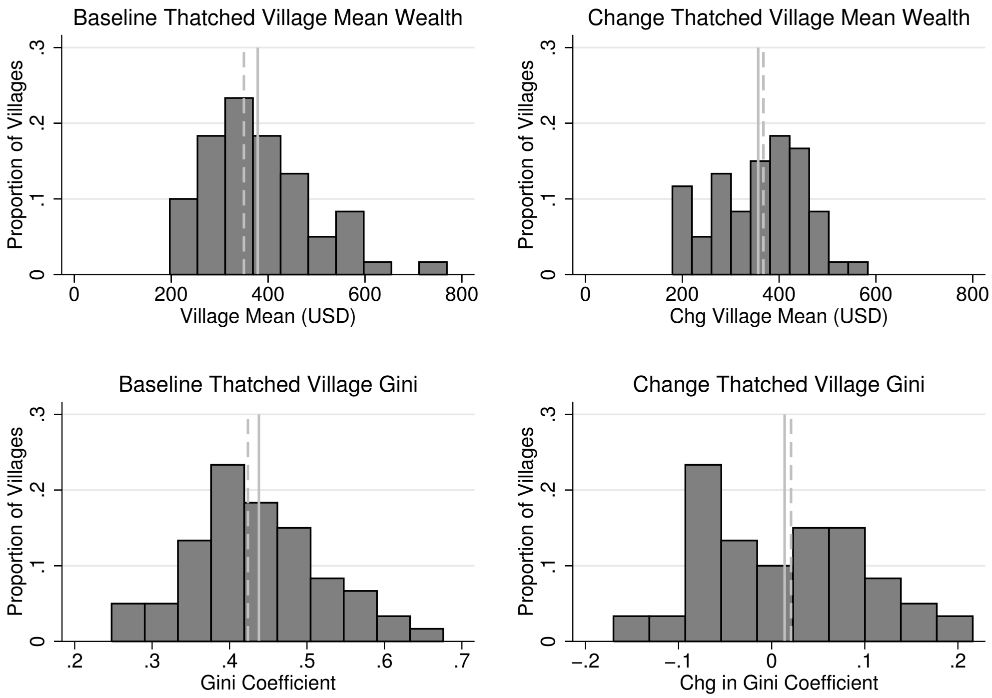
Figure 1: Change in Village Mean and Gini



Notes: Distribution of level of thatched village baseline mean wealth, thatched village mean wealth change, baseline thatched village Gini coefficient, and change in thatched village Gini coefficient across 60 sample villages. Mean wealth levels and change are reported in USD 100. The median value across villages is shown by the dashed line. The mean value across villages is shown by the solid line.

Table 1: Effect of Changes in Absolute Wealth, Relative Wealth and Dispersion of Wealth on Psychological Wellbeing

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Happiness (WVS)	0.01	0.01	−0.00	0.00	−0.35	−0.17	1474
	(0.00)***	(0.00)***	(0.03)	(0.03)	(0.34)	(0.28)	
	[0.01]***	[0.01]***	[1.00]	[0.99]	[0.84]	[0.97]	
Life satisfaction (WVS)	0.02	0.02	−0.08	−0.09	0.11	0.34	1474
	(0.00)***	(0.00)***	(0.05)*	(0.04)**	(0.47)	(0.45)	
	[0.00]***	[0.00]***	[0.40]	[0.12]	[0.90]	[0.95]	
Depression (CESD)	−0.01	−0.01	−0.01	−0.01	0.29	0.13	1474
	(0.00)**	(0.00)**	(0.04)	(0.04)	(0.46)	(0.46)	
	[0.03]**	[0.05]**	[0.99]	[0.99]	[0.90]	[0.97]	
Stress (Cohen)	−0.03	−0.03	0.03	0.06	0.43	0.26	1474
	(0.01)***	(0.01)***	(0.04)	(0.05)	(0.42)	(0.45)	
	[0.00]***	[0.00]***	[0.90]	[0.62]	[0.84]	[0.97]	
Log cortisol (with controls)	−0.00	−0.00	0.01	−0.01	0.17	0.07	1456
	(0.01)	(0.01)	(0.04)	(0.03)	(0.40)	(0.39)	
	[0.43]	[0.41]	[0.99]	[0.99]	[0.90]	[0.97]	
Psychological Wellbeing Index	0.03	0.03	−0.04	−0.05	−0.43	−0.14	1474
	(0.00)***	(0.00)***	(0.05)	(0.04)	(0.49)	(0.47)	
Joint test (p-value)	0.00***	0.00***	0.45	0.15	0.64	0.77	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. The other variable is a weighted-average indices with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table 2: Heterogenous Effects for Untreated Households

	(1) Untreated Household	(2) Untreated X Mean Change	(3) Treated X Mean Change	(4) Untreated X Gini Change	(5) Treated X Gini Change	(6) F-Test (2)=(3) (*p*-value)	(7) F-Test (4)=(5) (*p*-value)	(8) N
Happiness (WVS)	−0.14	0.04	−0.02	−0.40	0.13	0.36	0.42	1474
	(0.05)***	(0.05)	(0.04)	(0.47)	(0.39)			
Life satisfaction (WVS)	−0.14	−0.11	−0.04	0.03	0.73	0.17	0.07*	1474
	(0.03)***	(0.05)**	(0.04)	(0.49)	(0.47)			
Depression (CESD)	0.09	−0.03	−0.00	0.75	−0.54	0.74	0.06*	1474
	(0.06)	(0.05)	(0.05)	(0.63)	(0.51)			
Stress (Cohen)	0.23	0.02	0.05	0.14	0.25	0.69	0.84	1474
	(0.05)***	(0.06)	(0.06)	(0.50)	(0.55)			
Log cortisol (with controls)	−0.01	−0.06	0.03	−0.23	0.32	0.15	0.39	1456
	(0.05)	(0.05)	(0.04)	(0.47)	(0.52)			
Psychological Wellbeing Index	−0.23	−0.01	−0.04	−0.48	0.35	0.67	0.18	1474
	(0.05)***	(0.06)	(0.05)	(0.53)	(0.59)			
Joint test (*p*-value)	0.00***	0.08*	0.88	0.80	0.10			

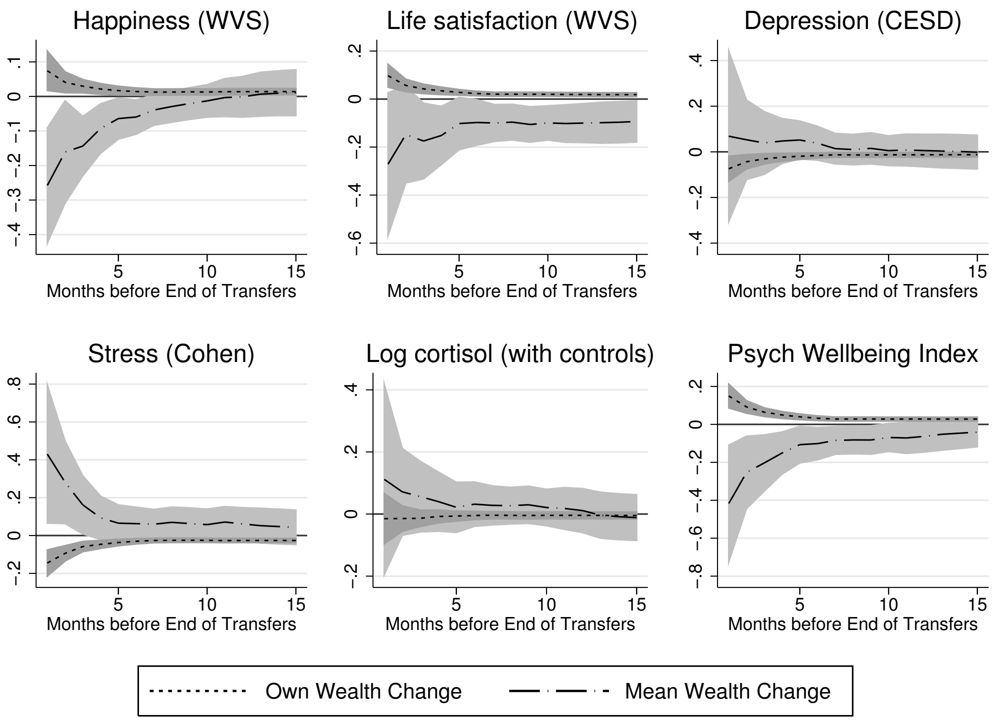
Notes: OLS estimate of heterogenous effects for treated households and untreated households. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. The other variable is a weighted-average indices with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. The comparison group in all regressions is (hypothetical) individuals living in treated households in villages at the average level of change in mean wealth. Column (1) reports the average difference in outcome variables between individuals living in untreated households and individuals in the comparison group. Column (2) reports the heterogenous effect per USD 100 of change in village mean wealth for individuals in untreated households in contrast to the comparison group. Column (3) reports the heterogenous effect per USD 100 of change in village mean wealth for individuals in treated households in contrast to the comparison group. Column (4) reports the heterogenous effect of a shift of thatched village Gini from 0 to 1 for individuals in untreated households in contrast to the comparison group. Column (5) reports the heterogenous effect of a shift of thatched village Gini from 0 to 1 for individuals in treated households in contrast to the comparison group. Column (6) reports the p-value from an F-test of the equality of heterogenous effects for treated and untreated households of shifts in village mean wealth. Column (7) reports the p-value from an F-test of the equality of heterogenous effects for treated and untreated households of shifts in thatched village Gini. Column (8) reports the sample size. The unit of observation is the individual. The last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table 3: Heterogenous Effect for HHs below Village Median Wealth at Baseline

	(1) Own Wealth Change	(2) Own Wealth X Poor	(3) Mean Chg	(4) Mean Chg X Poor	(5) Gini Chg	(6) Gini Chg X Poor	(7) (1)+(2) p-value	(8) (3)+(4) p-value	(9) (5)+(6) p-value
Happiness (WVS)	0.02	−0.00	0.01	−0.03	−0.05	−1.02	0.20	0.68	0.12
	(0.01)***	(0.01)	(0.03)	(0.05)	(0.33)	(0.65)			
Life satisfaction (WVS)	0.02	−0.00	−0.05	−0.04	0.30	−0.67	0.06*	0.04**	0.53
	(0.00)***	(0.01)	(0.05)	(0.06)	(0.54)	(0.65)			
Depression (CESD)	−0.01	0.01	0.02	−0.07	−0.02	1.22	0.49	0.44	0.09*
	(0.01)**	(0.01)	(0.04)	(0.06)	(0.49)	(0.79)			
Stress (Cohen)	−0.03	0.01	0.04	−0.01	0.34	0.53	0.06*	0.67	0.19
	(0.01)***	(0.01)	(0.05)	(0.06)	(0.46)	(0.78)			
Log cortisol (with controls)	−0.00	−0.01	0.01	0.06	−0.04	0.40	0.07*	0.25	0.57
	(0.01)	(0.01)	(0.04)	(0.07)	(0.42)	(0.66)			
Psych Wellbeing Index (Cortisol)	0.03	−0.00	−0.04	−0.02	−0.03	−1.39	0.02**	0.28	0.06*
	(0.01)***	(0.01)	(0.05)	(0.06)	(0.52)	(0.83)*			
Joint test (p-value)	0.00***	0.76	0.79	0.94	0.80	0.26			

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on measures of psychological wellbeing with heterogenous effects for households below the sample median of baseline wealth. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. The other variable is a weighted-average indices with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Column (1) reports the effect of a USD 100 increase in own household wealth on average. Column (2) reports the heterogenous effect of a USD 100 increase in own household wealth for poorer households. Column (3) reports the effect of a USD 100 increase in village mean wealth on average. Column (4) reports the heterogenous effect of a USD 100 increase in village mean wealth on poorer households. Column (5) reports the effect of a increase in thatched village Gini coefficient from 0 to 1 on average. Column (6) reports the heterogenous effect of a increase in thatched village Gini coefficient from 0 to 1 on poorer households. Thus the sum of the coefficients in column (1) and (2) represents the overall effect of a USD 100 increase in own household wealth for poorer household. The p-value of null hypothesis that this overall effect is 0 is reported in column (7). The sum of the coefficients in column (3) and (4) represents the overall effect of a USD 100 increase in village mean wealth for poorer households. The p-value of null hypothesis that this overall effect is 0 is reported in column (8). The sum of the coefficients in column (5) and (6) represents the overall effect of a village Gini coefficient from 0 to 1 for poorer households. The p-value of null hypothesis that this overall effect is 0 is reported in column (9). The last row shows joint significance of the coefficients in the corresponding column from SUR estimation. All regressions include individual, household, and village level controls. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Figure 2: Hedonic Adaptation



Notes: Coefficients from regression of outcome variable on changes in own wealth, village mean wealth, and village inequality calculate using only transfers during the reported number of months before the end of the transfer program. Dotted lines are coefficients on change in own wealnd and village mean wealth. Shaded areas are the 95 percent confidence intervals of the coefficients. Outcome variable is standardized, so the coefficient is the number of standard deviations change in the outcome measure per USD 100 of change in the independent variables.

A Appendix

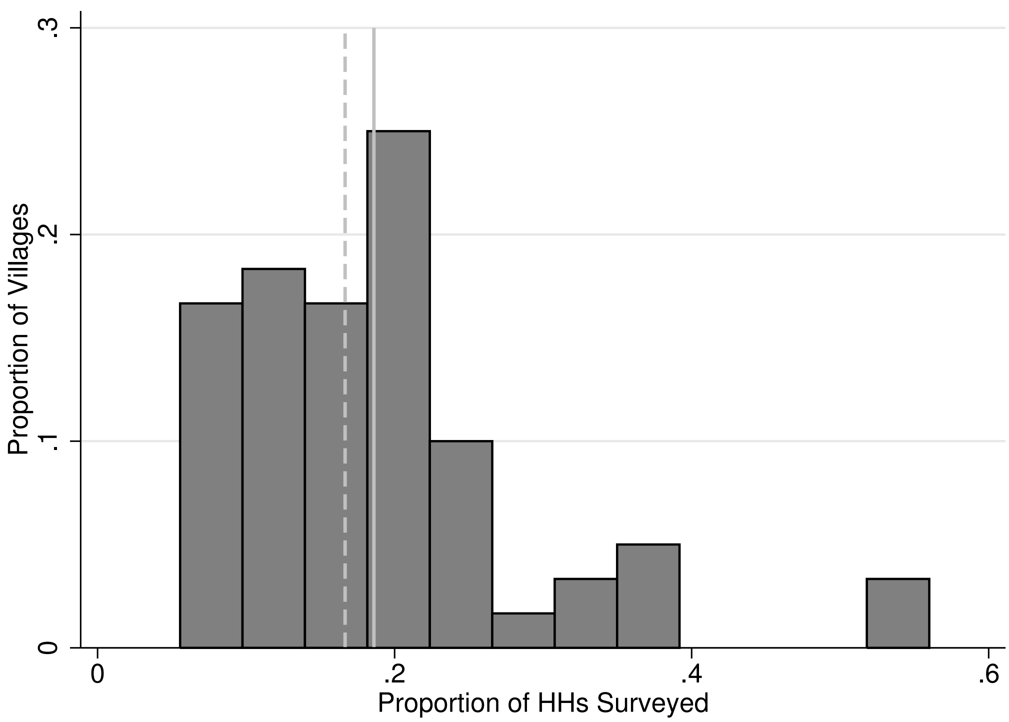
A.1 Village Descriptive Statistics

Table A.1.1: Village Summary Statistics

	Mean	SD	Median	Minimum	Maximum
Approximate Population	670.37	406.79	555.50	100.00	2000.00
Percent of All Village Households Surveyed	0.40	0.14	0.37	0.17	0.87
Percent of All Village Households Treated	0.50	0.05	0.50	0.40	0.75
Percent Treated Households Receiving Large Transfers	0.27	0.14	0.30	0.00	0.57
Village Average Baseline Assets of All Sample Households	378.62	112.28	350.03	197.01	768.92
Village Average Baseline Assets of Treated Households	383.17	163.65	349.42	136.33	1027.13
Change in Mean Wealth among Sample Households (USD 100)	3.57	0.94	3.68	1.80	5.83
Change in Mean Wealth across Total Population (USD 100)	0.14	0.16	0.11	0.01	1.01
Change in Gini Coefficient across Sample Households	0.01	0.09	0.02	-0.17	0.22
Change in Coefficient of Variation Change across Sample Households	-0.02	0.25	0.02	-0.60	0.58

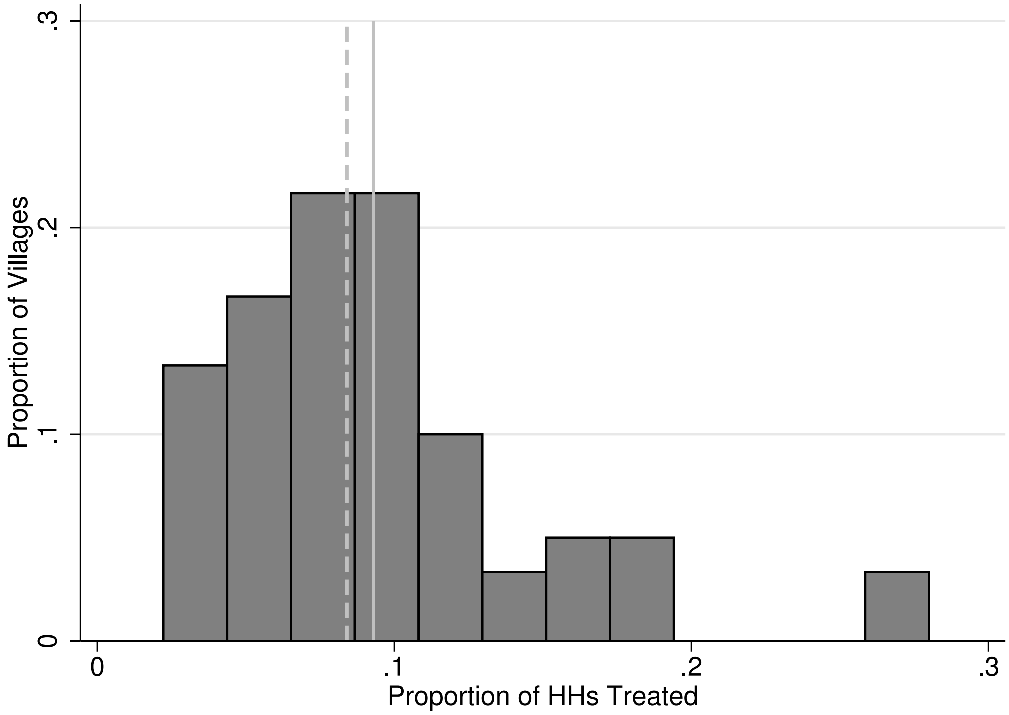
Notes: Mean, standard deviation, median, minimum and maximum for key statistics relating to proportion of each village included in the sample.

Figure A.1.1: Proportion of Households Surveyed by Village



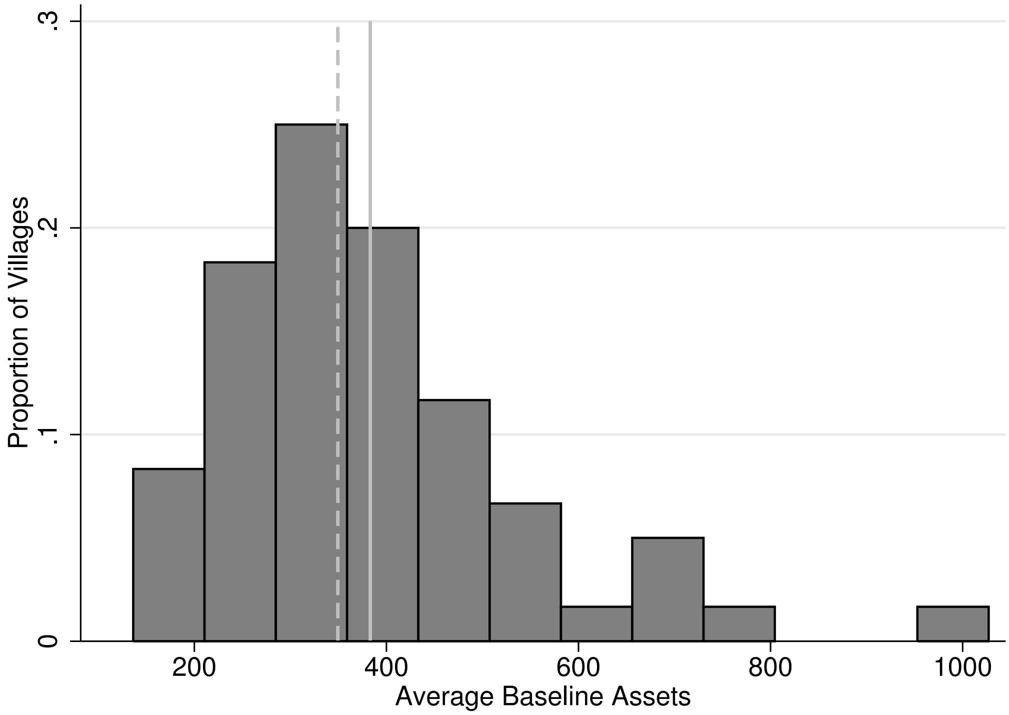
Notes: Distribution of the proportion of households in each village included in the sample. All thatched roof households in the village were eligible for a transfer, and approximately half of these households were assigned to the treatment condition and half were assigned to the control condition. Median across villages is depicted with the dashed line. Mean across villages is depicted with the solid line.

Figure A.1.2: Proportion of Households Receiving Transfers by Village



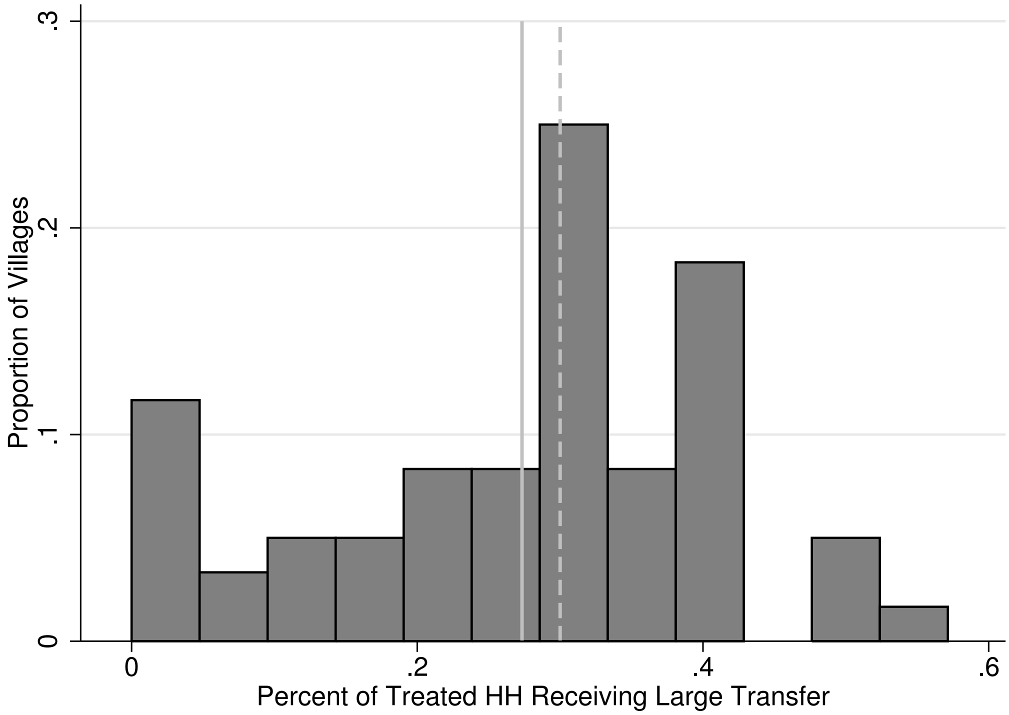
Notes: Distribution of the proportion of households in each village receiving a transfer. All thatched roof households in the village were eligible for a transfer, and approximately half of these households were assigned to the treatment condition and half were assigned to the control condition. Median across villages is depicted with the dashed line. Mean across villages is depicted with the solid line.

Figure A.1.3: Average Baseline Assets of Treated Households



Notes: Distribution of the average level of baseline assets of households receiving transfers by village. Median across villages is depicted with the dashed line. Mean across villages is depicted with the solid line.

Figure A.1.4: Percent of Treated Households Receiving Large Transfers



Notes: Distribution of the proportion of households receiving transfers in each village selected to recieve large transfers. Median across villages is depicted with the dashed line. Mean across villages is depicted with the solid line.

A.2 Gini Simulations

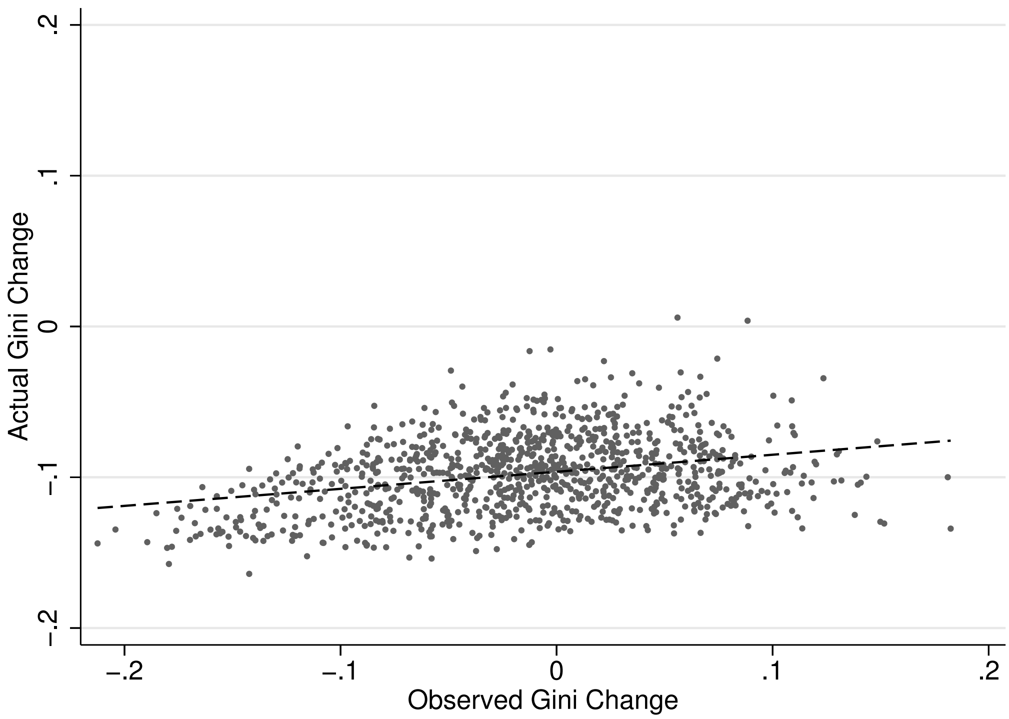
We simulate artificial villages in which half of the households were designated observed (thatched roof) households with baseline wealth drawn from a log-normal distribution with a mean and standard deviation equal to the mean and standard deviation of the baseline wealth among households in our sample. We randomly select half of these households to receive a transfer of USD 717 (the mean transfer in the study) and the other half to receive no transfer. We designate the other half of households in the simulated village as unobserved (metal roof) households. We find that the difference in wealth between the observed households and the unobserved households is the main determinant the relationship between the observed change in inequality and the unobserved change in inequality. Since the relationship between the baseline wealth of these observed households and the baseline wealth of the unobserved households is the main factor in determining whether the observed change in Gini matches the unobserved change in Gini, we evaluate three different possibilities for baseline wealth in the unobserved households.

Appendix Figure A.2.1 depicts the results of a simulated cash transfer program when the observed, eligible set of households have significantly lower wealth levels than the unobserved, ineligible households. This is likely the most realistic scenario due to the thatched-roof criterion for eligibility. In this case, both increases and decreases in observed inequality tend to correspond to decreases in unobserved inequality, as described above. However, there is a clear positive linear relationship between observed inequality and unobserved inequality, such that increases in observed inequality still lead to increases in (unobserved) overall inequality, and decreases in observed inequality are correlated with decreases in overall inequality.

Appendix Figure A.2.2 reports the results of simulations of villages in which there is no difference in baseline wealth between eligible and ineligible households. This scenario is less likely to reflect our sample due to the thatched roof eligibility criterion, but both increases and decreases in the observed change in inequality correspond to increases in inequality in the full population. Again, the positive linear relationship remains.

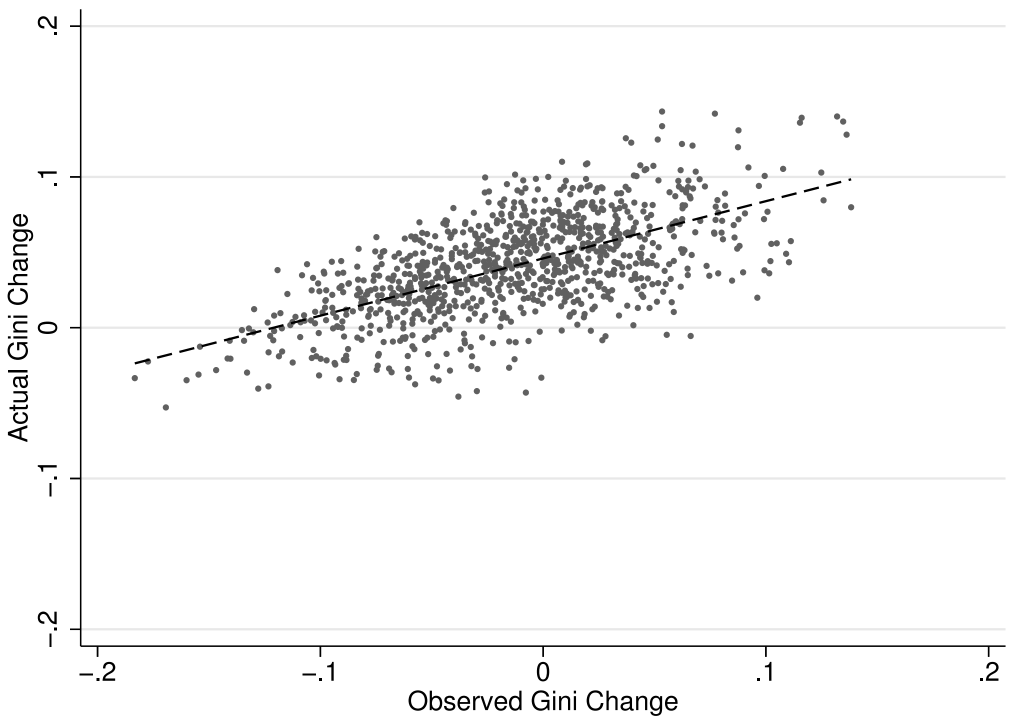
Finally, Appendix Figure A.2.3 reports the results of simulations of villages in which the baseline wealth of eligible households is only marginally below that of the full population. In this case, the relationship between the change in observed inequality and unobserved inequality is nearly one to one. In villages where this is the case, our measure will be highly representative of the actual change in inequality.

Figure A.2.1: Gini Coefficient results from 1000 simulated villages: actual vs. observed



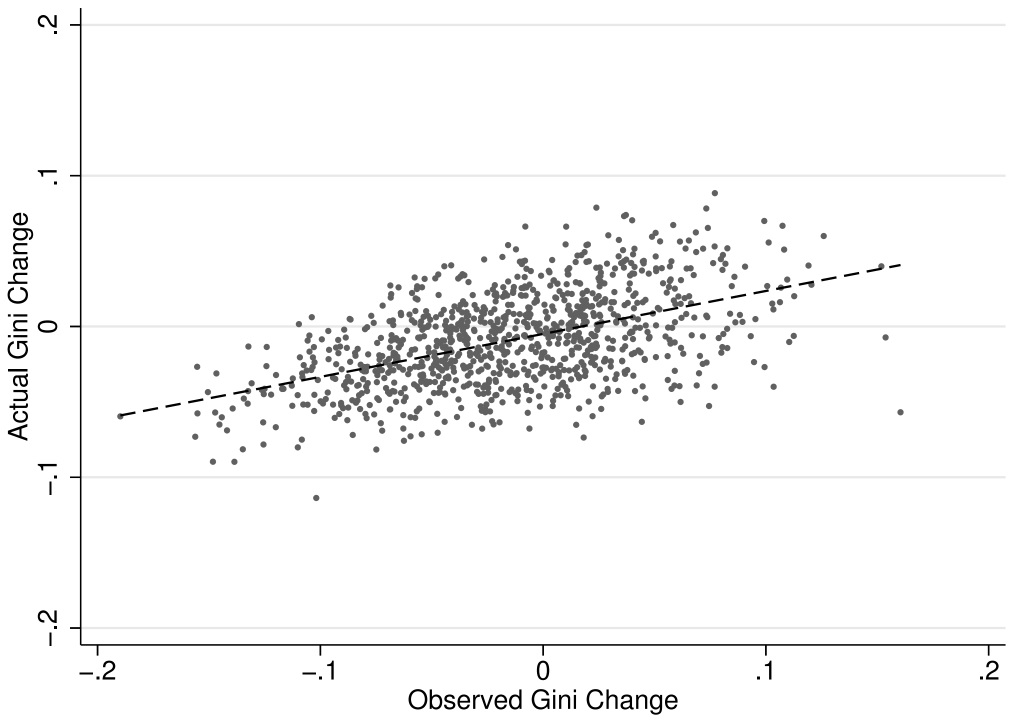
Notes: Results from a simulated cash transfer program. Each dot represents a village consisting of 50 households. Half of the households in each village are designated as 'eligible' for the transfer. The baseline wealth level of these households is then set according to a log normal distribution with the same mean as the households in the GiveDirectly program that did not have metal roofs at endline (approximately USD 226). Half of these households (a quarter of the village) is then designated to receive a transfer of USD 700, the average amount of the GiveDirectly program. The other half of households in the village are designated as 'ineligible' for the transfer, and the wealth level of these households is set according to a log normal distribution with a mean equal to the mean among households in our sample that had metal roofs at endline (USD 1078). We then calculate the Gini coefficient for the village based on household wealth after treatment, both retricted to the 'eligible' households and for the all households in the village. The scatterplot thus depicts the relationship between the observed change in Gini coefficient (only 'eligible' households) and the change in Gini coefficient for the full village (all households.)

Figure A.2.2: Gini Coefficient results from 1000 simulated villages: actual vs. observed



Notes: Results from a simulated cash transfer program. Each dot represents a village consisting of 50 households. Half of the households in each village are designated as 'eligible' for the transfer. The other half of households in the village are designated as 'ineligible' for the transfer. The baseline wealth level of all households is then set according to a log normal distribution with the same mean as the households in the GiveDirectly program that did not have metal roofs at endline (approximately USD 226). Half of the 'eligible' households (a quarter of the village) is then designated to receive a transfer of USD 700, the average amount of the GiveDirectly program. We then calculate the Gini coefficient for the village based on household wealth after treatment, both retricted to the 'eligible' households and for the all households in the village. The scatterplot thus depicts the relationship between the observed change in Gini coefficient (only 'eligible' households) and the change in Gini coefficient for the full village (all households.)

Figure A.2.3: Gini Coefficient results from 1000 simulated villages: actual vs. observed



Notes: Results from a simulated cash transfer program. Each dot represents a village consisting of 50 households. Half of the households in each village are designated as 'eligible' for the transfer. The baseline wealth level of these households is then set according to a log normal distribution with the same mean as the households in the GiveDirectly program that did not have metal roofs at endline (approximately USD 226). Half of these households (a quarter of the village) is then designated to receive a transfer of USD 700, the average amount of the GiveDirectly program. The other half of households in the village are designated as 'ineligible' for the transfer, and the wealth level of these households is set according to a log normal distribution with a mean equal to the mean among households in our sample that did not have metal roofs at endline plus one standard deviation (USD 378). We then calculate the Gini coefficient for the village based on household wealth after treatment, both retricted to the 'eligible' households and for the all households in the village. The scatterplot thus depicts the relationship between the observed change in Gini coefficient (only 'eligible' households) and the change in Gini coefficient for the full village (all households.)

A.3 Correlations between right-hand side variables

Table A.3.1: Correlations between Independent Variables

	Change in...					
	Own Wealth	Mean (with Self)	Mean (without Self)	Mean (Full Village)	Gini (with Self)	Gini (without Self)
Own Wealth	1					
Mean (with Self)	0.165***	1				
Mean (without Self)	-0.198***	0.910***	1			
Mean (Full Village)	0.0436	0.267***	0.243***	1		
Gini (with Self)	0.0376	0.227***	0.206***	0.0350	1	
Gini (without Self)	0.00963	0.221***	0.238***	0.0364	0.933***	1

Notes: Correlation coefficients between independent variables in main econometric specification. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

A.4 Temporal effects full results

Table A.4.2: Effect of Recent Transfers

		Months Before Endline														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Happiness	Own	0.07*	0.04*	0.03*	0.02*	0.02*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*
		(0.03)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	Mean	−0.26*	−0.16*	−0.14*	−0.09*	−0.06*	−0.06*	−0.04	−0.03	−0.02	−0.01	−0.00	−0.00	0.01	0.01	0.01
		(0.08)	(0.07)	(0.04)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
	Gini	−19.93*	3.55	3.91*	1.97*	1.25*	0.88	0.50	0.20	0.01	−0.09	−0.09	−0.18	−0.19	−0.27	−0.28
		(6.66)	(3.20)	(1.51)	(0.75)	(0.62)	(0.55)	(0.45)	(0.38)	(0.38)	(0.36)	(0.34)	(0.34)	(0.32)	(0.31)	(0.31)
Satisfaction	Own	0.10*	0.06*	0.04*	0.03*	0.03*	0.02*	0.02*	0.02*	0.02*	0.02*	0.02*	0.02*	0.02*	0.02*	0.02*
		(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	Mean	−0.27	−0.15	−0.17*	−0.15*	−0.10	−0.10*	−0.10*	−0.10*	−0.11*	−0.10*	−0.10*	−0.10*	−0.10*	−0.10*	−0.09*
		(0.15)	(0.10)	(0.08)	(0.06)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
	Gini	−2.35	3.51	2.34	2.65	0.92	0.95	1.17	0.93	1.09	0.83	0.79	0.70	0.55	0.45	0.39
		(4.31)	(3.26)	(2.33)	(1.39)	(1.01)	(0.88)	(0.76)	(0.63)	(0.61)	(0.57)	(0.56)	(0.53)	(0.50)	(0.49)	(0.50)
Depression	Own	−0.07*	−0.04*	−0.03*	−0.02*	−0.02*	−0.02*	−0.01*	−0.01*	−0.01*	−0.01*	−0.01*	−0.01*	−0.01*	−0.01*	−0.01*
		(0.03)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
	Mean	0.07	0.05	0.04	0.05	0.05	0.04	0.01	0.01	0.02	0.01	0.01	0.01	0.00	0.00	−0.00
		(0.19)	(0.09)	(0.07)	(0.05)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
	Gini	4.81	−2.37	0.33	−0.34	−1.28	−0.84	−0.22	0.11	−0.29	−0.07	−0.04	−0.08	−0.03	−0.00	0.03
		(10.12)	(3.73)	(2.32)	(1.40)	(1.11)	(0.89)	(0.83)	(0.72)	(0.67)	(0.62)	(0.59)	(0.58)	(0.54)	(0.51)	(0.50)
Stress	Own	−0.15*	−0.09*	−0.06*	−0.05*	−0.04*	−0.03*	−0.03*	−0.03*	−0.02*	−0.03*	−0.03*	−0.03*	−0.03*	−0.03*	−0.03*
		(0.03)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	Mean	0.43*	0.28*	0.16*	0.09	0.07	0.06	0.06	0.07	0.06	0.06	0.07	0.06	0.05	0.05	0.04
		(0.18)	(0.11)	(0.08)	(0.06)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
	Gini	6.34	−5.97	−0.88	0.63	0.80	0.50	0.28	−0.05	−0.11	0.11	0.09	0.09	0.28	0.36	0.42
		(8.45)	(4.44)	(2.32)	(1.19)	(1.02)	(0.85)	(0.80)	(0.62)	(0.58)	(0.55)	(0.53)	(0.52)	(0.52)	(0.50)	(0.50)
Cortisol	Own	−0.01	−0.01	−0.01	−0.01	−0.01	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00
		(0.04)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	Mean	0.11	0.07	0.06	0.04	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.01	−0.00	−0.01	−0.01
		(0.15)	(0.07)	(0.06)	(0.05)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
	Gini	1.60	2.77	0.05	0.01	−0.04	−0.55	−0.46	−0.61	−0.55	−0.34	−0.31	−0.25	−0.09	0.06	0.11
		(5.35)	(2.34)	(1.43)	(0.90)	(0.78)	(0.69)	(0.60)	(0.47)	(0.48)	(0.45)	(0.45)	(0.45)	(0.44)	(0.43)	(0.43)
Index	Own	0.15*	0.09*	0.06*	0.05*	0.04*	0.03*	0.03*	0.03*	0.03*	0.03*	0.03*	0.03*	0.03*	0.03*	0.03*
		(0.03)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	Mean	−0.42*	−0.25*	−0.20*	−0.15*	−0.11*	−0.10*	−0.08*	−0.08*	−0.08*	−0.07	−0.07	−0.06	−0.05	−0.05	−0.04
		(0.15)	(0.10)	(0.07)	(0.06)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
	Gini	−13.57	4.72	2.29	1.48	0.89	0.88	0.67	0.53	0.65	0.30	0.27	0.21	0.03	−0.12	−0.20
		(9.94)	(3.34)	(1.87)	(1.03)	(1.04)	(0.87)	(0.82)	(0.65)	(0.62)	(0.59)	(0.57)	(0.56)	(0.54)	(0.52)	(0.53)

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on measures of psychological wellbeing. Changes in thatched village mean wealth and thatched village inequality are calculated based only on transfers recently before scheduled village endline. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 5 pct. level.

A.5 Alternate measures of relative wealth and inequality

Table A.5.1: Treatment Effects with Alternate Measure of Change in Mean Wealth Based on Total Village Population

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Happiness (WVS)	0.01	0.01	−0.17	−0.06	−0.33	−0.18	1474
	(0.00)***	(0.00)***	(0.10)*	(0.12)	(0.31)	(0.27)	
	[0.01]***	[0.01]**	[0.31]	[0.88]	[0.75]	[0.95]	
Life satisfaction (WVS)	0.02	0.02	−0.22	−0.21	−0.03	0.13	1474
	(0.00)***	(0.00)***	(0.12)*	(0.11)*	(0.47)	(0.46)	
	[0.00]***	[0.00]***	[0.31]	[0.28]	[0.93]	[0.99]	
Depression (CESD)	−0.01	−0.01	−0.13	−0.12	0.28	0.11	1474
	(0.01)**	(0.00)**	(0.13)	(0.11)	(0.46)	(0.46)	
	[0.03]**	[0.03]**	[0.69]	[0.79]	[0.91]	[0.99]	
Stress (Cohen)	−0.02	−0.02	0.08	−0.00	0.49	0.38	1474
	(0.01)***	(0.01)***	(0.19)	(0.21)	(0.42)	(0.45)	
	[0.00]***	[0.00]***	[0.79]	[1.00]	[0.74]	[0.92]	
Log cortisol (with controls)	−0.00	−0.00	0.07	−0.10	0.17	0.04	1456
	(0.01)	(0.01)	(0.11)	(0.15)	(0.37)	(0.35)	
	[0.37]	[0.38]	[0.79]	[0.87]	[0.91]	[0.99]	
Psych Wellbeing Index (No Cortisol)	0.03	0.03	−0.15	−0.07	−0.45	−0.21	1474
	(0.00)***	(0.00)***	(0.13)	(0.10)	(0.48)	(0.47)	
Psych Wellbeing Index (Cortisol)	0.03	0.03	−0.14	−0.03	−0.49	−0.24	1474
	(0.01)***	(0.01)***	(0.13)	(0.11)	(0.50)	(0.49)	
Joint test (p-value)	0.00***	0.00***	0.02**	0.32	0.68	0.83	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, change in village mean wealth caclulated across the total village population, and thatched village inequality on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.5.2: Treatment Effects with Alternate Measure of Change in Mean Wealth Based on Percent Receiving Large Transfer

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Happiness (WVS)	0.01	0.01	−0.00	−0.00	−0.35	−0.16	1474
	(0.00)***	(0.00)***	(0.04)	(0.04)	(0.35)	(0.30)	
	[0.01]***	[0.01]**	[0.98]	[0.97]	[0.87]	[0.98]	
Life satisfaction (WVS)	0.02	0.02	−0.09	−0.11	0.19	0.45	1474
	(0.00)***	(0.00)***	(0.05)*	(0.05)**	(0.49)	(0.46)	
	[0.00]***	[0.00]***	[0.33]	[0.09]*	[0.93]	[0.87]	
Depression (CESD)	−0.01	−0.01	0.01	0.01	0.24	0.09	1474
	(0.01)**	(0.01)**	(0.04)	(0.04)	(0.46)	(0.45)	
	[0.04]**	[0.04]**	[0.98]	[0.97]	[0.93]	[0.98]	
Stress (Cohen)	−0.03	−0.03	0.03	0.06	0.42	0.22	1474
	(0.01)***	(0.01)***	(0.04)	(0.05)	(0.43)	(0.45)	
	[0.00]***	[0.00]***	[0.94]	[0.61]	[0.87]	[0.98]	
Log cortisol (with controls)	−0.00	−0.00	−0.02	−0.03	0.23	0.14	1456
	(0.01)	(0.01)	(0.04)	(0.04)	(0.42)	(0.39)	
	[0.42]	[0.46]	[0.96]	[0.76]	[0.93]	[0.98]	
Psych Wellbeing Index (No Cortisol)	0.03	0.03	−0.06	−0.08	−0.32	0.01	1474
	(0.00)***	(0.00)***	(0.04)	(0.04)**	(0.47)	(0.46)	
Psych Wellbeing Index (Cortisol)	0.03	0.03	−0.04	−0.06	−0.39	−0.08	1474
	(0.00)***	(0.01)***	(0.05)	(0.04)	(0.49)	(0.47)	
Joint test (*p*-value)	0.00***	0.00***	0.42	0.04**	0.61	0.70	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, estimated change in village mean wealth calculated only based on the percent of treated households receiving large transfers, and change in thatched village inequality on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.5.3: Treatment Effects Excluding Own Wealth from Village Mean and Gini

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Happiness (WVS)	0.01	0.01	−0.01	−0.01	−0.20	−0.04	1474
	(0.00)***	(0.00)***	(0.03)	(0.03)	(0.33)	(0.29)	
	[0.03]**	[0.01]***	[1.00]	[1.00]	[0.92]	[0.99]	
Life satisfaction (WVS)	0.01	0.01	−0.07	−0.08	0.23	0.44	1474
	(0.00)***	(0.00)**	(0.04)	(0.04)**	(0.44)	(0.41)	
	[0.03]**	[0.02]**	[0.49]	[0.14]	[0.92]	[0.81]	
Depression (CESD)	−0.01	−0.01	−0.01	−0.00	0.23	0.01	1474
	(0.01)**	(0.01)**	(0.04)	(0.03)	(0.40)	(0.41)	
	[0.04]**	[0.03]**	[1.00]	[1.00]	[0.92]	[0.99]	
Stress (Cohen)	−0.02	−0.02	0.03	0.05	0.26	0.10	1474
	(0.01)***	(0.01)***	(0.04)	(0.04)	(0.39)	(0.41)	
	[0.00]***	[0.00]***	[0.93]	[0.62]	[0.92]	[0.99]	
Log cortisol (with controls)	−0.00	−0.01	0.00	−0.01	0.38	0.26	1456
	(0.01)	(0.01)	(0.04)	(0.03)	(0.40)	(0.39)	
	[0.40]	[0.34]	[1.00]	[1.00]	[0.86]	[0.94]	
Psych Wellbeing Index (No Cortisol)	0.03	0.02	−0.04	−0.06	−0.19	0.12	1474
	(0.01)***	(0.01)***	(0.04)	(0.03)	(0.41)	(0.40)	
Psych Wellbeing Index (Cortisol)	0.03	0.02	−0.04	−0.05	−0.32	−0.01	1474
	(0.01)***	(0.01)***	(0.04)	(0.04)	(0.43)	(0.42)	
Joint test (p-value)	0.00***	0.00***	0.50	0.20	0.62	0.68	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, village mean wealth calculated from sample households but excluding an individual's own household, and village Gini coefficent calculated from sample households but excluding an individual's own household on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.5.4: Treatment Effects using Coefficient of Variation as Inequality Measure

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Coefficient of Variation Change	(6) Coefficient of Variation Change	(7) N
Happiness (WVS)	0.01	0.01	−0.00	−0.00	−0.12	−0.04	1474
	(0.00)***	(0.00)***	(0.03)	(0.03)	(0.12)	(0.10)	
	[0.01]***	[0.01]***	[1.00]	[1.00]	[0.80]	[0.97]	
Life satisfaction (WVS)	0.02	0.02	−0.08	−0.09	0.10	0.21	1474
	(0.00)***	(0.00)***	(0.05)*	(0.04)**	(0.16)	(0.16)	
	[0.00]***	[0.00]***	[0.38]	[0.15]	[0.88]	[0.70]	
Depression (CESD)	−0.01	−0.01	−0.01	−0.01	0.11	0.06	1474
	(0.01)**	(0.00)**	(0.04)	(0.04)	(0.17)	(0.16)	
	[0.03]**	[0.05]**	[1.00]	[1.00]	[0.88]	[0.97]	
Stress (Cohen)	−0.03	−0.03	0.04	0.06	0.19	0.13	1474
	(0.01)***	(0.01)***	(0.04)	(0.05)	(0.14)	(0.15)	
	[0.00]***	[0.00]***	[0.85]	[0.62]	[0.66]	[0.86]	
Log cortisol (with controls)	−0.00	−0.00	0.01	−0.01	0.06	0.02	1456
	(0.01)	(0.01)	(0.04)	(0.03)	(0.14)	(0.13)	
	[0.39]	[0.40]	[1.00]	[1.00]	[0.88]	[0.97]	
Psych Wellbeing Index (No Cortisol)	0.03	0.03	−0.05	−0.06	−0.12	−0.00	1474
	(0.00)***	(0.00)***	(0.04)	(0.04)	(0.16)	(0.16)	
Psych Wellbeing Index (Cortisol)	0.03	0.03	−0.04	−0.05	−0.14	−0.02	1474
	(0.00)***	(0.00)***	(0.05)	(0.04)	(0.16)	(0.16)	
Joint test (p-value)	0.00***	0.00***	0.45	0.15	0.35	0.36	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village coefficient of variation on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a 1 point increase in thatched village coefficient of variation. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.5.5: Treatment Effects based on HHs $<$ 1km (not villages)

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Mean Change Under 1km	(4) Mean Change Under 1km	(5) Gini Change Under 1km	(6) Gini Change Under 1km	(7) N
Happiness (WVS)	0.01	0.01	−0.03	−0.03	−0.22	−0.21	1426
	(0.00)***	(0.00)***	(0.02)	(0.02)	(0.28)	(0.27)	
	[0.00]***	[0.00]***	[0.59]	[0.47]	[0.90]	[0.90]	
Life satisfaction (WVS)	0.02	0.02	0.00	−0.00	0.01	−0.03	1426
	(0.00)***	(0.00)***	(0.02)	(0.02)	(0.26)	(0.26)	
	[0.00]***	[0.00]***	[0.88]	[0.92]	[0.99]	[1.00]	
Depression (CESD)	−0.01	−0.01	0.06	0.07	0.07	0.00	1426
	(0.00)**	(0.00)**	(0.02)**	(0.02)***	(0.28)	(0.28)	
	[0.05]*	[0.03]**	[0.09]*	[0.04]**	[0.99]	[1.00]	
Stress (Cohen)	−0.02	−0.02	0.02	0.03	0.05	0.06	1426
	(0.01)***	(0.01)***	(0.02)	(0.02)	(0.28)	(0.27)	
	[0.00]***	[0.00]***	[0.71]	[0.49]	[0.99]	[1.00]	
Log cortisol (with controls)	−0.00	−0.00	0.01	0.01	0.59	0.65	1408
	(0.00)	(0.00)	(0.02)	(0.02)	(0.29)**	(0.29)**	
	[0.40]	[0.38]	[0.87]	[0.87]	[0.17]	[0.14]	
Psych Wellbeing Index (No Cortisol)	0.03	0.03	−0.04	−0.05	−0.14	−0.13	1426
	(0.00)***	(0.00)***	(0.02)*	(0.02)**	(0.28)	(0.27)	
Psych Wellbeing Index (Cortisol)	0.03	0.03	−0.04	−0.05	−0.33	−0.33	1426
	(0.00)***	(0.00)***	(0.02)*	(0.02)**	(0.28)	(0.27)	
Joint test (p-value)	0.00***	0.00***	0.19	0.10*	0.46	0.36	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, mean wealth of sample households living within 1 km, and Gini coefficient of sample households liviing within 1 km on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the household. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in sample mean wealth of households living within 1 km. Columns (5) and (6) report the effect of a 1 point increase in Gini coefficient calculated from households living within 1 km. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.5.6: Subtracting out the Effect of Change in Own Wealth

	(1) Village Mean Change	(2) Village Mean Change	(3) Gini Change	(4) Gini Change	(5) N
Happiness (WVS)	0.01	0.01	−0.32	−0.14	1474
	(0.04)	(0.03)	(0.34)	(0.28)	
	[0.98]	[0.92]	[0.88]	[0.97]	
Life satisfaction (WVS)	−0.06	−0.08	0.14	0.38	1474
	(0.05)	(0.04)*	(0.47)	(0.45)	
	[0.63]	[0.33]	[0.92]	[0.91]	
Depression (CESD)	−0.02	−0.02	0.26	0.10	1474
	(0.04)	(0.04)	(0.46)	(0.46)	
	[0.98]	[0.92]	[0.90]	[0.97]	
Stress (Cohen)	0.01	0.03	0.38	0.21	1474
	(0.04)	(0.05)	(0.42)	(0.45)	
	[0.98]	[0.92]	[0.88]	[0.97]	
Log cortisol (with controls)	0.00	−0.01	0.16	0.06	1456
	(0.04)	(0.03)	(0.40)	(0.39)	
	[0.98]	[0.92]	[0.92]	[0.97]	
Psychological Wellbeing Index	−0.01	−0.02	−0.38	−0.08	1474
	(0.05)	(0.04)	(0.50)	(0.47)	
Joint test (p-value)	0.57	0.29	0.70	0.79	
Includes controls	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village coefficient of variation on measures of psychological wellbeing. Outcome variables are listed on the left. Measures of happiness, life satisfaction, stress, depression and cortisol are standardized by subtracting baseline sample mean and dividing by the baseline standard deviaion. Other variables are weighted-average indices, both including and excluding cortisol, with higher values corresponding to "positive" outcomes. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. FWER-corrected p-values are shown in brackets for all variables except the indicies. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

A.6 Additional outcome variables

Table A.6.1: Full Psych Variable Results

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Happiness (WVS)	0.01	0.01	−0.00	0.00	−0.35	−0.17	1474
	(0.00)***	(0.00)***	(0.03)	(0.03)	(0.34)	(0.28)	
	[0.80]	[0.84]	[0.86]	[0.72]	[0.82]	[0.95]	
Life satisfaction (WVS)	0.02	0.02	−0.08	−0.09	0.11	0.34	1474
	(0.00)***	(0.00)***	(0.05)*	(0.04)**	(0.47)	(0.45)	
	[0.05]*	[0.03]**	[0.46]	[0.41]	[0.42]	[0.10]	
Depression (CESD)	−0.01	−0.01	−0.01	−0.01	0.29	0.13	1474
	(0.00)**	(0.00)**	(0.04)	(0.04)	(0.46)	(0.46)	
	[0.13]	[0.21]	[0.86]	[0.72]	[0.76]	[0.89]	
Stress (Cohen)	−0.03	−0.03	0.03	0.06	0.43	0.26	1474
	(0.01)***	(0.01)***	(0.04)	(0.05)	(0.42)	(0.45)	
	[0.00]***	[0.01]***	[0.56]	[0.41]	[0.82]	[0.95]	
Log cortisol (with controls)	−0.00	−0.00	0.01	−0.01	0.17	0.07	1456
	(0.01)	(0.01)	(0.04)	(0.03)	(0.40)	(0.39)	
	[0.80]	[0.84]	[0.80]	[0.71]	[0.82]	[0.89]	
Optimism (Scheier)	0.01	0.01	−0.03	−0.03	0.09	0.05	1474
	(0.00)**	(0.00)**	(0.04)	(0.03)	(0.29)	(0.29)	
	[0.13]	[0.15]	[0.80]	[0.72]	[0.76]	[0.70]	
Psych Wellbeing Index	0.03	0.03	−0.04	−0.06	−0.38	−0.08	1474
	(0.00)***	(0.00)***	(0.04)	(0.04)	(0.47)	(0.46)	
Psych Wellbeing Index	0.03	0.03	−0.04	−0.05	−0.43	−0.14	1474
	(0.00)***	(0.00)***	(0.05)	(0.04)	(0.49)	(0.47)	
Joint test (p-value)	0.00***	0.00***	0.40	0.17	0.74	0.86	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on preferences. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.2: Effect on Preferences

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Impatience	−0.00	−0.00	−0.03	−0.06	−0.61	−0.28	1474
	(0.01)	(0.01)	(0.07)	(0.06)	(0.62)	(0.62)	
	[0.80]	[0.83]	[0.94]	[0.55]	[0.68]	[0.89]	
Decreasing impatience	0.01	0.01	0.03	0.08	−0.68	−0.83	1474
	(0.01)	(0.01)	(0.06)	(0.06)	(0.64)	(0.69)	
	[0.41]	[0.43]	[0.94]	[0.42]	[0.68]	[0.57]	
Risk aversion	0.01	0.01	−0.01	−0.02	−0.05	−0.05	1474
	(0.00)*	(0.00)*	(0.03)	(0.03)	(0.28)	(0.28)	
	[0.18]	[0.19]	[0.94]	[0.55]	[0.84]	[0.89]	
Joint test (p-value)	0.13	0.16	0.91	0.42	0.59	0.66	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on preferences. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.3: Effect on Consumption

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Food total (USD)	1.72	1.74	−5.56	−4.88	18.46	−7.61	939
	(0.45)***	(0.46)***	(3.12)*	(2.94)	(31.61)	(30.05)	
	[0.00]***	[0.01]***	[0.48]	[0.56]	[0.99]	[1.00]	
Alcohol (USD)	−0.11	−0.12	0.30	0.40	−0.04	−2.00	939
	(0.08)	(0.09)	(0.52)	(0.60)	(5.12)	(5.65)	
	[0.46]	[0.34]	[0.88]	[0.91]	[1.00]	[1.00]	
Tobacco (USD)	−0.02	−0.03	0.15	0.23	−0.14	−0.17	939
	(0.02)	(0.02)	(0.13)	(0.14)*	(1.46)	(1.51)	
	[0.46]	[0.34]	[0.80]	[0.56]	[1.00]	[1.00]	
Medical expenditure past month (USD)	0.18	0.17	−0.31	−0.39	5.43	0.14	939
	(0.10)*	(0.10)*	(0.54)	(0.65)	(6.42)	(6.51)	
	[0.26]	[0.34]	[0.88]	[0.91]	[0.97]	[1.00]	
Medical expenditure, children (USD)	0.03	0.03	0.29	0.19	2.17	0.37	837
	(0.06)	(0.06)	(0.46)	(0.49)	(4.54)	(4.41)	
	[0.63]	[0.67]	[0.88]	[0.91]	[0.99]	[1.00]	
Education expenditure (USD)	0.13	0.12	−0.42	−0.52	0.35	−0.35	939
	(0.05)**	(0.05)**	(0.27)	(0.30)*	(3.40)	(2.64)	
	[0.10]	[0.17]	[0.63]	[0.56]	[1.00]	[1.00]	
Social expenditure (USD)	0.19	0.21	−0.49	−0.45	−0.15	−2.25	939
	(0.05)***	(0.06)***	(0.22)**	(0.28)	(2.92)	(3.14)	
	[0.01]**	[0.01]**	[0.24]	[0.56]	[1.00]	[0.99]	
Other expenditure (USD)	1.19	1.23	−1.33	−1.34	21.65	9.82	939
	(0.19)***	(0.19)***	(1.29)	(1.37)	(13.49)	(13.76)	
	[0.00]***	[0.00]***	[0.82]	[0.85]	[0.64]	[0.99]	
Home repair (USD)	1.36	1.46	−0.58	−0.33	9.23	10.89	939
	(0.18)***	(0.18)***	(0.80)	(0.94)	(7.21)	(7.73)	
	[0.00]***	[0.00]***	[0.88]	[0.91]	[0.83]	[0.77]	
Non-durable expenditure (USD)	3.40	3.35	−7.93	−7.23	42.76	−2.56	939
	(0.68)***	(0.68)***	(4.33)*	(4.29)*	(46.77)	(42.91)	
	[0.00]***	[0.00]***	[0.44]	[0.56]	[0.95]	[1.00]	
Joint test (p-value)	0.00***	0.00***	0.03**	0.07*	0.76	0.94	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on measures of household monthly consumption at endline reported in USD PPP. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include household and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the household. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.4: Effect on Assets

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Value of non-land assets (USD)	31.93	34.44	−32.78	−36.05	−24.56	−93.00	939
	(3.48)***	(3.30)***	(18.27)*	(18.57)*	(206.13)	(187.63)	
	[0.00]***	[0.00]***	[0.34]	[0.26]	[0.93]	[0.94]	
Value of livestock (USD)	8.32	8.87	−8.80	−13.82	121.15	96.40	939
	(1.76)***	(1.80)***	(8.75)	(9.83)	(90.25)	(86.96)	
	[0.00]***	[0.00]***	[0.81]	[0.52]	[0.63]	[0.73]	
Value of durable goods (USD)	6.28	6.69	−8.76	−9.76	19.01	−14.18	939
	(1.05)***	(0.96)***	(5.42)	(5.33)*	(56.73)	(53.52)	
	[0.00]***	[0.00]***	[0.42]	[0.30]	[0.93]	[0.94]	
Value of savings (USD)	1.12	1.22	−0.53	−0.01	16.39	7.60	939
	(0.28)***	(0.29)***	(1.64)	(1.84)	(15.53)	(19.31)	
	[0.00]***	[0.00]***	[0.81]	[0.99]	[0.76]	[0.94]	
Land owned (acres)	0.02	0.02	0.06	0.14	−1.07	−1.61	939
	(0.02)	(0.02)	(0.10)	(0.11)	(1.02)	(1.06)	
	[0.46]	[0.45]	[0.81]	[0.52]	[0.76]	[0.50]	
Has non-thatched roof (dummy)	0.03	0.03	−0.02	−0.02	−0.29	−0.24	939
	(0.00)***	(0.00)***	(0.02)	(0.02)	(0.20)	(0.22)	
	[0.00]***	[0.00]***	[0.81]	[0.76]	[0.58]	[0.73]	
Joint test (*p*-value)	0.00***	0.00***	0.31	0.13	0.04**	0.41	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on measures of household endline assets reported in USD PPP. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include household and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the household. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.5: Effect on Labor and Enterprise

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Wage labor primary income (dummy)	0.00	0.00	0.01	0.01	−0.44	−0.51	939
	(0.00)	(0.00)	(0.02)	(0.02)	(0.19)**	(0.19)***	
	[0.99]	[0.99]	[0.91]	[0.89]	[0.13]	[0.05]**	
Own farm primary income (dummy)	0.00	0.00	0.02	0.03	0.10	0.18	939
	(0.00)	(0.00)	(0.03)	(0.03)	(0.33)	(0.31)	
	[0.99]	[0.99]	[0.86]	[0.62]	[0.94]	[0.90]	
Non-ag business primary income (dummy)	0.00	0.00	−0.02	−0.03	0.12	0.07	939
	(0.00)	(0.00)	(0.01)*	(0.02)*	(0.15)	(0.15)	
	[0.95]	[0.91]	[0.32]	[0.36]	[0.87]	[0.90]	
Total revenue, monthly (USD)	1.02	1.10	−6.11	−6.15	24.19	2.10	939
	(0.53)*	(0.58)*	(4.07)	(4.61)	(39.19)	(40.29)	
	[0.25]	[0.24]	[0.45]	[0.53]	[0.88]	[0.94]	
Total expenses, monthly (USD)	0.85	0.99	−5.62	−5.99	43.04	32.21	939
	(0.40)**	(0.44)**	(2.73)**	(2.82)**	(25.73)*	(27.01)	
	[0.21]	[0.15]	[0.23]	[0.19]	[0.37]	[0.68]	
Total profit, monthly (USD)	−0.09	−0.14	−0.82	−0.34	−6.40	−19.34	939
	(0.25)	(0.28)	(2.10)	(2.74)	(22.60)	(24.79)	
	[0.99]	[0.92]	[0.91]	[0.91]	[0.94]	[0.88]	
Joint test (p-value)	0.01**	0.00***	0.32	0.39	0.02**	0.00***	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on measures of household endline enterpise measures. Outcome variables are listed on the left. For measures of primary income source, outcomes are discrete, and thus coefficients report the increase in probability of that source being the household's main income source. Revenue, profit and expenses are measured per USD 100. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include household and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the household. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.6: Gender Violence

	(1) Own Wealth Change	(2) Own Wealth Change	(3) Village Mean Change	(4) Village Mean Change	(5) Gini Change	(6) Gini Change	(7) N
Physical violence (dummy)	-0.00	-0.00	-0.02	-0.02	0.00	0.04	698
	(0.00)	(0.00)	(0.03)	(0.02)	(0.23)	(0.24)	
	[0.79]	[0.63]	[0.61]	[0.59]	[0.99]	[1.00]	
Sexual violence (dummy)	-0.00	-0.00	-0.01	-0.01	0.04	0.08	698
	$(0.00)^{*}$	$(0.00)^{**}$	(0.01)	(0.02)	(0.15)	(0.16)	
	[0.33]	[0.13]	[0.61]	[0.59]	[0.99]	[0.94]	
Emotional violence (dummy)	0.00	0.00	-0.04	-0.04	0.03	0.02	698
	(0.00)	(0.00)	$(0.01)^{***}$	$(0.01)^{***}$	(0.15)	(0.15)	
	[0.43]	[0.40]	$[0.04]^{**}$	$[0.03]^{**}$	[0.99]	[1.00]	
Justifiability of violence (dummy)	-0.00	-0.00	-0.06	-0.04	0.29	0.16	698
	(0.00)	(0.00)	$(0.02)^{***}$	$(0.02)^{*}$	(0.22)	(0.20)	
	[0.79]	[0.63]	$[0.04]^{**}$	[0.31]	[0.65]	[0.88]	
Female empowerment index	0.01	0.01	0.16	0.16	-0.67	-0.82	698
	(0.01)	$(0.01)^{*}$	$(0.04)^{***}$	$(0.05)^{***}$	(0.57)	(0.57)	
Joint test (p-value)	0.06^{*}	0.07^{*}	0.00^{***}	0.01^{***}	0.74	0.90	
Includes controls	No	Yes	No	Yes	No	Yes	

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on preferences. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.7: Gender Violence

	(1) Own Wealth Change	(2) Village Mean Change from Transfers to Men	(3) Village Mean Change from Transfers to Women	(4) Gini Change	(5) p-value (2)=(3)	(6) N
Physical violence (dummy)	−0.00	−0.02	−0.03	0.05	0.85	698
	(0.00)	(0.03)	(0.02)	(0.24)		
	[0.73]	[0.71]	[0.58]	[0.99]		
Sexual violence (dummy)	−0.00	−0.01	−0.02	0.08	0.41	698
	(0.00)**	(0.02)	(0.02)	(0.16)		
	[0.22]	[0.80]	[0.58]	[0.91]		
Emotional violence (dummy)	0.00	−0.04	−0.04	0.01	0.85	698
	(0.00)	(0.02)**	(0.02)**	(0.15)		
	[0.51]	[0.16]	[0.14]	[0.99]		
Justifiability of violence (dummy)	−0.00	−0.06	−0.03	0.15	0.26	698
	(0.00)	(0.03)**	(0.03)	(0.20)		
	[0.73]	[0.16]	[0.58]	[0.91]		
Female empowerment index	0.01	0.15	0.17	−0.83	0.75	698
	(0.01)*	(0.05)***	(0.05)***	(0.57)		
Joint test (p-value)	0.07*	0.02**	0.04**	0.92		

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on preferences. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.6.8: Gender Violence

	(1) Own Wealth Change	(2) Village Mean Change from Transfers to Men	(3) Village Mean Change from Transfers to Women	(4) Gini Change	(5) *p*-value (2)=(3)	(6) N
Happiness (WVS)	0.01	−0.00	0.01	−0.18	0.81	1474
	(0.00)***	(0.04)	(0.03)	(0.28)		
	[0.00]***	[0.98]	[0.96]	[0.99]		
Life satisfaction (WVS)	0.02	−0.16	−0.05	0.26	0.02**	1474
	(0.00)***	(0.05)***	(0.04)	(0.41)		
	[0.00]***	[0.02]**	[0.70]	[0.99]		
Depression (CESD)	−0.01	0.02	−0.02	0.14	0.49	1474
	(0.01)**	(0.05)	(0.04)	(0.45)		
	[0.05]*	[0.98]	[0.93]	[0.99]		
Stress (Cohen)	−0.03	0.04	0.06	0.26	0.75	1474
	(0.01)***	(0.06)	(0.05)	(0.44)		
	[0.00]***	[0.90]	[0.70]	[0.99]		
Log cortisol (with controls)	−0.00	−0.01	−0.01	0.06	0.88	1456
	(0.01)	(0.05)	(0.04)	(0.38)		
	[0.42]	[0.98]	[0.96]	[0.99]		
Psychological Wellbeing Index	0.03	−0.08	−0.03	−0.18	0.21	1474
	(0.00)***	(0.05)	(0.04)	(0.45)		
Joint test (*p*-value)	0.00***	0.02**	0.62	0.78		

Notes: OLS estimates of the effect of changes in own wealth, thatched village mean wealth, and thatched village inequality on preferences. Outcome variables are listed on the left. For each outcome variable, we report the coefficients of interest and their standard errors in parentheses. Standard errors are clustered at the village level. Columns (1) and (2) report the effect of a USD 100 increase in own household wealth. Column (3) and (4) report the effect of a USD 100 increase in village mean wealth. Columns (5) and (6) report the effect of a increase in thatched village Gini coefficient from 0 to 1. Columns (2), (4) and (6) include individual and village-level baseline control variables. Column (7) reports the sample size. The unit of observation is the individual. The second to last row shows joint significance of the coefficients in the corresponding column from SUR estimation. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

A.7 Construction of indices

We construct indices for several of our groups of outcome variables. To this end, we follow the procedure proposed by Anderson (2008), which is reproduced below:

First, for each outcome variable y_{jk}, where j indices the outcome group and k indices variables within outcome groups, we re-code the variable such that high values correspond to positive outcomes.

We then compute the covariance matrix $\hat{\mathbf{\Sigma}}_{\mathbf{j}}$ for outcomes in outcome group j, which consists of elements:

$$\hat{\Sigma}_{jmn} = \sum_{i=1}^{N_{jmn}} \frac{y_{ijm} - \bar{y}_{jm}}{\sigma^y_{jm}} \frac{y_{ijn} - \bar{y}_{jn}}{\sigma^y_{jn}} \tag{6}$$

Here, N_{jmn} is the number of non-missing observations for outcomes m and n in outcome group j, $\bar{y}_{jm}$ and $\bar{y}_{jn}$ are the means for outcomes m and n, respectively, in outcome group j, and σ^y_{jm} and σ^y_{jn} are the standard deviations in the pure control group for the same outcomes.

Next, we invert the covariance matrix, and define weight w_{jk} for each outcome k in outcome group j by summing the entries in the row of the inverted covariance matrix corresponding to that outcome:

$$\hat{\mathbf{\Sigma}}_{\mathbf{j}}^{\mathbf{-1}} = \begin{bmatrix} c_{j11} & c_{j12} & \cdots & c_{j1K} \\ c_{j21} & c_{j22} & \cdots & \cdots \\ \vdots & \vdots & \ddots & \ddots \\ c_{jK1} & \vdots & \ddots & c_{jKK} \end{bmatrix} \tag{7}$$

$$w_{jk} = \sum_{l=1}^{K_j} c_{jkl} \tag{8}$$

Here, K_j is the total number of outcome variables in outcome group j. Finally, we transform each outcome variable by subtracting its mean and dividing by the control group standard deviation, and then weighting it with the weights obtained as described above. We denote the result $\hat{y}_{ij}$ because this transformation yields a generalized least squares estimator (Anderson 2008).

$$\hat{y}_{ij} = \left(\sum_{k \in \mathbb{K}_{ij}} w_{jk} \right)^{-1} \sum_{k \in \mathbb{K}_{ij}} w_{jk} \frac{y_{ijk} - \bar{y}_{jk}}{\sigma^y_{jk}} \tag{9}$$

Here, $\mathbb{K}_{ij}$ denotes the set of non-missing outcomes for observation i in outcome group j.

A.8 Family-wise Error Rate

We adjust the p-values of our coefficients of interest for multiple statistical inference. To this end, we proceed as follows, reproduced again from Anderson (2008). A similar procedure is described in Lee & Shaikh (2013) and Romano & Wolf (2005).

First, we compute naïve p-values for all index variables $\hat{y}_j$ of our j main outcome groups, and sort these p-values in ascending order, i.e. such that $p_1 < p_2 < \cdots < p_J$.

Second, we follow Anderson's (2008) variant of Efron & Tibshirani's (1993) non-parametric permutation test: for each variable $\hat{y}_j$ of our j main outcome groups, we randomly permute the treatment assignments across the entire sample, and estimate the model of interest to obtain the p-value for the coefficient of interest. We enforce monotonicity in the resulting vector of p-values $[p_1^*, p_2^*, \cdots p_J^*]'$ by computing $p_r^{**} = \min\{p_r^*, p_{r+1}^*, \cdots p_J^*\}$, where r is the position of the outcome in the vector of naïve p-values.

We then repeat this procedure 10,000 times. The non-parametric p-value, p_r^{fwer*}, for each outcome is the fraction of iterations on which the simulated p-value is smaller than the observed p-value. Finally we enforce monotonicity again: $p_r^{fwer} = \min\{p_r^{fwer*}, p_{r+1}^{fwer*}, \cdots p_J^{fwer*}\}$. This yields the final vector of family-wise error-rate corrected p-values. We will report both these p-values and the naïve p-values.