THREE ESSAYS ON POVERTY, INCOME SHOCKS, AND DECISION MAKING: EVIDENCE FROM MALAWI AND ZAMBIA

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ABSTRACT

Adria Molotsky: Three Essays on Poverty, Income Shocks, and Decision-Making: Evidence from Malawi and Zambia
(Under the direction of Sudhanshu Handa)

This dissertation contributes to the literature on decision-making under poverty by empirically examining the relationship between income poverty and the decisions that households make due to shocks. This dissertation is composed of three essays attempting to identify ways policy can be used to influence the trajectory of poverty for generations to come. Each chapter focuses on gaining a deeper understanding of the decision-making processes of households and individuals living in poverty. In the first essay, I identify the indirect impact of the Malawi Social Cash Transfer Program on youths' present bias, by examining the intergenerational transmission of such bias within the household from caregivers to youth. The second essay is focused on negative income shocks and marriage outcomes for youth in rural Malawi. The paper utilizes survey data from a cohort of unmarried youth and follows them over three years as they transition into and out of relationships, identifying the influence negative shocks have on these outcomes. In the final essay, I show the impacts of the Malawi Social Cash Transfer Program and the Zambia Child Grant Program on stress and affect, and, subsequently, whether these psychological indicators affect savings and intertemporal choices.

To my grandfather Leonard, the original Dr. Molotsky;
Thank you for instilling in me your sense of humor and passion for learning.

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LIST OF ABBREVIATIONS

CGP	Child Grant Program
CWAC	Community Welfare Assistance Committees
DD	Difference-in-differences
DU	Discounted utility
EA	Enumeration Areas
FE	Fixed effect
GDP	Gross domestic product
HIV	Human Immunodeficiency Virus
IHS2	Second Integrated Household Survey
IPV	Intimate partner violence
IV	Instrumental variables
LPM	Linear probability model
MRS	Marginal rate of substitution
MTM	Marriage Transitions in Malawi
MWK	Malawi Kwacha
NS	Non-self
NSA	National Survey of Adolescents
OLS	Ordinary least squares
pp	Percentage point
PSS	Perceived Stress Scale
PSSS	Perceived Social Support Scale
RCT	Randomized Controlled Trial
SCTP	Social Cash Transfer Program
SWB	Subjective well-being
TA	Traditional Authority
UCT	Unconditional cash transfer
UNDP	United Nations Development Program

UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
VC	Village Cluster

CHAPTER 1: INTRODUCTION

Malawi is one of the poorest countries in the world with nearly half of its 18 million citizens surviving on less than a dollar a day (UNICEF, 2003; World Bank, 2017). In fact, the UNDP ranked Malawi the 18th least developed country in 2017. Moreover, about 30% of the country's GDP stems from agricultural production, and 90% of the population lives in rural areas relying on subsistence agriculture, leaving the majority of the citizenry vulnerable to weather-related shocks such as droughts and floods as well as changes in crop prices (World Bank, 2007, 2017). Even though strides have been made to improve the economic and non-economic development outcomes of the country, Malawi still lags behind the majority of other countries in Sub-Saharan Africa, especially among those that are similar in geography and demography (IMF, 2017). What are some of the ways in which we can improve the livelihoods of individuals living in Malawi and other such underdeveloped countries in Sub-Saharan Africa and the world? How can we design effective policies and programs that enable these individuals and households to pull themselves out of poverty?

Individuals and families living in poverty constantly struggle to make ends meet and are more apt to face negative income shocks and make short-sighted decisions. This is particularly true in Malawi where these phenomena are exacerbated by the lack of infrastructure and high-income inequality which are rampant throughout the developing world. Even more concerning is the strain placed on these already under-resourced communities by diseases such as HIV. According to the literature, the root of the issue stems from the economic hardship of

impoverished households, and their limited access to cash and credit which, in turn, limits their productive abilities and investment in other income-generating activities (e.g., Pitt, Khandker, & Bank, 2001; Kazianga & Udry, 2005). Moreover, these economic barriers have been shown to hinder the human capital and capabilities development of not only the household heads, but that of their children as well which enables the vicious cycle of poverty to repeat for subsequent generations.

My dissertation is composed of three papers attempting to identify ways policy can be used to influence the trajectory of poverty for generations to come. Each chapter focuses on gaining a deeper understanding of the decision-making processes of households and individuals living in poverty: from discerning what causes people to make short-sighted decisions to how the circumstances faced by such households rationalize the subsequent decisions that are made. Taken together, these three essays explore why and how the cycle of poverty is perpetuating itself, and identify ways interventions, particularly cash transfer programs, can be used to mitigate the intergenerational transmission of poverty. This dissertation consists of three essays addressing these objectives:

Essay One

This essay examines the intergenerational transmission of time discounting within the household. Time discounting denotes the importance an individual assigns to consumption and gratification in the present versus the future (Frederick, Loewenstein & O'Donoghue, 2002). As such, time preferences are a key determinant of the decision-making process relating to everything from human capital investment decisions to financial decisions, the uptake of risky behaviors, and even subjective well-being. Using data from 1,728 youth-caregiver pairs from the evaluation of the Malawi Social Cash Transfer Program (SCTP), this study exploits the random

assignment of treatment and the change in caregivers' discounting to exogenously predict youth's discounting at endline using an instrumental variables approach. I find evidence to support the overall transmission of time discounting within the household, and stronger effects for females, older youth, and youth with female caregivers.

Essay Two

This essay is motivated by the ever-increasing prevalence of negative shocks experienced by poor, vulnerable households in Malawi, and the often-extreme measures they take to recover from their negative income effects. One potential coping mechanism households may use, particularly in patrilineal households, is child marriage. Therefore, this study examines whether youth in households experiencing a negative shock are more likely to get married than those whose households did not experience a shock based on the lineage system to which their family belongs. I show that marrying off daughters is, in fact, a coping mechanism used by households after experiencing a shock and is more likely used by patrilineal households. These effects are strongest for girls who are already out-of-school compared to those currently attending school. Conversely, I find no significant effect for males. Additionally, I find suggestive evidence of an increased likelihood of girls engaging in transactional sexual relationships after a shock as an individual-level coping mechanism. Understanding the underlying mechanisms leading to the increased incidence of child marriages and transactional sex provides valuable information for policymakers aiming to combat such practices.

Essay Three

Individuals living in poverty are often less likely to save and plan for the future opting instead to focus their attention on the more pressing needs of today thus perpetuating the condition of poverty. Additionally, poverty affects one's psychological well-being by triggering

stress and negative emotional states, and laboratory results suggest that stress and negative emotion may influence time discounting. We show that results from laboratory experiments hold in the field by examining the effect of the Malawi SCTP and the Zambia Child Grant Program (CGP) on stress and affect, and, subsequently, whether these psychological indicators affect savings and intertemporal choices. The programs are found to significantly impact positive affect and to reduce stress. Moreover, stress and affect are predictive of savings and waiting for future money. The results indicate that the psychological toll of poverty has a direct effect on economic decisions, which then reinforce poverty. There remains a need to understand the mechanisms through which psychological well-being influences economic decision-making in field settings.

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CHAPTER 2: THE INTERGENERATIONAL TRANSMISSION OF TIME DISCOUNTING: EVIDENCE FROM THE MALAWI

Introduction

It is often assumed that people living in poverty make certain decisions because of their differing preference structure compared to those living more affluent lives (e.g., limited investments in education or healthcare, lack of savings). These perceived 'bad' choices are commonly associated with perpetuating the cycle of poverty. Researchers have sought to determine the mechanisms underlying these intertemporal choices, such as time discounting. According to Frederick, Loewenstein & O'Donoghue (2002), time discounting denotes any reason an individual assigns more importance to consumption and gratification in the present versus the future. It is a key determinant of the decision-making process relating to everything from human capital investment decisions to the uptake of risky behaviors, financial decisions, and even subjective well-being (Falk et al., 2013; Frederick, Loewenstien & O'Donoghue, 2002; Martorano et al., 2015; Tanaka, Camerer, & Nguyen, 2010). Time discounting includes one's actual discount rate applied to decisions which is indicative of one's more general time preference – simply a person's preference for consumption today versus in the future. Higher time discounting causes an individual to shift consumption to the present at the expense of the future, and results in individuals being less willing to invest in activities with high costs and limited benefits accrued today, even if they yield substantial future benefits (Bradford, Dolan & Galizzi, 2014).

This phenomenon partly explains the limited investments in human capital seen in poor households as they do not prioritize the need for investing in education, for example, - the payoffs of which may not materialize for years into the future and which seem uncertain – when making intertemporal choices related to their children (Bradford, 2010; Lang & Ruud, 1986). Instead, these households often opt for sending their children to work to make a wage that will be realized in the much shorter term. Unfortunately, this intertemporal tradeoff has resulted in lower than desired human capital investment in poor households, especially among those in the developing world.

The discourse surrounding the intergenerational transmission of poverty tends to focus exclusively on limited human capital investment as the basis for continued poverty amongst future generations positing that increasing the educational attainment and/or improving health-seeking behaviors are the only means by which to break this cycle (e.g., Bird, 2007 or Moore, 2001). While this pathway has been thoroughly studied, I contend it alone is insufficient to explain the intergenerational transmission of poverty, and suggest a new pathway enter the discussion – the intergenerational correlation in intertemporal choice. This study investigates this proposed new channel by examining whether caregiver's time discounting is transmissible to youth in the household by exploiting data from the evaluation of the Malawi SCTP.

The Malawi SCTP is an unconditional cash transfer (UCT) program implemented by the Government of Malawi in partnership with UNICEF. UCTs represent an ever-growing policy tool used throughout Sub-Saharan Africa to change behaviors and break the cycle of poverty. Governments and practitioners across the developing world have started focusing their efforts on increasing the ability for extremely poor households to smooth their consumption and alter their decision-making behaviors over time by introducing additional no-strings-attached income

through such UCT programs. The main objectives of Malawi's SCTP are to decrease poverty and hunger, and to increase school enrollment for children – each of which necessitates beneficiaries making intertemporal decisions (Handa et al., 2014). The presence of strong impacts of the SCTP on indicators related to its main objectives absent conditions required to receive the payments implies that there is some inherent shift in beneficiaries' thinking which enables them to be more future oriented. Similar research shows that the SCTP has a significant effect on reducing myopia in beneficiaries (caregivers) by making them more patient (Handa & Molotsky, n.d.). Understanding an individual's time discounting helps to understand how intertemporal choices are made, and, more importantly, if time discounting is transmissible within the household, it opens the door to new policy options for breaking the cycle of poverty.

Changing the time discounting of poor individuals may be one way to break the cycle of poverty by enabling them to devote more attentional resources to the future, and give more equal weight to benefits realized today and those received in the future. As such, I examine the relationship of two keys aspects of time discounting (henceforth simply referred to as 'discounting') – an individual's discount rate and their marginal rate of substitution (MRS) – between caregivers and youth. These measures of discounting are assessed through a hypothetical intertemporal choice task administered to both caregivers and youth. In this study, I begin by examining the factors influencing youth's discounting finding that caregiver's contemporaneous endline discount rate, youth's age, and youth's sex are some of the main determinants of discounting for youth. However, these estimates are likely biased due to endogeneity occurring at the household-level affecting both caregiver's and youth's discounting. Therefore, I implement an instrumental variables (IV) approach to address this situation using both random assignment to treatment and lagged differences in caregiver's discounting outcomes

as instruments. The results of the IV analysis lend support to the hypothesis of the intergenerational correlation in discounting within the household. I further examine this relationship by assessing differential effects based on the sex and age of youth, sex of the caregiver, and caregiver-youth pairs in terms of both sex and relationship. In general, females spend more time in the home, so I hypothesize the relationship should be stronger for female youth as well as youth with female caregivers. Similarly, I assert that older youth have witnessed more of their caregivers' decision-making, and are more apt to be making intertemporal choices of their own so they too will realize a stronger association. In line with these hypotheses, I find a stronger relationship for female youth as compared to their male counterparts. Similarly, female-headed households exhibit higher rates of intergenerational correlation as compared to male-headed households. Lastly, I find parent-child pairs and grandparent-grandchild pairs produce the only significant results in terms of the relationship between caregivers and youth in the household.

Finally, I test for the moderation effect of caregiver socialization (defined as effort on the part of the caregiver to interact with the youth). The results show no clear pattern in greater socialization being indicative of a stronger relationship between caregiver's and youth's discounting. On the whole, I find caregiver's discounting to be highly correlated with that of the youth in their household, and find evidence suggesting discounting is malleable at the household-level. This suggests that a new pathway potentially exists to break the cycle of poverty for subsequent generations.

Background and Significance

Discounting and Safe Transitions to Adulthood

Discounting and patience (the ability to delay gratification) are found to be empirically linked to educational attainment, cognitive functioning, health behaviors, and economic outcomes later in life. The most famous evidentiary support for this claim stems from Mischel, Shoda & Rodriguez's 1989 study of delayed gratification in kindergarteners colloquially known as "the marshmallow test." Children that were able to delay gratification by waiting for a higher future payoff (in the form of marshmallows) were found to have higher standardized test scores in the future. While results from the marshmallow test served as the impetus for many subsequent studies examining the link between patience and future life outcomes, it has also been met with skepticism. Critics contend that children's patience derived through such methods represents not only their self-control and ability to delay gratification, but also their views on the stability of the world (Kidd, Palmeri & Aslin, 2012; Ferdman, 2016; Sturge-Apple et al., 2016). In other words, context matters, and one's environment may influence how they perform in these games; poorer children who opt for the immediate reward might be displaying rational decision-making based on their learned behaviors related to living in scarcity rather than impulsiveness. Even so, similar studies of individual discount rates have shown their ability to foretell student achievement with lower discount rates being predictive of both higher grades and test scores (Benjamin, Brown & Shapiro, 2013; Duckworth & Seligman, 2005; Kirby, Winston & Santiesteban, 2005).

Not only is time discounting associated with educational attainment, but also with one's employment outcomes. Firstly, educational attainment is known to be an indicator of employment outcomes with higher levels of education having a direct, positive relationship with

employment and wages (e.g., Becker, 1964). Moreover, evidence supports the notion that employment decisions represent important intertemporal choices individuals must make that are reflective of one's discount rate. Multiple studies have identified a relationship between discounting and workers opting for immediate temporary or lower quality employment over higher paid, more stable options that are not available until later (Dohmen et al., 2011; Hesketh, Watson-Brown & Whiteley, 1998; Lee & Ohtake, 2012; Saunders & Fogarty, 2001; Schoenfelder & Hantula, 2003).

Discounting is also intricately linked with decisions related to health outcomes including smoking, drinking, unhealthy eating, and uptake of preventive services. Decisions surrounding health behaviors offer prime examples of intertemporal tradeoffs as they most often entail the choice between a consequence realized today in exchange for some future benefit. For instance, foregoing a cigarette and its associated utility today will likely lead to a healthier, more productive life twenty years from now. Relatedly, receiving a small pox vaccine today will significantly reduce one's chance of developing the disease in the future at the cost of unpleasantness of the injection and potential side effects today. Relationships between discounting and health outcomes have been found for a variety of addictive behaviors (Dohmen et al., 2011; MacKillop et al., 2011; Yi, Mitchell & Bickel, 2010), use of preventative care (Chapman et al., 2001; Urminsky, 2014), and BMI levels (Adams & Nettle, 2009; Bishai, 2005; Chabris et al., 2008; Urminsky, 2014).

Furthermore, higher education and uptake of health services has been shown to promote healthier transitions to adulthood by reducing the likelihood of early marriage and early pregnancy, increasing the age of sexual debut, and reducing the risk of HIV infection, all of which have been linked to increased future well-being and productivity, especially for females

(Jewkes et al., 2001; Bearainger et al., 2007; Jain & Kurz, 2007; Handa et al., 2015). As such, these relationships signify substantial implications for the intergenerational transmission of discounting especially in poorer households.

Intergenerational Transmission of Preference Traits

The past two decades have seen an influx of empirical studies devoted to assessing the extent to which parents are able to shape the preferences, traits, and decision making of their children. Generally, these studies have found strong correlations between parents' preference traits and those of their children with few exceptions. Children's generosity (Wilhelm et al., 2008), risk and trust attitudes (Alan et al., 2017; Dohmen et al., 2012; Zumbuehl, Dohmen & Pfann, 2013), time preferences (Gouskova et al., 2010), attitude towards women working (Escriche, Olcina & Sanchez, 2004), preferences for leisure activities (Volland, 2013), preferences for volunteering (Bekkers, 2007), culture (Bisin & Verdier, 2001), and values (Schonpflug, 2001) are all shown to be malleable with respect to their parents' preferences. Conversely, Bettinger & Slonim (2007) studied the relationship between the discount rate of children and their parents and boast the only study which found no evidence of intergenerational correlations. However, their analysis relied on a small sample with just under 200 child-parent pairs so their study may not have been able to detect a meaningful relationship. In general, there is substantial evidence supporting the correlation in preferences between the generations within families.

One of the main factors influencing the intergenerational transmission of traits is direct socialization or the effort put forth by parents to socialize their children to their particular preference set (Bisin & Verdier, 2001; Dohmen et al., 2012). The assumption that parents attain utility from their children exhibiting similar preferences and traits is key for rationalizing this

notion. This conclusion gives voice to the age-old nature-versus-nurture conundrum for child development implying a role for nurture in preference development. In the literature, the only substitute for direct socialization is oblique socialization which pertains to the influence of other adults in the child's environment affecting the child's preferences assuming some influence is necessitated for children to form their own preferences (Dohmen et al., 2012). Bisin & Verdier (2001) developed a theoretical model portraying these socialization pathways which will be further discussed in the following section.

Theory

Behavioral economics combines the disciplines of economics and psychology to better understand the complexities and nuances of human decision-making and actions. The field stems from the seminal work of Kahneman and Tversky (1979) on prospect theory which theorizes that people's choices made under risk do not align with traditional expected utility theory. Likewise, most classic economic models assume that individuals are rational actors, but often, a person's actions do not mirror what theory predicts. Perhaps the most sought-after answers relate to how and why individuals' decision-making deviates from these models in the real world even when living under the same or similar circumstances (Anderson & Stamoulis, 2006).

In order to better understand the mechanisms of intertemporal choice, Samuelson (1937) proposed the widely touted discounted utility (DU) model which simplifies everything into a single parameter known as the discount rate. Generally speaking, the DU model suggests that an individual derives utility from receiving money or goods, but if they are received in the future, the individual applies some discount factor, f, defined by the discount rate, r, which varies in

regards to the time horizon, *t*.[1] Therefore, an individual's intertemporal choice is based off the comparison of the utility they derive from reception of the good today versus in the future.

To model the intergenerational transmission of preferences and traits, Bisin and Verdier (2001) proposed a theory of cultural transmission and preference evolution focused on socialization within and without the household. Succinctly, the Bisin and Verdier model suggests that children's preferences are acquired through imitation and adaptation dependent upon socialization, whether direct, d^i, (from parent to child) or oblique, $1 - d^i$, (from a peer). Parents can directly affect the socialization of their children through their own effort, τ, (e.g., time spent with child) which comes at a cost, C(τ), or children can imitate their peers in the community.[2] Parents are assumed to prefer to socialize their child to their own preference set to improve their own utility as well as their child's future welfare.

More explicitly, in a community with two traits *i* and *j*, parents choose to maximize[3]:

$$u^i(x^i) - C(\tau^i) + (P^{ii}V^{ii} + P^{ij}V^{ij}) \tag{1}$$

subject to

$$P^{ii} = d^i(q^i) + \left(1 - d^i(q^i)\right)q^i \tag{2}$$

$$P^{ij} = \left(1 - d^i(q^i)\right)(1 - q^i) \tag{3}$$

[1]Samuelson (1937) models the influence of the discount factor on utility as $U_0 = f(t)U_t$, and the discount factor as a function of the discount rate as $f(t) = \frac{1}{(1+r)^t}$.

[2]The terms "parents" and "children" are used for ease of comprehension, but for the purposes of this study relate to the household caregiver and household youth regardless of relationship status.

[3]The Bisin & Verdier model assumes families are composed of one child and one parent in a community with two potential traits, *i* and *j*, and that children are born without defined preferences or traits (2001). Rather, preferences and traits are only obtained through socialization.

(4) $$d^i = D(\tau^i, q^i)$$

Equation (1) represents the expected lifetime gains of a parent with trait *i* minus the costs associated with the concerted effort to socialize their child to the same *i* trait. It is dependent upon the utility the parent derives from the likelihood their child is socialized to the same trait ($P^{ii}V^{ii}$) or a different trait ($P^{ij}V^{ij}$), where P^{ii} denotes the probability that the child is socialized to trait *i*, P^{ij} the probability they are socialized to trait *j*, and V^{ii} represents the utility the parent obtains from having a type *i* child, while V^{ij} is the utility for having a type *j* child. Equation (2) and (3), thus, represent the production functions of the probability that a child from a parent with trait *i* is socialized to trait *i* or trait *j*, respectively. These probabilities are, subsequently, a function of the inherent probabilities that a child receives direct socialization $d^i(q^i)$ versus oblique socialization $1 - d^i(q^i)$ each of which depends upon the fraction of the population with trait *i* represented by q^i. Finally, Equation (4) illustrates that the production function of direct socialization is based on parental socialization effort, and the proportion of the community with trait *i.* As such, parental socialization acts as a moderator which strengthens the transmission of preferences and traits from parent to child.

Using the discount rate obtained in accordance with the DU model, this paper will attempt to test Bisin and Verdier's theory by ascertaining whether parental socialization has any influence over the strength of the transmission of discounting from caregiver to youth. I will test this proposed moderator using familial support indicators as proxies for direct socialization efforts on the part of the caregivers.

Malawi Social Cash Transfer Program

Program Design

The Malawi SCTP is an UCT program targeted to ultra-poor, labor-constrained households administered by the Ministry of Gender, Children and Social Welfare.[4] The program began as a pilot in the Mchinji district in 2006, was expanded to an additional eight districts out of 28 total districts by 2009 and was further expanded starting in 2014 to reach a total of 18 districts and over 163,000 beneficiary households (Handa et al., 2016). Beneficiary households receive bimonthly payments of varying amounts depending on household size and the number of primary and secondary school-aged children in the home. By endline, the average monthly per capita transfer amount received by beneficiary households was equivalent to US$1.25 a month or about US$60 per household annually. Payments are made in cash every other month through a local pay-point manager to the main beneficiary, and there are no conditions to receive the money. Payments represent approximately 20 percent of pre-program consumption for beneficiary households. The overarching objective of the SCTP is to reduce extreme poverty and hunger, and to increase school enrollment among the ultra-poor.

Malawi SCTP Study Design

The evaluation study was designed around the Government of Malawi's plans to extend and expand coverage of the SCTP starting in 2014. Two districts, Salima and Mangochi, were chosen to align the evaluation with the expansion plans. Randomization took place at multiple

[4]The SCTP Operations Manual defines ultra-poor as a household that is unable to meet the most basic urgent needs, including food and essential non-food items such as soap and clothing, while labor constrained refers to a household with a dependency ratio (ratio of 'fit to work' to 'not fit to work') of more than three or with no individuals who are fit to work. An individual who is considered not fit to work is someone under the age of 18, over the age of 64, or within the age range 18 to 64 but suffering from a chronic illness or disability or is otherwise unable to work (Handa et al. 2014).

levels within these two districts starting with Traditional Authorities (TAs) down to Village Clusters (VCs). Two TAs were randomly selected in each district to participate in the study, and 29 VCs within the TAs were randomly assigned to either the treatment or delayed-entry control arm. Prior to treatment assignment, a list of eligible households within each VC was created based on a targeting procedure designed by the Government of Malawi. This process resulted in a final sample of 3,531 households – 1,678 in the 14 treatment VCs and 1,853 in the 15 delayed-entry control VCs. For additional details on the sampling procedure and power calculations to determine optimal sample size, see the publicly available study baseline report (Handa et al. 2014).

The cluster-randomized, longitudinal study comprised multiple survey instruments including a household questionnaire, the main survey instrument, which covered a comprehensive list of topics including household composition, consumption, health, education, economic activity, time use, and subjective wellbeing, among others, an accompanying youth questionnaire, and a community survey. Surveys were administered in each of three rounds as follows: the baseline survey conducted mid-2013, the first follow-up survey conducted in late 2014 through early 2015, and the final follow-up survey conducted in late 2015.

Data

Sample

This present study uses data from all three waves of the household survey, and those from the endline youth survey. There was minimal attrition in follow-up rounds with 93.5% of baseline eligible households remaining in the sample at both midline and endline (Handa et al., 2016). No differential attrition was found across follow-up rounds indicating that baseline

balance between treatment and control groups was preserved (See Table 2.1 for baseline balance tables at the household level).

The youth questionnaire was administered to up to three youth in each household in each of the three rounds.[5] This instrument was targeted at youth aged 13-19 at baseline and consisted of questions related to mental health, sexual behavior, perceptions of risk, and tobacco and alcohol use, among others. The intertemporal choice module was only administered to youth at endline, therefore this study focuses on the cross-section of youth interviewed at endline which results in a sample of 2,325 individuals aged 15-22 – 1,085 in treatment households, 1,240 in control households (See Table 2.2 youth characteristics by treatment status at endline for the youth analytic sample). Since not all eligible youth were interviewed at endline for any number of reasons (e.g., at school, out of town, or sick when enumerators came by), Table 2.3 compares key characteristics and shows that there are some significant differences between the two groups. Specifically, youth that were not interviewed are older, more likely to be out of school, but with more educational attainment, and more likely to be married. Additionally, the demographic composition of their households differ slightly, though caregivers are similarly aged. This implies that results from this study are likely not generalizable to all youth populations and are only applicable to youth with a similar propensity to be interviewed in such studies.

[5]The youth survey was conducted with replacement based on youth availability. This means that while the survey team tried to ensure the same youth were administered the survey in each round, they were instructed to replace youth who were unable to be surveyed in subsequent rounds. In other words, if there were more than three youth in the household, and one of the youth that had been surveyed at baseline was unreachable at the first follow-up, another youth that had not been surveyed at baseline but was available was administered the survey. This ensured that no more than three youth per household were surveyed in each survey round, but the survey team was able to maintain a relatively large number of youth in the study.

Measures

Both the youth and caregiver questionnaires contained intertemporal choice modules, with slight variations, following the discrete choice approach which has been used to elicit time discounting in field research since the 1980's (Pender, 1996; van der Pol & Cairns, 2001; Harrison, Lau & Williams, 2002; Carvhalho, 2010; Tanaka, Camerer & Nguyen, 2010; Handa et al., 2014). The youth intertemporal choice module included six hypothetical scenarios each offering youth a choice between receiving 10,000 Malawi Kwacha (MWK) (approximately US $20) today or a different amount in one month's time. Specifically, the youth were asked to identify which option they preferred for each of the following choice pairs:

A. MWK 10,000 today or MWK 5,000 in one month.
B. MWK 10,000 today or MWK 20,000 in one month.
C. MWK 10,000 today or MWK 17,000 in one month.
D. MWK 10,000 today or MWK 11,500 in one month.
E. MWK 10,000 today or MWK 13,000 in one month.
F. MWK 10,000 today or MWK 15,000 in one month.

From this module, I assess an individual's switch point – the point at which they switch from opting to take the money today to waiting for a specific future value. While the future amounts varied from 5,000 MWK to 20,000 MWK in the choice task, the questions were arranged in a random order (shown above) so that the proposed future amounts were not asked in ascending order as they are in other studies (e.g. Holt & Laury 2002). Because of this unique feature, I am able to identify those respondents who had multiple switch points – switched from selecting the 10,000 MWK today, to waiting for a larger future value, and switched back to choosing the 10,000 MWK today when offered the choice between an even larger future value. I consider such occurrences representative of inconsistent responses. Additionally, the youth module

offered another check by first asking about their preference between 10,000 MWK today and 5,000 MWK in one month. If youth responded that they were willing to wait for the lower future amount, I again interpret this as having inconsistent preferences as it seems implausible one would opt to wait for a smaller, future value over a larger, immediate value. However, I acknowledge there may be extenuating circumstances inducing individuals to exhibit such preferences which I am terming inconsistent.[6] For example, a woman may know that her husband will be away in one month's time, so she would prefer any amount, even a smaller amount, in a month as she knows any amount she receives today will be taken away by her husband. Even so, for the purposes of this paper, I exclude these inconsistent responses from the analysis. In total, I find only 3% of youth (approximately 70 youth) with double switches or opting to wait for 5,000 MWK which is lower than the rate of inconsistent responses reported by laboratory studies using ordered values (Bradford et al., 2014).[7]

As mentioned, this subset of questions was hypothetical in nature meaning respondents were not incentivized and no monetary rewards were exchanged.[8] While there is a debate in the literature over the merit of hypothetical versus incentivized choice modules, studies have found

[6]Frederick, Loewenstein & O'Donoghue (2001) suggest the situations researchers often deem to be 'anomalies' (e.g., exhibiting inconsistent preferences in an intertemporal choice task) may in fact be errors of the model rather than of the people who commit them (p. 365). As such, I acknowledge that the responses of these individuals may actually be consistent and telling of some deeper situational preferences, however, for ease of interpretation of results, I chose to exclude them.

[7]A switch point refers to the moment a respondent opted to wait for the future value over selecting to receive the value today. Switch points were assessed after putting questions back in ascending order to determine whether respondents exhibited consistent preferences. If so, respondents should only switch from not waiting to waiting a maximum of one time throughout the choice task.

[8]The statement that was read to both youth and caregivers prior to express the hypothetical nature of the intertemporal choice module read as follows: "I am going to ask you about a hypothetical situation. Please think about what you would do if this situation were to occur. Suppose you suddenly find that a relative has left you 10,000 MWK. You can choose to receive the 10,000 MWK now or an amount at a later date. What would you choose? This is not a real situation and there is no real money."

both types lead to similar responses, and hypothetical questions afford researchers the additional advantage of testing a broader range of values across a larger sample (Camerer & Hogarth, 1999; Delavande et al., 2011; Harrison et al., 2002; Harrison et al., 2007; Holt & Laury, 2002; Johnson & Bickel, 2002; Kirby, 1997). Researchers must remain within their budget constraint, so incentivizing such tasks necessitates smaller sample sizes and lower future value ranges as the costs associated with paying out the rewards can quickly add up. Conversely, with hypothetical tasks, researchers are provided the opportunity to sample more individuals and use a much larger spread of future values. Since reviews show that preferences and discount rates stemming from each type are similar, it follows that the use of such hypothetical questions for this study is reasonable and that the responses are valid and believable.

An almost identical intertemporal choice module was included in the household survey administered to the main caregivers. Unlike in the youth survey, this module was administered in each of the three survey rounds. While the amounts of the future values in the caregiver's choice task differed slightly (ranging from 10,000-40,000 MWK), the overall structure was consistent with that in the youth survey. Correspondingly, caregivers with multiple switch points are excluded from further analysis. This resulted in an additional 10 youth from eight households being excluded – a further 0.58% of all youth dropped.

To evaluate one's time discounting, I create multiple variables based on the responses obtained from the intertemporal choice module. First, I create descriptive variables which serve to help explain patterns and trends in the data. To begin with, I look at the likelihood one chooses to wait for each future value and create binary variables for each representing whether the individual waited or not. Next, I create a dichotomous impatience variable which takes on the

value 1 if the individual never waited for a future value and 0 if the individual opted to wait for at least one future value regardless of what that future value was.

I then create two key variables which serve as my outcome variables – youths' MRS and discount rate based on switch points. The MRS is typically calculated at an individual's indifference point where they can give up some amount of one good in exchange for some amount of another good maintaining the same level of utility. In this case, that would be the point at which an amount of money received in one month provides the youth with the same level of utility as receiving 10,000 MWK today. Similar to field-based studies, due to the nature of the intertemporal choice task, I am unable to obtain the actual values of this measure for each individual.[9] Instead, I calculate an upper bound obtained by calculating the MRS at the switch point. Using the point at which the individual switches to waiting for the future amount, I calculate the MRS by simply dividing the future value by the present value:

$$MRS = \frac{FV}{PV} \tag{5}$$

For those that never switched, I calculated their MRS using the highest switch point and adding four.[10] Similarly, the discount rate was calculated using the conventional future value formula from finance solving for the discount rate:

[9]While the hypothetical nature of the questions does allow a wider range of future values, it would be too time consuming to narrow down to this point of equivalency in utility in an already two-three hour survey. Matching-based tasks have also been used to elicit an individual's time discounting where individuals are given an amount to receive today and are asked what amount they would need to be offered at some future time to either be indifferent or to opt for waiting (Thaler, 1981). Opponents of this elicitation method purport that the task is more cognitively demanding and allows for extreme answers that skew results and complicate analysis (Urminsky & Zauberman, 2015).

[10]The value four was selected by taking doubling the highest possible value (two) based on the intertemporal choice task. A similar method was used to determine the MRS value to assign to never switchers. I test whether my results are robust to the way the MRS and discount rate are calculated for

(6) $$r = (\frac{FV}{PV})^{1/t} - 1$$

where *t* was equal to one month based on the timeframe used in the intertemporal choice task. This measure captures an individual's specific monthly discount rate based on monetary tradeoffs again using their switch point. Like the MRS, when calculating the discount rate for impatient individuals, I use the highest future value and add two. I calculate MRS and discount rates for caregivers in the same manner, as they serve as the key explanatory variables in my analysis.

Methodology

The main relationship of interest in this paper is that between youth and caregiver discounting. I start by modeling the determinants of a youth's discounting (TD_y) as a function of their caregiver's discounting (TD_{cg}), household characteristics (*H*), as well as time-varying and time-invariant characteristics of both themselves (*X, A*) and their caregiver (*Z, C*):

(7) $$TD_{y_{it}} = f(TD_{cg_{it}}, X_{it}, A_i, Z_{it}, C_i, H_{it})$$

Using the cross-section of youth surveyed at endline, I begin with a basic OLS specification of the determinants of discounting for youth *i* in household *h* to test the contemporaneous relationship with caregiver's discounting:

(8) $$TD_{y_{ih}} = \alpha + \beta_1 TD_{cg_h} + \beta_2 X_i + \beta_3 X_h + \beta_4 T_i + \mu_h + \varepsilon_{ih}$$

In this linear regression model, X_i is a vector of individual youth characteristics, X_h represents household-level controls, and T_i is an indicator for being in a treatment household.

individuals that never opted to wait by rerunning my analyses adding smaller and larger values to calculations using the highest future value for these individuals. After testing the different values for MRS and discount rate, I do find that my results are robust to these different calculations, so stick with adding double the highest value.

Individual characteristics include youth's age, sex, marital status, and education levels. Household-level controls include baseline values of caregiver's age, sex, and education as well as whether the household experienced any covariate shocks in the past 12 months, week of SCTP interview, community level prices at endline, and TA of residence. Standard errors are clustered at the village cluster level (level of randomization to treatment).[11]

However, this model fails to take into account any endogeneity at the household level. It is likely there is a household level factor that affects both caregiver's time discounting and that of the youth residing in the household; in other words, TD_{cg_h} is correlated with the time invariant portion of the error term denoted by μ_h. Relatedly, there is likely some time-varying bias due to contemporaneous, idiosyncratic shocks, such as the death of a household wage earner, that affects both youth and caregiver discounting rendering the latter endogenous. As such, results from this model (discussed in the results section) may suffer from bias stemming from such unobservable household-level characteristics.

To address the endogeneity of caregiver's discounting, I use an instrumental variables (IV) approach where caregiver's discounting is predicted in a first stage equation using instruments (Z) as follows:

$$TD_{cg_{ht}} = \beta_0 + \beta_1 \boldsymbol{Z}_{ht} + \beta_2 X_{ht} + \varepsilon_{ht} + \mu_h \tag{9}$$

[11]Since there are only 29 village clusters in this sample, I use wild bootstrapping with 1000 repetitions to obtain more conservative standard error estimates that allow for heteroskedasticity.

Equation (9) shows that caregiver's discounting is a function of the instrument(s) Z_{ht}, and household characteristics X_{ht}. The discounting predicted from this equation is then used in the second stage (equation 8) to predict youth's discounting.

I test multiple instruments for use in this approach. First, I exploit the random assignment to treatment in the SCTP. This is plausible because i.) treatment has been shown to decrease caregiver's discounting (Handa & Molotsky, n.d.), and ii.) treatment does not significantly predict youth's discounting (see Appendix Table A.1). Consequently, most changes within the household attributable to the introduction of the cash transfer (e.g., increased human capital investments, greater diet diversity) are a direct result of caregiver's intertemporal decision-making, which is intricately related to their discounting. This includes many benefits the youth themselves receives from the transfer suggesting the transfer most prominently influences youth's discounting through its effect on caregivers' discounting thus meeting the exclusion restriction. There may be a few instances, such as youth's improved subjective well-being, where youth are more directly influenced by the household's receipt of the transfer aside from the influence on their caregiver's discounting. Even so, it is reasonable to assume that the transfer acts mainly through caregivers' discounting to youths' discounting. Unfortunately, treatment alone is found to be a rather weak instrument for predicting caregiver's endline discounting (as shown by the instrument's F-test and related R^2 in Table 2.6). Therefore, I explore adding additional variables to the instrument set.

This full instrument set includes the random assignment to treatment, the interaction of treatment with baseline community-level prices, and the lagged non-self (NS) cluster mean of caregivers' discount rates. Baseline prices are only included as an interaction with treatment as they best represent the prices beneficiaries faced once they started receiving the cash. Therefore,

this interaction should represent how the effect of the cash transfer played out against households' budget constraints which are dependent upon these prices. The lagged NS cluster mean represents the mean discounting of all other caregivers in the village at midline exclusive of one's own caregiver's discounting. As mentioned in the theory section, youths' preferences may also be influenced by those of their peers, so it stands to reason that caregivers' preferences can similarly be influenced by their peer group. Therefore, the NS cluster mean provides a source of exogenous variation for caregivers' own discounting based on the average discounting of all other caregivers in the same village (cluster). Each of these instruments in this larger instrument set successfully remove μ_h, the household-level time invariant component and the main driver of endogeneity in the error term in equation (9).

Once the μ_h is removed this leaves only the exogenous change in caregiver's discounting over time to predict caregiver's discounting at endline. Neither the interaction of baseline prices with treatment nor the lagged NS cluster mean should be included in the second stage equation as they have no direct bearing on youth's discounting other than through their effects on caregiver's discounting. Again, youth are not directly receiving the cash in beneficiary households so while their own discounting may be influenced by local prices, the treatment effect as a function of these prices should not directly predict their own discounting outside of the influence on their caregiver's discounting. Likewise, while youths' preferences and discounting may be influenced by their caregivers as well as their own peers, the mean discounting of other caregivers in the village at midline should have no explanatory power over youths' discounting endline except through its predictive power on caregiver's endline discounting. As such, each of these instruments theoretically meet the exclusion restriction. Even so, they may be correlated with the time varying portion, ε_t (or simply ε as it appears in equation

8), at endline if there is serial correlation. It is likely that the correlation with this time varying piece of the error term pertains to idiosyncratic (household-level) shocks.[12] In this case, serial correlation would only be a concern if such shocks were severe enough to produce effects which spilled over into the next survey round. Therefore, assuming no serial correlation, and with the additional assumption that such shocks do not relate systematically to any unobserved characteristics that may also influence youth's discounting, this full instrument set remains viable. The results from the first stage (equation 9) and validity of the instruments are discussed further in the next section.

Results

Descriptive Results

As mentioned, I dropped individuals from the analysis if they exhibited inconsistent preferences by reporting double switch points (20 youth) or opting to wait for 5,000 MWK in one month's time over receiving 10,000 MWK at the time of the survey (52 youth). Additionally, youth were excluded if their caregivers exhibited similarly inconsistent preferences resulting in the loss of another 10 individuals for a total analytic sample size of 1,728 caregiver-youth pairs. Table 2.4 presents the summary statistics for youth in the final analytic sample (those with consistent responses) compared to those dropped based on inconsistent responses and shows there are relatively few statistically significant differences across for key independent or dependent variables.

[12]Idiosyncratic shocks can arguably be seen as exogenous. However, since their exogeneity is not agreed upon, I assess the robustness of my results by comparing my results between models controlling for and excluding the household reporting any idiosyncratic shocks at endline. Results are consistent regardless of specification, therefore, I assume there is no bias resulting from these shocks, and present results only from regressions exclusive of idiosyncratic shocks.

Since youth were only administered the intertemporal choice task in the final round of data collection, there is no way to compare how their time discounting changed over time. However, valuable information can still be obtained from looking at the trends in the data. Figure 2.1 graphically depicts the proportion of youth willing to wait for each future value. As expected, as the future value increases, the proportion willing to wait increases as well. The same general upward trend is also seen in Figures 2.2 and 2.3. However, Figure 2 shows that females are relatively more patient than males with a larger proportion of females willing to wait for each future value. Interestingly, Figure 2.3 shows that as youth age, they are less likely to wait for future payment. Researchers, especially those who ascribe to the hyperbolic discounting model, suggest that discounting is higher at the age extremes – younger and much older individuals tend to have larger discount rates while they shrink in the middle years (e.g., Frederick, Loewenstein & O'Donoghue, 2002; Pender, 1996; Urminsky & Zauberman, 2015). While such studies have found that individuals tend to become more patient as they age, these studies focus on changes in patience over the life-cycle (e.g., differences between individuals in their 20's, 40's, and 60's). This study, conversely, focuses on a narrow age range indicating the findings are not an inherent contradiction to results from those other studies.

Determinants of Youth Discounting

Next, I assess the relationship between caregivers' discounting and youths' discounting using equation (8). First, I look at the associations between caregiver's discounting outcomes at endline (as measured by the MRS and discount rate) and youth's outcomes. Table 2.5 shows that a caregiver's discounting is highly correlated with youth's discounting. On average, an increase in a caregiver's MRS of one-point is associated with a 0.121 increase in the youth's MRS (Table 2.5, Column 8, Row 3). In other words, thinking back to the intertemporal choice task, a one-

point increase in caregiver's MRS is associated with an increase in the future value at the youth's switch point by 1,210 MWK (or 12.51% of the present value). This implies that a youth that was previously willing to wait for 15,000 MWK will now require 16,210 MWK to be offered in one month's time before they are willing to wait for future money. A similar increase in caregiver's discount rate is associated with a 0.169 increase in youth's discount rate, on average (Table 2.5, column 9, Row 1). This is equivalent to an increase in the future value for which they are willing to wait by 16.9% of the present value such that a youth who was willing to wait for 15,000 MWK now will not wait until they are offered 16,690 MWK in one month. The associations between caregivers' discounting and those of youth are very strong with all relationships being significant at the 1% level.[13]

The results also show that both the age and sex of the youth are highly predictive of youth's time discounting. As mentioned above, older youth are more likely to be impatient and have a higher MRS and discount rate than their younger counterparts (see Appendix Tables A-1 and A-2). Also, males are found to be more impatient than females. This result supports previous research which has also found females to be the more patient sex. Caregiver characteristics do not appear to predict youth's discounting suggesting the effect of these aspects act only through their effect on caregiver's own discounting.

First Stage Results: Treatment, Baseline Prices, and Lagged NS Cluster Mean

In order for the IV approach to be viable, the instrument must account for a substantial amount of variation in the endogenous variable (caregiver's discounting) and not be directly

[13]The dichotomous impatience outcome is not used in the IV models because of the use of the lagged difference instrument. Moreover, the results obtained when using the MRS variable are consistent with those generated when using the discount rate. Therefore, I will present only the results from the discount rate analysis for the remainder of this paper for ease of reading. Additional results from the MRS analyses are available in Appendix A.

related to the youth's discounting. A common rule of thumb is that the F-statistic from the first stage should be at least 10, and the partial R^2 should demonstrate the instruments are strong by predicting substantial variation in the endogenous variable after controlling for other exogenous variables.

Table 2.6 shows the results from the first stage using the instruments to predict caregiver's discount rate. Each column represents a different instrument set with Column 1 presenting estimates when only including the random assignment to treatment as an instrument, whereas Columns 2 presents those from the full instrument set adding in the interaction with prices as well as the lagged NS cluster mean discount rate. Estimates from both columns pertain to caregiver's endline discount rate. The F-tests and partial R^2 testing the strength of the instruments are shown in the last three rows of each column.

Treatment alone is found to have a significant effect on the discount rate at endline with an associated F-statistic of 13.98, but the specification explains only about 1% of the variation in caregiver's endline outcome. To strengthen the instrument set, I add the interaction with baseline prices as well as the lagged NS cluster mean of caregiver's discount rate shown in Column 2. However, when adding these additional instruments, Column 2 shows that treatment's predictive power of caregiver's endline discounting is reduced. Even so, this full instrument set results in an F statistic of 65.915, rendering it much stronger than treatment alone. Relatedly, results of the Lagrange Multiplier test for overidentifying restrictions fails to reject the null for the specification in Column 2 indicating that all instruments are valid. Thus, the full instrument set includes not only a theoretically strong group of instruments but also an empirically strong grouping.

Intergenerational Transmission of Time Discounting

Table 2.7 shows results comparing the OLS estimates with the IV estimates of the effect of caregiver's discount rate on that of youth. Both IV estimates produce larger effect sizes with much larger standard errors, effects increased by 110 and 48 percent relative to OLS depending on the instrument set, but the results become only marginally significant with the lagged NS cluster mean, and treatment alone shows that caregivers' discount rates does not significantly influence youth's discount rates. Of course, these coefficients are not directly comparable as the former corresponds to the average treatment effect while the IV estimate pertains specifically to the local average treatment effect identified from the sample whose caregiver's discount rates are influenced by the instrument set. More specifically, Table 2.7 shows that a one-point increase in the caregivers' discount rate is associated with a 0.17 increase in youth's discount rate when using a basic OLS specification. However, when the endogeneity is accounted for, the effect increases to 0.25 (Column 3). This effect is equivalent to saying that a youth whose caregiver's discount rate increases by one-point switches from being indifferent between 10,000 MWK today and 15,000 MWK in one month, to 17,500 MWK in one month, effectively increasing the future value equivalency point by 2,500 MWK (25% of the present value).

Results from a variant of the Hausman test reported at the bottom of Table 2.7 indicate that the OLS and IV coefficients are not statistically different regardless of the instrument set used. Even so, the remaining analyses in this paper will present results using the instrument sets containing treatment, and the full instrument set: a combination of treatment, baseline prices interacted with treatment, and the non-self cluster mean of caregiver's discount rate. While treatment alone is a relatively weak instrument, results obtained using this specification will serve as more illustrative estimates of effects.

Heterogeneous Effects

While there is overall evidence of the intergenerational transmission of discounting within the household, it is likely this average effect masks variation. As mentioned, females typically spend more time in the home assisting with domestic chores and caretaking, potentially affording them more interaction with their caregivers. Accordingly, I expect the relationship between caregivers' and youths' discounting to be stronger for female youth and youth in female-headed households. Relatedly, older youth may have spent more time in the household, as a function of their age similarly allowing them more frequent interactions with their caregivers. Moreover, older youth are more likely to make their own intertemporal decisions which, it is reasonable to assume, they base off of what and how they have witnessed their caregivers making decisions, again indicating they would boast a stronger relationship with their caregiver's discounting. Additionally, studies have shown that the transmission of preferences and other traits are stronger for mother-daughter relationships compared to mother-son and even father-daughter relationships (Alan et al., 2017). As such, I expect the relationship to be strongest for female-female caregiver-youth pairs. In this section, I examine whether any of these theoretical and empirical considerations hold for the intergenerational transmission of discounting in my sample.

Table 2.8 presents the results looking at differences in the effect of caregiver discount rate on male and female youth discount rates. Column 1 presents results from the IV model using treatment only, while Columns 2 and 3 derive from models using the full instrument set. The strength of treatment as an instrument diminishes when attempting to stratify the sample for subgroup analyses. Accordingly, when using this instrument, I use interactions to identify heterogeneous effects. For models using the larger instrument set, I present results from

stratifying the sample as the instrument remains strong enough for each of the subgroups.[14] I find no evidence of a relationship between discount rates for male youth regardless of the specification, while, for the stratified model, there is a strong effect of caregivers' discount rate on that of female youth suggesting the full sample effect is being driven by the influence on female youth. Females' discount rates are found to increase by 0.336 points due to a one-point increase in their caregiver's discount rate suggesting females are more affected by the preferences of their caregiver. In fact, endline means for youth aged 15 to 22 in the control group support this notion. 90% of female youth in control households reported engaging in household chores the day prior to the interview while only 58% of males affirmed the same. While similar proportions of male (68%) and female (63%) youth reported ever working in ganyu labor (short-term, often physical agricultural labor outside the home) in the past year, males worked approximately 30% more days – on average, males worked 49 days while females only worked 33 days. These numbers lend support to such a hypothesis relating to differences in time spent in the home between the two sexes.

Next, I examine differences by age group and when youth entered the household. Table 2.9 indicates that there are important heterogeneous effects as youth in the youngest and oldest two age groups (age 15-16 and age 20-22) are more influenced by the discounting of their caregivers compared to those aged 17-19. Specifically, a one-point increase in their caregiver's discount rate is associated with an increase in the discount rate of 0.247 points for youth aged 15-16, and 0.351 for youth aged 20 to 22 (Columns 4 and 6, respectively). I find no evidence of a

[14]Even though results from the model using interactions and those from stratified samples are not exactly comparable – one compares the relative strength of the effect amongst groups while the other simply identifies effects across subgroups but does not directly tell us how they relate to each other – they illustrate related findings.

relationship for youth in the middle age group, nor for any age group in the model using interactions. To test whether this is due exclusively to one's age or if age is simply acting as a proxy for the length of interactions between youth and their caregiver, I restrict the sample to those youth that were in the household from baseline, and those that entered after baseline data collection (by either midline or endline). After restricting the samples in this manner, I find results being strongest for those who have been in the household since baseline (Columns 2, 7-9). I find similar results for the stratified model (0.283 for youth aged 20-22, though it is only marginally significant). However, when using the interacted model, I find the effect is strongest for those in the youngest age group compared to the older age groups, and the magnitude is much larger (0.453). There are no significant results for youth that have entered the household since baseline suggesting the duration of interactions with a caregiver is important for transmitting preferences; however, sample sizes for the new entrants are significantly smaller than those for baseline household members.

Moreover, I test whether the results from the age subgroups is driven by gender as I've already established a stronger effect for females above. Table 2.10 presents results from this analysis. As expected, the age effects are larger and significant for females only. Both models show the largest effect for females in older age groups (age 17-19 in Column 2 and age 20-22 in Column 7). On average, a one-point increase in caregivers' discount rate increases youths' discount rate by 0.225 and 0.556 points, respectively. These results additionally indicate these interactions are most suited for transmission post to age 16, especially for females.

Subsequently, I examine the intensity of intergenerational transmission based on the gender of the main caregiver. Mothers and other female caregivers are frequently associated with investing more in their children's well-being than male caregivers (Duflo, 2000), and mother-

daughter relationships have proved to be stronger predictors of the transmission of preferences than mother-son or father-daughter. As such, I expect youth residing in female-headed households to have larger rates of transmission of discounting, and, specifically, to see the largest effects for female-female caregiver-youth pairs compared to female-male pairs as well as male-female pairs. I explore these differential effects of transmission by sex of the caregiver as well as caregiver-youth pairs the results of which are shown in Table 2.11. I find that, overall, female caregivers have a positive and statistically significant influence on the youth in their households while there is no significant effect for male caregivers (for the stratified model, Columns 3 and 6) while no similar effects are found in the interacted model (Column 1). However, the effects for male caregivers should be interpreted with caution as over 85% of all households in the sample were female-headed and the sample size for male caregivers is only 179. In regards to caregiver-youth pairs, I find that, as hypothesized, female-female pairs produce the largest, significant effects, and find no evidence of transmission for female-male pairs in the stratified model (Table 2.11, Columns 7 and 8). Relatedly, there is no significant effect for male-female pairs or male-male pairs (Columns 4 and 5). Results from the interacted model find the largest and only significant effect amongst female-male pairs (Column 2). The strong relationships between same sex caregiver-youth pairs in the stratified model and female-male pairs in the interacted model represent interesting dynamics to be further explored as a factor influencing policy and programmatic success moving forward.

Lastly, I investigate the potential for transmission of discounting by the youth's relationship to the caregiver. The results in Table 2.12 suggest the majority of the effect is driven by parent-child (0.337), grandparent-grandchild (0.527), and uncle/aunt-niece/nephew (0.529) relationships within the household. However, the interacted model identifies no significantly

different effects between the groups. Again, the majority (90 percent) of the youth-caregiver pairs represented such relationships, so there is more power to detect significant effects among these groups (indeed the point estimate in the other relation grouping is much smaller, and with fewer than 100 observations, is not statistically significant). Even so, it is interesting to discover that parent-child, grandparent-grandchild, and uncle/aunt-niece/nephew relationships are capable of influencing intergenerational transmission of discounting.

Parental Socialization

As theory suggests, effortful socialization by parents is indicative of whether or not and, perhaps, to what extent discount rates are transmitted from parent to child (Bisin and Verdier, 2001). This implies socialization acts as a moderator for the relationship with caregivers who engage in more socialization realizing larger relationships between caregiver and youth discounting. I, therefore, test for an influential effect of caregiver socialization on youth's discounting in this context. In the endline survey, youth were administered a social support module based on questions from Zimet et al.'s Multidimensional Scale of Perceived Social Support (1988), which asked a variety of questions about their perceptions related to the social support they receive from friends and family.[15] I create a revised version of the Perceived Social Support scale (PSSS) using only the four family-related support questions. Youth responses were given on a five-item Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). For each of the four family-related scale items, the maximum score was 5, so the highest total value across items was 20. To create the miniature PSSS, I then divide by four to get an average PSSS score (see Table 2.13 for distributional analysis of the PSSS).

[15]For more information on this particular survey module, please see the publicly available youth survey instruments on the Transfer Project website at: https://transfer.cpc.unc.edu/?page_id=875.

For the analysis, I divide youth into two groups – those reporting high familial support, and those reporting low support – based on the median value of four and run the same IV regressions as before simply restricted to each group to compare effect sizes. The results provided in Table 2.14 do not provide evidence of caregiver socialization providing a consistent moderating effect. The coefficient for youth reporting the highest levels of perceived social support falls to 0.167 while the coefficient for youth reporting the lowest levels of support also falls but to 0.179. Specifically, if their caregivers' discount rate increases one-point, this increases the future value youth with high support would need to be offered to induce them to wait by 1,670 MWK (almost 17% of the present value) and by 1,790 MWK (17.9% of the present value) for youth with low support, though neither of these effects are found to be significant. The results of this socialization analysis may be influenced by the measures used as the PSSS score is merely a proxy for actual socialization; the construction of PSSS module is subjective in nature, and simply reporting one received support from family does not necessitate it is the main caregiver providing this support.

Discussion and Conclusion

This study investigated the intergenerational transmission of discounting within the household using an IV approach and data from the Malawi SCTP. The results of this study generally support the notion of the intergenerational correlation of discounting within the household. The overall results suggest that discounting is malleable, rather than a constant component of one's decision-making process. Both OLS and IV (which purge the estimates of bias due to unobserved household level heterogeneity) show at least a margninally significant relationship between caregivers' discounting and that of youth in their household; the correlation in caregiver and youth discounting ranged from 0.169-0.251 depending on the model

specification (exclusive of results obtained using only treatment). This correlation fits well within the range (0.07-0.31) found by other studies in developed countries examining the intergenerational transmission of time preferences and time discounting (Webley & Nyhus, 2006; Knowles & Postlewaite, 2005; Reynolds et al., 2009; Kosse & Pfieffer, 2012; Brown & van der Pol, 2015).

Similar to previous studies, the correlation is found to be strongest for females and youth who have been in the household since baseline as well as for youth residing in households with a female caregiver. Moreover, I find that the effect is most salient for same sex caregiver-youth pairs while the effect is nonexistent for mixed gender caregiver-youth pairs except in the interacted model. Finally, I tested for the moderation effect of caregiver socialization, and find no evidence of caregiver's intentional interaction with youth strengthening the correlation in discounting. Taken together, the overall results of this study highlight the potential for the intergenerational correlation in discounting within the household and suggest a way to influence the present-bias in youth.

The main goal of this study was to provide evidence of a new channel capable of breaking the intergenerational cycle of poverty above and beyond the direct reliance on the intergenerational correlation in human capital. While altering the relative value individuals place on the future compared to the present can lead to greater investments in education and healthcare due to the lower discounting of future payoffs in one's individual cost-benefit analysis calculations, changes can manifest themselves in other ways that promote improved future well-being including through increased savings and less risky sexual behaviors – all of which promote overall well-being and improved future outcomes. This provides policymakers new options for alleviating poverty across generations. The intergenerational correlation of discounting can

potentially be described as a 'causal mediating process' suggesting that any program that is able to decrease caregiver's discounting is capable of also making youth living in the same household less myopic (Cook, 2014). This implies that while the analysis conducted in this study stems from a UCT program, the findings pertain more broadly and can be applied more generally to other poverty-reduction programs which are able to alter the first piece in the chain – caregiver's discounting.

While many researchers have studied individuals' time discounting and its predictors, very few programs or interventions have been evaluated in terms of their ability to affect discounting. To date, only six studies have been conducted to assess the effects of different programs on time discounting and patience, and all but one found positive impacts. Luhrmann, Serra-Garcia & Winter (2015) study the effects of a financial literacy program randomly provided to a sample of German high school students and find that those provided with financial education were less likely to report making impulse purchases suggesting the program was able to decrease student's present bias. Carvahlo, Prina & Sydnor (2016) similarly show that a program which randomized access to formal savings accounts for poor individuals in Nepal increased the treated group's ability to delay gratification. The remaining studies evaluate large-scale, cash transfer programs (two conditional, two unconditional) and find mixed results. Evidence from each of the UCT evaluations illustrate that these programs are able to decrease the discounting of caregivers in beneficiary households. Handa, Seidenfeld & Tembo (2012) find that Zambia's Monze cash transfer program directly and indirectly influences recipients' discount rates particularly as it works through one's positive future outlook. Relatedly, Handa et al. (2014) show that Kenya's cash transfer program targeted at poor households with orphaned and vulnerable children was also able to increase caregivers' propensity to wait. They further

find these effects to be strongest for the program's poorest households at baseline, and for those with access to credit (Handa, Seidenfeld & Tembo, 2012; Handa et al., 2014) Carvhalo's (2010) study of Mexico's PROGRESA, a conditional cash transfer, shows the program's ability to influence participants' impatience. Conversely, a study of Familias en Accion, Colombia's conditional cash transfer program, finds no impact on time discounting or on a proxy measure for changes in discounting (Suarez & Cameron, 2016). Accordingly, more research is needed to understand whether cash transfers or other programming are best suited for changing discount rates, and whether these changes are lasting over time.

This study's high level of generalizability is also apparent in the population studied. While the sample comprised extremely poor individuals in rural Malawi, it is these exact traits that make the results applicable to similar populations in other national cash transfer programs throughout Africa. In particular, the eligibility criteria in the Malawi SCTP is similar to those used in the targeting of national cash transfer programs in Ghana, Kenya, Zambia, and Zimbabwe. Even though this study is not directly measuring programmatic impacts, if the direct and indirect influence of such UCTs stem not from the cultural characteristics of the participants but rather from their ultra-poor status, then the results presented here are likely to have a high degree of external validity.

While results from this study highlight new ways to think about how policies and programs aimed at reducing poverty affect behavior, there are a few limitations to consider when interpreting the results. First of all, there is concern over how the MRS and discount rate were calculated. Each of these terms is intended to correspond to the point at which an individual is indifferent between two consumption bundles. However, based on the intertemporal choice module used in this study, I do not necessarily obtain an individual's indifference point. Rather, I

know where their switch point is, when they change from preferring the monetary value received today to preferring the future value. Therefore, all MRS and discount rate calculations are estimated using these values likely resulting in inflated values (upper bounds). Relatedly, the measures for assessing the moderation of caregiver socialization are imperfect. The survey module used to ascertain the level of socialization refers broadly to youth reporting their family provided support and assistance, rather than distinctly referring to their main caregiver. As such, the associated PSSS score for each youth likely contains measurement error and is a non-perfect measure of caregiver's actual effort to interact with youth and impress their discounting. Lastly, in accordance with the DU model and previous research, this analysis relied on the key assumptions underpinning this theory which may not be realistic to explain actual human decisions and discounting. For instance, this study assumes that a person's discounting is consistent across resources and consumption bundles. While the intertemporal choice task used to elicit time discounting from SCTP participants references monetary rewards, I cannot extrapolate to apply these same measures to other goods and behaviors reducing the external validity of the results to other domains.

In summation, this study presented evidence of a strong intergenerational correlation in time discounting suggesting the potential for a new pathway for reducing myopia in extremely poor, rural populations ultimately resulting in breaking the cycle of poverty. In order to solidify this effect, more research is needed. Most importantly, research needs to move beyond this associational relationship in discounting between the generations and focus on identifying a more causal connection. To do so, more data is needed to establish temporal precedence, longer-term discounting, and to show changes over time. It would also be useful to obtain more accurate measures of discounting and socialization to generate more exact estimates of this phenomenon.

Understanding time discounting lends itself not only to comprehending how and why people make certain decisions, but also why poverty often continues to stronghold subsequent generations. Gaining this new view of individuals' decision-making calculus enables policymakers to better tailor programs to achieve the greatest participation and, ultimately, realize the largest impact by influencing the future well-being of individuals.

Tables and Figures

Table 2.1. Baseline balance test for key household and caregiver characteristics

	N	All	Control	Treatment	P-value of diff.
Household characteristics					
Household size	1,597	5.78	5.81	5.75	0.74
Per capita expenditure (Malawi Kwacha)	1,597	44,052.97	42,452.05	45,785.53	0.39
No. livestock owned	1,597	1.18	1.20	1.15	0.82
Caregiver characteristics					
Female caregiver	1,597	0.90	0.91	0.90	0.70
Caregiver age	1,597	52.72	52.72	55.10	0.25
Caregiver any school	1,597	0.34	0.35	0.34	0.97
Caregiver widow	1,597	0.41	0.38	0.43	0.26
Caregiver key variables					
Caregiver impatience - dichotomous	1,597	0.32	0.30	0.34	0.39
Caregiver impatience - ordinal	1,597	6.29	6.25	6.32	0.18
Caregiver marginal rate of substitution	1,597	3.78	3.63	3.93	0.33
Caregiver discount rate	1,597	0.87	0.82	0.91	0.29

NOTE: P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the village cluster level.

Table 2.2. Comparison of key variables for the youth analytic sample by treatment arm

	N	All	Control	Treatment	P-value of diff.
Youth characteristics					
Male	1,728	0.53	0.53	0.53	0.86
Age	1,728	17.44	17.51	17.35	0.10
Currently Enrolled	1,728	0.57	0.52	0.62	**0.03**
Grade Attainment	1,728	5.72	5.53	5.93	0.14
Ever Married	1,728	0.07	0.08	0.06	0.33
Youth key variables					
Youth impatience - dichotomous	1,728	0.34	0.32	0.36	0.41
Will wait for 11,500 MWK	1,728	0.28	0.28	0.29	0.47
Will wait for 13,000 MWK	1,728	0.40	0.40	0.39	0.66
Will wait for 15,000 MWK	1,728	0.58	0.60	0.57	0.19
Will wait for 17,000 MWK	1,728	0.61	0.62	0.60	0.28
Will wait for 20,000 MWK	1,728	0.66	0.68	0.64	0.09
Youth MRS	1,728	2.93	2.85	3.02	0.43
Youth discount rate	1,728	0.91	0.89	0.94	0.47

NOTE: Sample is restricted to youth interviewed at endline with consistent preferences throughout the intertemporal choice module who matched with caregivers interviewed in all study waves and likewise exhibited consistent preferences. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the village cluster level.

Table 2.3: Comparison of key variables for the analytic sample compared to eligible household youth not interviewed by treatment arm

	Control			Treatment			Difference	
	Interviewed (1)	Not interviewed (2)	P-value (3)	Interviewed (4)	Not interviewed (5)	P-value (6)	Col(1)-Col(4) (7)	P-value (8)
Youth Characteristics								
Male	0.52	0.52	0.83	0.56	0.53	0.48	-0.02	0.09
Age (years)	14.25	17.60	**0.00**	14.20	17.45	**0.00**	0.15	0.68
Currently enrolled in school	0.78	0.51	**0.00**	0.85	0.59	**0.00**	-0.08	**0.01**
Suffer from chronic illness	0.06	0.05	0.28	0.08	0.05	**0.01**	0.00	0.06
Ever been married	0.01	0.09	**0.00**	0.01	0.07	**0.00**	0.02	0.91
Highest grade attended	4.39	5.62	**0.00**	4.61	5.94	**0.00**	-0.32	0.45
Household Characteristics								
Caregiver ever attended school	0.34	0.38	0.07	0.38	0.37	0.48	0.01	0.63
Caregiver female	0.85	0.85	0.98	0.85	0.85	0.85	0.00	0.85
Caregiver age	53.08	53.51	0.43	55.77	55.36	0.64	-1.85	0.25
Caregiver widow	0.40	0.37	0.15	0.39	0.41	0.11	-0.04	0.73
Household members 0-5 years	0.77	0.71	0.17	0.75	0.68	0.05	0.04	0.78
Household members 6-11 years	1.56	1.38	**0.00**	1.50	1.29	**0.00**	0.08	0.43
Household members 12-17 years	1.42	1.60	**0.00**	1.41	1.60	**0.00**	0.01	0.98
Household members 18-65 years	1.38	1.55	**0.00**	1.33	1.47	**0.00**	0.08	0.65
Household members 65 and over	0.45	0.48	0.26	0.55	0.47	**0.03**	0.01	**0.04**
Numbers of persons in household	5.58	5.72	0.20	5.54	5.51	0.77	0.21	0.86

Note: Overall N for control is 2,200 (In study/non-attritors=1,240; Attritors=960). Overall N for treated is 1,946 (In study/non-attritors=1,085; Attritors=101). Each survey round up to three youth per household were included interviewed with replacement across the waves. Not interviewed refers to eligible youth who met the criteria to be interviewed based on the household roster but were not interviewed for some reason. *** p<0.01, ** p<0.05, *** p<0.1 T-tests based on standard errors clustered at the EA level.

Table 2.4: Comparison of youth sample by consistency of time discounting responses by treatment arm

	Control			Treatment			Difference	
	Inconsistent (1)	Consistent (2)	P-value (3)	Inconsistent (4)	Consistent (5)	P-value (6)	Col(1)-Col(4) (7)	P-value (8)
Youth Characteristics								
Male	0.52	0.61	0.45	0.53	0.68	0.21	-0.07	0.60
Age (years)	17.60	17.51	0.81	17.42	18.29	**0.02**	-0.78	**0.03**
Currently enrolled in school	0.51	0.56	0.65	0.59	0.58	0.92	-0.02	**0.03**
Suffer from chronic illness	0.05	0.07	0.60	0.05	0.03	0.68	0.04	0.76
Ever been pregnant	0.30	0.19	0.27	0.28	0.40	0.59	-0.21	0.67
Ever been married	0.09	0.05	0.29	0.07	0.03	0.22	0.02	0.45
Highest grade attended	5.61	6.05	0.26	5.91	6.87	**0.01**	-0.82	0.28
Household Characteristics								
Caregiver ever attended school	0.38	0.41	0.61	0.37	0.19	**0.01**	0.22	0.92
Caregiver female	0.85	0.83	0.66	0.85	0.87	0.69	-0.04	0.90
Caregiver age	53.39	57.02	0.29	55.16	62.13	**0.01**	-5.10	0.42
Caregiver widow	0.37	0.37	0.95	0.41	0.45	0.64	-0.09	0.34
Household members 0-5 years	0.71	0.78	0.74	0.68	0.61	0.80	0.17	0.63
Household members 6-11 years	1.38	1.32	0.75	1.30	1.06	0.06	0.25	0.32
Household members 12-17 years	1.61	1.56	0.79	1.61	1.39	0.27	0.17	0.99
Household members 18-65 years	1.55	1.51	0.80	1.47	1.65	0.54	-0.13	0.52
Household members 65 and over	0.47	0.68	0.18	0.47	0.55	0.45	0.13	0.97
Numbers of persons in household	5.72	5.85	0.70	5.52	5.26	0.66	0.60	0.40

Note: Overall N for control is 1,240 (In study/non-attritors=1,199; Attritors=41). Overall N for treated is 1,085 (In study/non-attritors=1,854; Attritors=31). Inconsistent responses include those youth you had two switch points or said they would wait for a lower future value (5,000 MWK) compared to the present value (10,000 MWK). *** p<0.01, ** p<0.05, *** p<0.1 T-tests based on standard errors clustered at the EA level.

Figure 2.1. Proportion of youth willing to wait for each future value

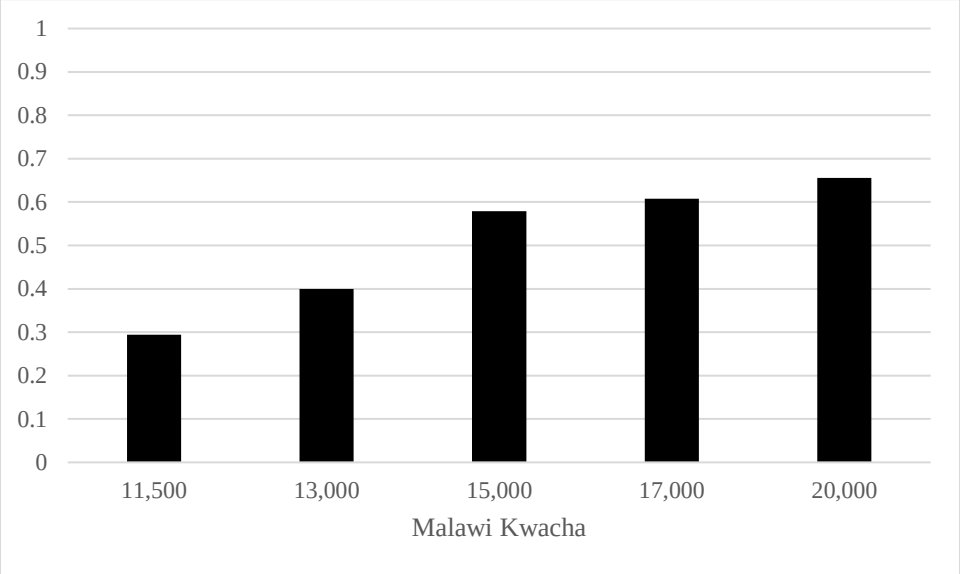

Figure 2.2. Proportion of youth willing to wait for each future value by sex

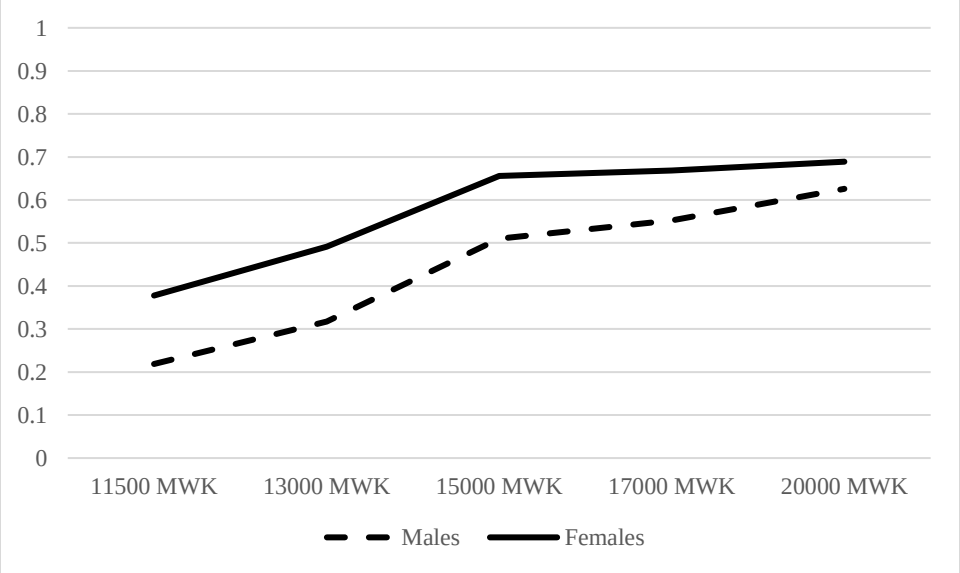

Figure 2.3. Proportion of youth willing to wait for each future value by age group

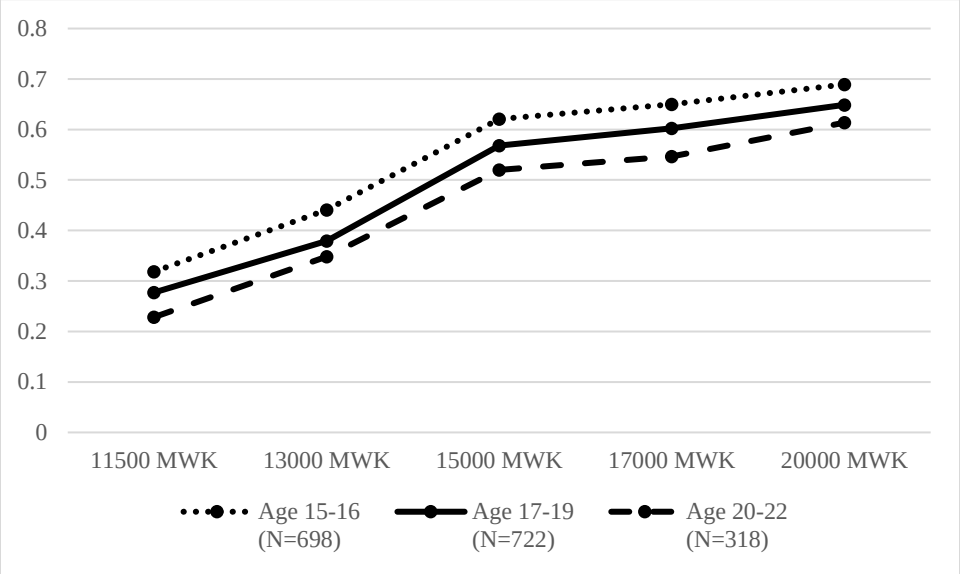

Table 2.5. OLS Results for the Relationship between Caregiver's Discounting and Youth's Discounting (N=1,728)

	11,500 MWK	13,000 MWK	15,000 MWK	17,000 MWK	20,000 MWK	Impatience - dichotomous	Youth MRS	Youth discount rate
	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)
Caregiver's Discount Rate	-0.073***	-0.092***	-0.096***	-0.098***	-0.094***	0.094***	0.450***	0.169***
	(0.015)	(0.016)	(0.015)	(0.016)	(0.015)	(0.015)	(0.072)	(0.026)
Wild bootstrap p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Caregiver's MRS	-0.018***	-0.023***	-0.025***	-0.026***	-0.025***	0.025***	0.121***	0.045***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.020)	(0.007)
Wild bootstrap p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

NOTE: Each column and row pairing represent a different OLS regression. All regressions control for a set of baseline characteristics including youth age, sex, schooling, caregiver age, sex, and schooling, any covariate shock in last 12 months, week of interview, TA of residence, and an indicator for SCTP treatment households. The key independent variables on shown as row headers, while dependent variables are listed as column headers. Variables for future values and impatience represent descriptive outcomes used to aid in simply describing the data, while the MRS and the discount rate are the main youth outcomes of interest. Numbers in the table show the coefficients obtained from OLS regression analyses. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H_0=0) are shown in Row 2 and 4. *** p<0.01, ** p<0.05, * p<0.1.

Table 2.6. First Stage Results Predicting Caregiver's Discount Rate

Instrument set:	Treatment only	Treatment, Baseline Prices X Treatment, & Lagged Non-Self Cluster Mean Discount Rate
	(1)	(2)
Treatment	-0.258***	-0.197
	(0.069)	(0.743)
Lagged non-self cluster mean discount rate	--	0.468**
		(0.204)
Baseline prices X Treatment	--	X
Caregiver's Age	0.001	0.002
	(0.002)	(0.002)
Caregiver Female	-0.054	-0.038
	(0.078)	(0.079)
Caregiver any schooling	-0.008	-0.006
	(0.049)	(0.048)
Any covariate shock	-0.066	-0.048
	(0.073)	(0.074)
Week of interview	0.097***	0.075*
	(0.031)	(0.039)
Salima - Ndindi	0.176***	0.204**
	(0.060)	(0.097)
Mangochi - Jalasi	-0.184*	-0.073
	(0.109)	(0.065)
Mangochi – Mbwana Nyambi	-0.080	-0.017
	(0.096)	(0.092)
F-test instruments (F-stat)	13.978	65.915
F-test instruments (F-prob)	0.0008	0.0000
Wild bootstrap F-test p-value	0.0070	0.0000
Partial R^2 for instruments	0.0083	0.0224
Lagrange Multiplier p-value	N/A	0.0659

NOTE: Regressions also include controls for contemporaneous endline prices. Standard errors, clustered at the VC level, are shown in parentheses below the coefficient. F-statistics produced using clustered standard errors, not wild bootstrapping. *** p<0.01, ** p<0.05, * p<0.1.

Table 2.7. OLS and IV Estimates of the Relationship between Youth's and Caregiver's Discount Rates at Endline

	OLS	IV Treatment only	IV Full Instrument Set
	(1)	(2)	(3)
Caregiver Discount Rate	0.169***	0.355	0.251*
	(0.027)	(0.258)	(0.143)
Wild bootstrap p-value	0.0000	0.2830	0.2580
First variant Hausman p-value	N/A	0.451	0.591
Observations	1,728	1,728	1,728

NOTE: The full instrument set includes random assignment to treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting. All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Tables for Subgroup Analyses

Table 2.8. IV Estimates of the Relationship between Youth's and Caregiver's Discounting by Youth Sex

	Dependent Variable: Youth Discount Rate		
	IV Treatment only	IV Full Instrument Set	
		Male	Female
	(1)	(2)	(3)
Caregiver Discount Rate	-0.337	0.064	0.336**
	(0.528)	(0.152)	(0.158)
Wild bootstrap p-value	0.6080	0.7720	0.0340
Caregiver Discount Rate x Male	0.375	--	--
	(0.370)	--	--
Wild bootstrap p-value	0.4150	--	--
Observations	1,728	920	808

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth sex. Instruments include random assignment to treatment (Column 1), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 2 and 3). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table 2.9. IV Estimates of the Relationship between Youth's and Caregiver's Discounting by Youth Age

	Dependent Variable: Youth Discount Rate											
	IV Treatment only			IV Full Instrument Set								
				All Youth			In house since baseline			Entered after baseline		
	All Youth (1)	In house since baseline (2)	Entered after baseline (3)	Age 15-16 (4)	Age 17-19 (5)	Age 20-22 (6)	Age 15-16 (7)	Age 17-19 (8)	Age 20-22 (9)	Age 15-16 (10)	Age 17-19 (11)	Age 20-22 (12)
Caregiver Discount Rate	0.319	0.453**	3.652	0.247**	-0.019	0.351**	0.178	-0.005	0.283*	0.023	0.156	-0.156
	(0.243)	(0.221)	(7.935)	(0.124)	(0.249)	(0.151)	(0.134)	(0.211)	(0.165)	(0.152)	(0.228)	(0.226)
Wild bootstrap p-value	0.3020	0.0770	0.4320	0.1140	0.9510	0.1980	0.2630	0.9890	0.3400	0.9140	0.6450	0.6520
Caregiver Discount Rate x Age 17-19	0.119	0.091	0.683	--	--	--	--	--	--	--	--	--
	(0.081)	(0.097)	(1.504)	--	--	--	--	--	--	--	--	--
Wild bootstrap p-value	0.1970	0.3670	0.5330	--	--	--	--	--	--	--	--	--
Caregiver Discount Rate x Age 20-22	0.127	0.096	1.026	--	--	--	--	--	--	--	--	--
	(0.117)	(0.137)	(2.961)	--	--	--	--	--	--	--	--	--
Wild bootstrap p-value	0.2850	0.5030	0.6000	--	--	--	--	--	--	--	--	--
Observations	1,728	1,556	172	697	718	313	630	652	274	67	66	39

NOTE: All models estimated using 2SLS. Those in columns 1-3 are run with interactions terms in a single regression while those in columns 4-12 are run separately stratified by when youth entered the household and age groups. Regressions associated with columns 1, and 4-6 include the full analytical sample of youth while those for columns 2, and 7-9 include only youth who have resided in the household since baseline. Columns 3, and 10-12 are include only youth who have entered the household since baseline data collection. Instruments include random assignment to treatment (Columns 1-3), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 4-12). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table 2.10. IV Estimates of the Relationship between Youth's and Caregiver's Discounting by Youth Age and Gender

	Dependent Variable: Youth Discount Rate							
	IV Treatment only		IV Full Instrument Set					
			Males			Females		
	Males (1)	Females (2)	Age 15-16 (3)	Age 17-19 (4)	Age 20-22 (5)	Age 15-16 (6)	Age 17-19 (7)	Age 20-22 (8)
Caregiver Discount Rate	0.362	0.229	-0.032	-0.303	0.041	0.208	0.215	0.556***
	(0.452)	(0.208)	(0.154)	(0.194)	(0.136)	(0.198)	(0.205)	(0.125)
Wild bootstrap p-value	0.4940	0.3350	0.9060	0.2720	0.9080	0.2700	0.7140	0.0450
Caregiver Discount Rate x Age 17-19	0.019	0.225*	--	--	--	--	--	--
	(0.104)	(0.133)	--	--	--	--	--	--
Wild bootstrap p-value	0.8490	0.1310	--	--	--	--	--	--
Caregiver Discount Rate x Age 20-22	0.147	0.082	--	--	--	--	--	--
	(0.174)	(0.170)	--	--	--	--	--	--
Wild bootstrap p-value	0.3780	0.6280	--	--	--	--	--	--
Observations	920	808	368	379	173	329	339	140

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth sex. Instruments include random assignment to treatment (Columns 1 and 2), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 3-8). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table 2.11. IV Estimates of the Relationship between Youth's and Caregiver's Discounting by Caregiver Sex and Caregiver-Youth Gendered Pairs

	Dependent Variable: Youth Discount Rate							
	IV Treatment only		IV Full Instrument Set					
				Males			**Females**	
	(1)	(2)	All (3)	Male-Female (4)	Male-Male (5)	All (6)	Female-Female (7)	Female-Male (8)
Caregiver Discount Rate	0.365	0.241	0.190	0.148	-0.160	0.328**	0.446***	0.113
	(0.243)	(0.264)	(0.150)	(0.210)	(0.179)	(0.153)	(0.131)	(0.197)
Wild bootstrap p-value	0.2140	0.5100	0.3350	0.6420	0.5570	0.1660	0.0520	0.7160
Caregiver Discount Rate x Female Caregiver	-0.005	--	--	--	--	--	--	--
	(0.108)	--	--	--	--	--	--	--
Wild bootstrap p-value	0.9650	--	--	--	--	--	--	--
Caregiver Discount Rate x Female-Male Pair	--	0.293***	--	--	--	--	--	--
	--	(0.079)	--	--	--	--	--	--
Wild bootstrap p-value	--	0.0030	--	--	--	--	--	--
Caregiver Discount Rate x Male-Female Pair	--	0.182	--	--	--	--	--	--
	--	(0.192)	--	--	--	--	--	--
Wild bootstrap p-value	--	0.3710	--	--	--	--	--	--
Caregiver Discount Rate x Male-Male Pair	--	0.150	--	--	--	--	--	--
	--	(0.234)	--	--	--	--	--	--
Wild bootstrap p-value	--	0.5740	--	--	--	--	--	--
Observations	1,728	1,728	179	66	113	1,549	742	807

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth sex. Instruments include random assignment to treatment (Columns 1 and 2), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 3-8). Columns 3 and 5 restrict the sample by the sex of the caregiver. Columns 4, 5, 7, and 8restrict the sample by caregiver-youth gendered pairs. For example, Column 4 presents coefficients for female youth with male caregivers. All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table 2.12. IV Estimates of the Relationship between Youth's and Caregiver's Discounting by Youth-Caregiver Relationship

	Dependent Variable: Youth Discount Rate				
	IV Treatment only	IV Full Instrument Set			
		Child	Grandchild	Niece/Nephew	Other Relation
	(1)	(2)	(3)	(4)	(5)
Caregiver Discount Rate	0.354	0.337**	0.527***	0.529***	0.029
	(0.257)	(0.134)	(0.194)	(0.139)	(0.168)
Wild bootstrap p-value	0.2740	0.1200	0.1120	0.1130	0.8990
Caregiver Discount Rate x Grandchild	0.070	--	--	--	--
	(0.161)	--	--	--	--
Wild bootstrap p-value	0.6660	--	--	--	--
Caregiver Discount Rate x Niece/Nephew	-0.012	--	--	--	--
	(0.204)	--	--	--	--
Wild bootstrap p-value	0.9920	--	--	--	--
Caregiver Discount Rate x Other Relation	-0.019	--	--	--	--
	(0.242)	--	--	--	--
Wild bootstrap p-value	0.9480	--	--	--	--
Observations	1,728	1,017	567	45	99

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 -5 are run separately by youth's relationship to the caregiver. Instruments include random assignment to treatment (Column 1), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 2-5). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table 2.13. Descriptive Statistics for Socialization Measures

	N	Mean	Std. Dev.	Median
PSSS Index	1,728	15.40	3.62	16
PSSS Score	1,728	3.85	0.91	4
Family tries to help me	1,728	0.71	0.45	
I get support I need from family	1,728	0.63	0.48	
I can talk to my family about my problems	1,728	0.78	0.41	
Family will help me make decisions	1,728	0.71	0.46	
No. family members regularly interact with	1,728	6.99	5.24	
PSSS High (≥4)	1,728	0.55	0.50	

Table 2.14. IV Estimates of the Influence of Socialization on the Intergenerational Transmission of Time Discounting

	Dependent Variable: Youth Discount Rate		
	IV Treatment only	IV Full Instrument Set	
		High PSSS (≥4)	Low PSSS (<4)
	(1)	(2)	(3)
Caregiver Discount Rate	0.370	0.167	0.179
	(0.259)	(0.146)	(0.225)
Wild bootstrap p-value	0.2690	0.4680	0.5620
Caregiver Discount Rate x High PSS Scale Score	-0.049	--	--
	(0.077)	--	--
Wild bootstrap p-value	0.5460	--	--
Observations	1,728	950	778

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth's PSS scale score. Instruments include random assignment to treatment (Column 1), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 2 and 3). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

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CHAPTER 3: INCOME SHOCKS AND PARTNERSHIP FORMATION: EVIDENCE FROM MALAWI

Introduction

The average global temperature has been steadily increasing over the past few decades with the past three years being the hottest on record, and temperatures now a full degree (Celsius) higher than pre-industrial levels (Carty, 2017; NASA, n.d.). The Intergovernmental Panel on Climate Change expects an increase in the incidence of environmental disasters and the variability of rainfall and temperature (2013). Accordingly, global warming and its associated climate-related changes are increasingly straining agricultural societies across the globe as fluctuations in rainfall, temperature, and extreme weather events continuously reduce crop yields (Thornton et al., 2011; Dell, Jones & Olken, 2012; IPCC, 2014; Bernauer et al., 2015; Ray et al., 2015; Rozenberg & Hallegatte, 2015; FAO, 2016; IMF, 2017; Carty, 2017). Currently 34% of all working individuals in low- and middle-income countries are employed in the agricultural sector (World Bank, 2018). In comparison, the agricultural sector employs approximately 55% in all of Sub-Saharan Africa with about 42% of total land area being devoted to agriculture in Sub-Saharan Africa. As such, the Sub-Saharan Africa region is considered one of the most vulnerable regions in the world in regards to the effects of climate change as rain-fed crops account for over 95% of all crop production (FAO, 2008; IPCC, 2014; Niang, et al., 2014; Bernauer et al.,2015; Rozenberg & Hallegatte, 2015; Serdeczny et al., 2016; Carty, 2017). More specifically, smallholder farms relying on subsistence agriculture are most at risk as they often lack the resources to cope with and recover from such weather-related shocks. For instance, adverse weather-related events such as droughts and floods can reduce household incomes, increase food

insecurity, result in livestock disease and death, and increase risks to human health through increased exposure to pathogens and the expansion of transmission zones for malaria, for example (IPCC, 2007, 2014; FAO, 2008, 2016). This trend in climate-related shocks and their associated impact on the livelihoods of individuals, particularly those in rural areas of Sub-Saharan Africa, has induced researchers to pay more attention to such shocks and has led to the increased incorporation of weather-related shocks in research examining their impacts and influences on these vulnerable populations.

Poor households, especially those without access to credit, are substantially burdened by the occurrence of negative shocks, and often resort to extreme coping mechanisms such as altering their food intake due to the inability to smooth consumption. Most of these coping strategies result in the household or some of its members being worse off than before the shock, and may even make the household more vulnerable to the next shock. Previous studies have found that households hit with negative shocks respond by reducing food diversity and caloric intake (Bhattacharya et al, 2003; Macani & Yang, 2009), removing children from school (Ferreira & Schady, 2009), working more jobs and/or longer hours (Kochar, 1995, 1999), selling assets including livestock (Rosenzweig & Wolpin, 1993), and marrying off daughters (Corno & Voena, 2015; Gong, de Walque & Dow, 2015; Corno, Hildebrandt, & Voena, 2017; Hoogeveen, Van der Klaauw & Van Lomwel, 2011). This current study is specifically focused on households using marriage of a child as a coping strategy.

Households which opt to marry off daughters as a coping mechanism often rely on child marriage (marriage of an individual under age 18) and bride price for help with consumption smoothing when they otherwise have few options (Lafraniere, 2005; Hoogeveen, Van der Klaauw & Van Lomwel, 2011; Corno & Voena, 2016; Corno, Hildebrandt, & Voena, 2017).

When a family marries off a daughter, they not only benefit by reducing the number of individuals in the household which factor into their resource allocations, but also by obtaining an inflow of income or assets in the form of a bride price from the groom's family. This double gain usually provides the household with greater utility, at least in the immediate future, than supporting the human capital of their daughter or soliciting her to work on the family farm. Until the underlying determinants of child marriages are rectified, and households have another mechanism to use when faced with debilitating income shocks and poverty, child marriage is an issue that cannot be ignored (Batha, 2015). While marrying off a daughter may financially assist the family in the short-term, it has long-term complications for the daughter such as limiting her schooling and ultimately her economic opportunities, negatively affecting her health through early pregnancies, lower utilization of healthcare, and limited agency to discuss family planning strategies (Corno & Voena, 2016; Field & Ambrus, 2008; Jensen & Thornton, 2003).

Relatedly, individuals are similarly induced to alter their behaviors due to shocks. Adolescent girls often bear the burden of such individual-level coping strategies and have been found to be more likely to engage in risky behaviors (Burke, Gong & Jones, 2011; Dinkelman, Lam & Leibbrandt, 2008; Robinson & Yeh, 2011). Transactional sexual relations are often viewed as an insurance mechanism for young girls against shocks; maintaining such a relationship affords girls a sense of financial stability in that their partners are able to provide school fees, cellphones, cash or other gifts when their family becomes unable to do so (Dunkle et al., 2004; Luke, 2003; Moore, Biddlecom & Zulu, 2007; Robinson & Yeh, 2011). However, transactional sexual relationships have been shown to be key contributing factors to the spread of HIV as girls often opt for older partners who are more able to provide gifts and favors. Older partners are also more likely to be infected, and transmission of HIV is increased as condoms use

is lower and because of girl's lower agency in such relationships (Hallman, 2004; Haram, 1995; Leclerc-Madlala, 2003; LoPiccalo, Robinson & Yeh, 2012; Luke, 2003; Meekers & Calves, 1997; Nzyuko et al., 1997; Poulin, 2007; UNAIDS, 2010).

As mentioned, a wide body of literature has been generated in the recent decades exploring the link between negative shocks and various perceived negative outcomes and behaviors. While many studies have been conducted on these topics across the developing world, most focus exclusively on weather-related shocks such as rainfall and droughts (which remain relatively exogenous in nature) and economic outcomes (e.g., agriculture, income and wealth, migration, labor markets, and conflict) (e.g., Miguel, Satyanath & Sergenti, 2004; Dell, Jones & Olken, 2012; Thiede, 2014; Wodon, Liverani & Joseph, 2014; Bernauer , et al., 2015; Strobl & Valfort, 2015; Wodon, Liverani & Joseph, 2014; Anglewicz & Myroniuk, 2018). Although a few have ventured to look at the effects of shocks on sexual behaviors and partnership formation, they still limit their exploration of shocks to rainfall/drought and food insecurity – a by-product of rainfall/drought shocks (Burke, Gong & Jones, 2011; Hoogeveen, van der Klaauw & van Lomwel, 2011; Gong, de Walque & Dow, 2015, Corno & Voena, 2015; Corno, Hildebrandt & Voena, 2017). This narrow focus on weather-related shocks limits the scope of understanding of comprehensive dynamics as households face a variety of shocks, in response to which they may respond differently. Anglewicz & Myroniuk (2018) is one of the only studies known to the author that explores a wider range of shocks in their analysis of the effect of shocks on migration in Malawi, looking separately at what they classify as environmental/economic shocks (poor crop yield, changes in the price of grain, and damage to houses du to fire or flood) and family shocks (death or serious illness of family members, loss of sources of income, and breakup of households).

Therefore, this paper seeks to add to the growing body of literature on the effect of shocks on behaviors at the household- and individual-level by providing empirical evidence of how shocks influence partnership formation, with a specific focus on marriage. I use data from the Marriage Transitions in Malawi (MTM) project which follows a cohort of never married youth at baseline, over a three-year period, from 2007 to 2009, in rural Malawi. The study targeted youth aged 13 to 26 at baseline that would likely transition into marriage over the course of the project, and collected substantial information on youths' relationships, sexual activity, as well as experience of shocks. Exploiting the longitudinal nature of the study, I look primarily at the likelihood of getting married or engaged to be married for both males and females based on the experience of various types of negative shocks the previous year. Further, I examine whether there are differences between those in tribes ascribing to matrilineal compared to patrilineal lineage systems using models with village fixed effects (FEs) and individual FEs. In matrilineal systems, husbands typically move into the wife's village and bride price is a rare practice. In patrilineal systems, wives move into their husband's village and a bride price is commonly exchanged. Therefore, shocks should differentially affect individuals based on their lineages system. Overall, I do find evidence of the lineage system strongly influencing the relationship between shocks and marriage outcomes. Patrilineal females are more likely to get married in the face of a shock as compared to matrilineal females, suggesting that both shocks and lineage systems play a role in household decision-making in regards to youths' marriage outcomes. Conversely, the opposite is true for males – they are more likely to get married if they are from matrilineal households when faced with a shock, as compared to patrilineal households. To provide supplemental evidence, I additionally examine the likelihood of entering into transactional sexual relationships and dating partnerships. Similar trends are found for those

beginning both types of relationships after their household experiences a shock. For each analysis, I look at differences by in-school status at baseline as this is one of the most significant individual-level determinants of marriage over the panel period. Associations for marriage are strongest for out of school females while those for transactional sexual relationships are stronger for those in school.

Child marriage, a common practice in much of the world, disproportionately affects girls and has been shown to limit their productive capabilities and increase their risks for HIV, maternal mortality, and intimate partner violence (IPV) (for instance, Nour, 2006; UNICEF, 2013; Steiner, Yager & Lee, 2017; Wodon et al., 2017).[16] Unfortunately, scant evidence exists identifying potential means to reduce the prevalence of such unions. Accordingly, the results from this study aim to fill a gap related to this dearth of knowledge by providing suggestive evidence of probable pathways to reduce the incidence of child marriage. Specifically, the evidence indicates that programs intended to help households cope with losses suffered due to negative shocks may have implications which extend beyond consumption smoothing to affect youth transitions. As such, it is hoped that the findings in this paper inspire future research efforts as well as programs aimed at reducing the incidence of child marriage via household economic strengthening.

Marriage in Malawi

Marriage in Malawi is near universal. The majority of the population (approximately 98%) gets married at some point in their life with most first marriages occurring before the age of 20 for females (Reniers, 2003; DHS, 2004; Palamuleni, 2011; Batha, 2015; Cherchye et al.,

[16]Child marriage is defined as marrying before the age of 18 (UNICEF, 2017).

2016). A UNFPA survey (2012) found that over half of Malawi's girls were married before the age of 18, and subsequently ranked the country eighth out of the twenty countries with the highest rates of child marriage. More recently, UNICEF's 2016 State of the World's Children report touts that 46% of all marriages in Malawi from 2008-2014 involved a girl aged 18 or younger. Even though Malawi has started the process of annulling child marriages and passed the Marriage, Divorce, and Family Relations Bill in 2015 making the legal age of marriage 18, this problem is not likely to disappear any time soon. It is difficult to disseminate such policy information and enforce it in rural areas, and these changes do not necessarily apply to customary marriages which are often outside the scope of the government's purview. Overall, marriages in Malawi tend to be predominantly monogamous relationships. While polygyny is not illegal, it is rarely practiced. Moreover, marriage tends to be relatively local with partners being selected from within the same village in 45% of marriages or the same district in another 25% of marriages (Sear, 2008). In fact, on average, most partners reside within 5 km of each other prior to marriage (Batha, 2015; Kapulula, 2015; Cherchye et al., 2016).

Malawi again tops the charts with one of the highest divorce rates in all of Africa at 40-65% (Cherchye et al., 2016). Such high rates are mostly a factor of the predominance of matrilineal societies in the country. Existing most prevalently in the Southern region, these matrilineal communities are characterized by uroxilocal residence after marriage whereby the husband moves to live with or near the bride's family (Phiri, 1983; Berge et al., 2014; Kapulula, 2015; Chae, 2016). Additionally, the tradition of bride price is less common in these societies, and landholdings, inheritance, and lineage all pass through the woman's family so that the woman seemingly has more power – at least by proxy of the men in her bloodline. Thus,

marriages among these groups are seen as less formal making the process of divorce relatively easy as the transaction costs are much lower (Reniers, 2003).

Conversely, the Northern region is comprised of primarily patrilineal tribes observing the tradition of bride price and practicing virilocal residence after marriage where the couple lives with or near the husband's family (Phiri, 1983; Palamuleni, 2011; Berge et al., 2014; Chae, 2016). In patrilineal societies, a marriage is considered customarily valid once the bride price has been fully paid (Mwambene, 2005). As such, divorce rates in this region tend to be lower as the bride's family must repay this gift at the dissolution of the marriage. Moreover, the husband and his family have full domain over the family's landholdings and the rights to the children from the union. The combination of such factors encourages women to stay with their husbands in patrilineal societies.

The Central region of Malawi serves as a mixing ground for these two societies whereby both matrilineal and patrilineal systems are observed. Home to the largest ethnic group in Malawi, the Chewa, the Central region is often thought to be mostly matrilineal in nature (Palamuleni, 2011). However, due partly to the increased interaction with other tribes in the region, this delineation has become less clear with the traditional systems of the Chewa people resembling patrilineal societies more and more over the years. Over the past few decades, Chewa men have found ways to circumvent the strict matrilineal customary marriage rules by engaging in cross-cousin marriages, selecting a wife from within their own village, or striking a deal with the wife's family to move to the husband's village after an initial period of uxorilocal (Phiri, 1983). In fact, the National Statistics Office (2010) reported that while Salima, the main district of the current study in the Central region, is majority matrilineal, only about 57% of households are matrilineal and practice uxorilocal residence whereas 36% are matrilineal but subscribe to

virilocal residence. The remaining 7% of the population in this district follow strictly patrilineal traditions. As such, while the Northern and Southern regions each maintain relatively strict adherence to their formal lineage systems, changes are blurring the lines among the various tribes residing in the Central region.

Conceptual Framework

Household decision making in the developing country context is often modeled in the economics literature according to the household production functions developed and detailed by Strauss & Thomas (1995) and Behrman & Deolalikar (1988), for example. Such models posit that decision making is a function of the household's productive capabilities subject to their budget constraints. As such, they make decisions in the interest of maximizing their utility. Additionally, Corno & Voena (2016) present their own formulation of a theoretical model aimed at depicting how bride price and child marriage act as consumption smoothers in the presence of rainfall shocks for credit constrained households. This paper takes insights gleaned from both sets of economic models to situate the present study.

Specifically, the decision to marry off daughter, i, in household, h, is a function of the household characteristics, X_h, (including current income levels), characteristics of the daughter (son), X_i, (including age and schooling), and the expected bride price, b_{ih}:

$$M_{ih} = f(X_h, X_{ih}, b_{ih}, v_h, v_{ih})$$

Bride price itself is typically a function of the daughter's characteristics as well as other exogenous characteristics, v_h:

$$b_{ih} = f(X_{ih}, v_h)$$

In regards to this present study, shocks enter into this model through their effect on household income – a factor present within X_h. The direction of influence on the decision-making process depends upon the underlying traditional lineage system of the household. In fact, Corno and Voena (2016), using data from Tanzania, find that shocks occurring during a woman's teenage years significantly increase the probability she gets married before age 18, and this effect is found to be largest in communities with the highest average bride price. Similarly, Corno, Hildebrandt, and Voena (2017) conduct a comparative analysis of the differing effects of shocks on marriage by the direction of marriage payments (i.e., bride price versus dowry) and find that droughts increased the incidence of marriage and child marriage in bride price societies in Sub-Saharan Africa and decreased the incidence for dowry-based societies in India. Conversely, for sons, the financial burden imposed by negative shocks operates in the opposite direction since their family is tasked with paying a bride price. Therefore, the influence of their household's lineage system on marriage decisions should work in reverse compared to females.

As discussed, the Central region of Malawi boasts a diverse population composed of individuals representing a variety of tribes ascribing to various land tenure, inheritance, and lineage systems. Therefore, it is plausible to assume that each group reacts differently to the presence of negative income shocks. Following the results of Corno, Hildebrandt, and Voena (2017), for patrilineal households, the shock should encourage households to marry off their eldest, single daughter in order to receive the bride price as a means of smoothing their consumption, and also to reduce the size of the household effectively increasing the household's budget by freeing up resources which would otherwise be devoted to her schooling, healthcare, food, etc. For matrilineal households, conversely, it is expected that households would be less likely to marry off their daughters since bride price is not a widely followed practice in these

societies. These households receive no immediate financial gain from the marriage, and, in fact, may effectively reduce their budget constraint if the girl contributes to household labor/income generation or due to the household providing a plot of land and/or housing to the new couple.

Relatedly, one can consider the decision to engage in a transactional sexual relationship as a coping mechanism for experiencing a negative shock; however, this would typically be an individual decision for the female youth as opposed to a household-level decision unless the youth received pressure from their family. In this instance, transactional sex is a function of household-level characteristics (especially lineage system and income), as well as individual-characteristics of the youth and exogenous characteristics:

$$TS_{ih} = f(X_h, X_{ih}, v_{ih})$$

Again, there are likely discrepancies in reactions between the lineage systems. Due to the underlying principles in patrilineal societies, female adolescents residing in such households are often seen as wielding less agency and are more often commoditized as her parents essentially sell her at marriage at which point she becomes her husband's property. Therefore, transactional relationships lend themselves more readily to women in these communities. Female youth in matrilineal societies have relatively more status as inheritance works through their bloodline and they are not sold into marriage; thus, they may not be as willing to engage in such relationships, which effectively diminish their power. Studies by Ranganathan et al. (2017) and Stoebenau et al. (2016) lend support to this notion. The first study looks at transactional sex and women's agency and relays the commonly held belief among young women that having their own financial resources greatly improves their bargaining power within sexual relationships and allows them to be more financially independent. The latter study reiterates the three underlying paradigms emerging from the literature for engaging in such a relationship – for basic needs, for

improved social status, and for expressions of love. It could easily be argued that a woman in a matrilineal society, in essence, already has a higher social status due to her land rights and inheritance compared to those in a patrilineal society, and, similarly, has resources to her name which could improve her bargaining power in relationships.

MTM Project and Study Design

This study makes use of a unique, public dataset from the MTM project conducted by researchers at the World Bank.[17] The project aimed to understand the links between socioeconomic status, sexual experiences, and the formation and dissolution of relationships for adolescents in rural Malawi over a three-year time period (Beegle & Poulin, 2017).

The MTM project followed a cohort of youth in Salima district who were never-married at baseline to map their trajectory into relationships and adulthood. The choice of Salima as the study site stemmed from the diversity ethnic groups in the region as well as the high rates of HIV infection as a result of the surging HIV/AIDS epidemic (Beegle & Poulin, 2017). Within Salima, the data were collected from a stratified random sample of approximately 1,200 never married core respondents. The research team first randomly selected 60 enumeration areas (EAs) out of a total of 215 in the district, then randomly chose 20 core respondents – 10 males and 10 females – from each EA fitting their age eligibility criteria to ensure both that respondents were never married and that approximately half would enter into marriage within the three-year study period.[18]

[17]See https://www.marriage-malawi.com/ for more information on the project and to access data.

[18]Using data from the Second Integrated Household Survey (IHS2), the study implementers determined the typical age at first marriage in the region and used this to identify the target age range for males (18-25) and females (15-21) in their study. See Table B.1 in Appendix for the breakdown of the target sample and actual sample comparisons.

Household surveys and core respondent interviews were administered each year from 2007 to 2009 with additional partnership interviews conducted six months after each of the first two household surveys for a select subsample of core respondents. Core respondents were also given HIV tests at various points throughout the study to confirm their status. Additionally, the study team administered 74 community-level surveys to identify socioeconomic and cultural characteristics of the broader communities. To ensure a high quality of data, and due to the nature of migration with new marriages, the research team tracked youth as they moved into new households to maintain them in the dataset. Even so, only a little over 85 percent of baseline core respondents were re-interviewed at both follow-up rounds resulting in a final, balanced panel comprising 1,003 individuals.[19]

Data

Sample

This current paper will make use of data collected through the main household and core respondent surveys: the baseline survey conducted July-September 2007, the midline survey from July-September 2008, and the endline survey in July-September 2009. The balanced panel of core respondents from all survey rounds is composed of 1,003 individuals – 528 females aged 13 to 23 at baseline and 475 males aged 14 to 26 at baseline. As mentioned, while there was approximately 15% attrition, those lost in follow-up resemble those remaining in the sample in socioeconomic and demographic characteristics so differential attrition biasing results is not a concern (Beegle & Poulin, 2017). See Appendix Table B.2 for details of the attrition analysis for this study.

[19] 1,090 were reinterviewed at round 2 and 1,048 were reinterviewed in round 3. The principal investigators report that there is no evidence of differential attrition (Beegle & Poulin, 2017).

Tables B.3-B.5 in the Appendix display how this cohort of youth compares to those in nationally representative samples from the 2004 National Survey of Adolescents (NSA) and the 2004 Second Integrated Household Survey (IHS2) in Malawi, respectively.[20] Generally, it appears that the MTM sample is fairly comparable to both the NSA and IHS2 on a variety on individual and household level characteristics including household socioeconomic status and sexual behavior. These samples do appear to differ in regards to their sociodemographic characteristics, such as tribe and religion, however, this is to be expected based on geography; tribes in Malawi mostly occupy distinct regions with the exception of the Central region (the focus of this present study), where there is more diversity. On the whole, these comparisons suggest the households in this current study mostly resemble the average Malawian household. The few differences are slight so the results from this paper could be generalizable to the other rural areas in the country.

Measures

In each of the three main survey rounds, core respondents reported their current marital status and responded to a variety of questions aimed at eliciting information about current and newly formed relationships. Specifically, youth were asked if they currently had a boyfriend/girlfriend, had made a promise to marry, or had other sexual partners. Various questions pertaining to why the relationship began and/or ended, characteristics of the partner (including age and education differences), and, if married or engaged to be married, details

[20]The NSA survey, part of the Next Generation Project conducted by the NSO and international collaborators, was administered to youth aged 12-19 in order to understand their risk factors for HIV infection and pregnancy (Munthali et al., 2006). The World Bank, IFPRI, and NSO have conducted various iterations of the IHS over the years. The IHS2 is a population-level survey intended to create a holistic view of household poverty (NSO, 2004).

surrounding the marriage and wedding were also included. From these survey questions, I created binary indicators for marriage, transactional sex, and bride price along with continuous variables for the value of bride price offered or accepted and partner age and education differentials.

Transactional sex is typically defined as giving or receiving money or gifts in exchange for sex but differs from prostitution and commercial sex work as it is not seen as a profession or primary income generating activity. Therefore, I create this variable by combining responses to multiple survey questions. Specifically, when asked about current relationships and how they began, if respondents stated that the relationship started because they wanted gifts, money, or they needed assistance, it is coded as a transactional sexual relationship. Although Poulin (2007) argues that money is commonly exchanged in all types of premarital relationships in Malawi, she goes on to describe how it is widely accepted that the exchange of money or gifts is a clear agreement between the couple that sexual relations will ensue. Therefore, I add those individuals who reported ever receiving gifts or money from their partners as engaging in transactional sex as I feel her argument substantiates rather than refutes the definition of a transactional sexual relationship. I am concerned with females, in particular, engaging in potentially risky sexual relations out of a perceived economic necessity. It is plausible that a female might not have accepted the gifts from her partner and, subsequently, may have waited to engage in sexual relations if she had no economic need or desire for the gifts. Furthermore, since some youth were already actively engaged in a such relationships at the time of the baseline survey, I create the transactional sex indicator only for newly established relationships to maintain temporal precedence in the analysis.

Respondents were also asked about the promise of a payment of a bride price. Married youth were asked whether there was a promise of gifts (either in cash or in-kind) that their family received from (or paid to) their spouse's family prior to marriage. The promised gifts were reported in Kwacha as well as number of livestock. For ease of comparison, I monetized the value of the livestock using average costs reported in November 2015 from the endline evaluation of the Malawi SCTP (Salima district sample) (Handa et al., 2016). Once an average price was obtained, I used the all item monthly rural consumer price index from the Malawi National Statistics Office (NSO) to deflate the November 2015 values back to 2008 and 2009 values depending on survey round.[21]

For the shock variables, I used household-level self-reported shock data obtained via the household survey. In each round, households were asked whether they had experienced 16 different shocks in the past year, and thereafter were asked to self-rank the top three most severe negative shocks. Additional information was given for each of the three most severe shocks including month and year of the shock, though not used in this analysis. Each survey questioned households about their experience of 15 inherently negative shocks which can be broadly categorized as either covariate (community-level, exogenous) or idiosyncratic (household-level, more often endogenous) shocks. Covariate shocks include: i.) lower crop yields due to drought or floods, ii.) crop disease or crop pests, iii.) large fall in sale prices for crops, iv.) large rise in price of food. Idiosyncratic shocks include: i.) livestock died or were stolen, ii.) household non-agricultural business failure, iii.) loss of salaried employment or non-payment of salary, iv.) end of regular assistance, aid, or remittances from outside the household, v.) illness or accident of

[21]CPI values obtained from: http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=69%3Aconsumer-price-index-rural&catid=3&Itemid=37

household member, vi.) death of household head, vii.) death of working member of household, viii.) death of other family member, ix.) breakup of the household, x.) theft, xi.) dwelling damaged or destroyed. Households were also asked about a birth in the household, but this shock is excluded from my analysis due to the ambiguity of its influence. I also categorize shocks based on whether they relate to an economic shock (related to agriculture, livestock, household business, cash flows, theft, or damage) or family shock (death or illness of family members, or breakup of the household). Economic shocks are those which directly affect a household's income and/or assets while a family shock may similarly affect those, but likely to a lesser extent. These family shocks may also produce more of a psychological response from household members, which may influence the coping mechanisms used to recover from them. Table 3.1 shows the number and proportion of youth in the analytic sample whose households reported experiencing each type of shock at baseline and midline.[22]

Lastly, following my hypothesis that associations will differ based on the traditional lineage system one belongs to, I create a binary indicator for matrilineal households. To create this variable, I use youths' reported tribe and, in accordance with the literature's assessment of which lineage system tribes in Malawi ascribe to, separate them into matrilineal or patrilineal (Palamuleni, 2011; Berge et al., 2014). See Table B.6 in the Appendix for a breakdown of tribes by lineage system.

[22]Since my analysis uses lagged shocks (as described in the following section), shocks reported at baseline and midline are those used to identify and predict marriage outcomes.

Methodology

The basic estimation strategy for this paper is a linear probability model (LPM) using a balanced panel of youth surveyed at baseline and both of the follow-up rounds.[23] Equation 1 shows the basic OLS specification:

$$(1) \quad Married/Engaged_{ihvt} = \alpha + \beta_1 shock_{hvt} + \beta_2(mat_{hv} * shock_{hvt}) + \beta_3 mat_{hv} + \theta \boldsymbol{X}_{ihv} + \gamma \boldsymbol{Z}_{hvt} + \delta_v + \mu_h + \omega_t + \varepsilon_{ihvt}$$

In this equation, the probability of individual, *i*, from household, *h*, in village, *v*, entering into marriage or an engagement is modeled as a function of the contemporaneous shock, $shock_{hvt}$, time-invariant ($\boldsymbol{X}_{ihv}$) individual level characteristics including age at baseline, sex, whether they were attending school at baseline, and whether they have a disability[24], along with a vector of household characteristics, $\boldsymbol{Z}_{hvt}$, including an indicator for whether the household belongs to a matrilineal lineage system, mat_{hv}, and baseline values of household size, the household's wealth index[25], whether the youth's father or mother ever attended school, and an indicator for whether the household was labor constrained.[26] Additionally, I include δ_v village-level time invariant characteristics. I run two different versions of this specification – one in which I use village-level

[23]Results using the unbalanced panel are consistent with those obtained using the balanced panel and are available in the Appendix (Tables B.7-B.10).

[24]These are typically minor disabilities defined as having difficulty walking or sweeping. Since women are often caretakers of the home, being able to sweep and/or walk to collect water or firewood may increase their desirability in the marriage market. Conversely, the inability to undertake such activities may reduce their marriage prospects.

[25]The wealth index was created using principal component analysis based on a household's assets (e.g., radio, phone, lantern, axe, bed) and dwelling characteristics (e.g., electrified, latrine, permanent roof) at baseline.

[26]A household is defined as labor constrained if they have a dependency ratio of greater than 3. The dependency ratio is the number of those under 18, over 64, or in the prime age range but unable to work, divided by the number of able-bodied individuals aged 19-64 in the household.

control variables including an indicator for whether the village has its own market and a distance index (composed of the village's distance to key services, a paved road, and Salima center) as measures of village isolation and development, and one in which I use village FEs. I prefer the model inclusive of the village FEs as it should account for any unobserved, time-invariant characteristics of the village which may affect how a household responds to a shock and the decision into or away from marriage. This should leave only the differentiation due to household characteristics, including the lineal nature of the village, to influence my results. However, including village FEs should reduce if not completely remove the potential influence of any covariate shocks as these occur at the village level and should, theoretically, affect all households in the broader community.

Given the hypothesized differences in direction and magnitude of effects based on lineage system, β_1 represents the coefficient of interest for patrilineal households while β_2 corresponds to the difference in effect for matrilineal households above and beyond that in patrilineal households. In other words, the full effect for matrilineal households is represented by $\beta_1 + \beta_2$. Standard errors are clustered at the EA level. Finally, as behavioral dynamics are likely to differ by sex, I run analyses separately for both females and males.

While shocks (both covariate and idiosyncratic) are plausibly exogenous, Equation 1 may still present identification concerns. Contemporaneous shocks do not allow for clear temporal precedence to be established between the explanatory variable and outcome variable. Additionally, there is likely a lag between the household experiencing the shock and the household implementing coping strategies. Moreover, given the nature of marriage in these villages, youth that marry likely change households either moving in with their spouse's family or starting their own household. This results in contemporaneous shocks being insufficient for

predicting marriage as this specification would use data regarding shocks for the new household not the youth's parents' household which is the relationship of interest. A straightforward approach to address these concerns is to use lagged shocks in lieu of contemporaneous shocks. Lagged shocks will also be independent of future time-varying omitted variables (ω_t) assuming there is no serial correlation. Therefore, equation 2 presents the improved LPM model:

$$(2) \quad Married_{ihvt} = \alpha + \beta_1 shock_{hv(t-1)} + \beta_2\left(mat_{hv} * shock_{hv(t-1)}\right) + \beta_3 mat_{hv} + \theta \boldsymbol{X}_{ih} + \gamma \boldsymbol{Z}_{hvt} + \delta_v + \mu_h + \omega_t + \varepsilon_{ihvt}$$

where the shocks are now lagged. While equation 2 accounts for time varying endogeneity, it does not address potential time-invariant household level endogeneity. These issues will be further discussed in later sections.

Identical analyses will be run to examine how shocks influence youth's involvement in less formal partnership formation including transactional sexual relationships and dating relationships. Moreover, only about one third of the entire youth cohort ever marries by the final survey round limiting the ability to run further analyses looking at effects on bride price and marriage quality (measured in terms of age and education differentials). Instead, I present descriptive comparisons in an attempt identify trends in the data and contextualize the main analysis findings.

Results

Descriptive Results

The analytic sample consists of female youth aged 13 to 23 and males aged 14 to 26 at baseline. A little over half of all females were attending school at the time of the baseline survey while only about a third of males were in school. Since males are older, on average, this could be

reflective of more males completing their desired amount of education by the data collection start date. Similarly, three-quarters of the males reported being sexually active prior to baseline while only about one-third of females reported the same. The majority of youth are of Chewa tribal descent (64%), a tribe which typically practices matrilineal traditions. Furthermore, marriage outcomes were not uncommon among study youth. As mentioned, about one third married while half got either married or engaged between 2007 and 2009 with more females (58%) entering such relationships as compared to males (46%).[27] Figure 3.1 graphically depicts this difference by comparing the probability of marriage or engagement over time by gender. Of the females that got married or engaged, 96% belong to matrilineal households while only 4% belong to patrilineal households. For males, 95% from matrilineal households got married or engaged and 5% from patrilineal households, See Table 3.2 for a summary of the proportion of youth by lineage system getting married or engaged in each survey round.[28] Moreover, 22% of females engaged in new transactional sexual relationships by 2009. In addition, there was no lack of shocks. Almost 90% of all households reported at least one negative shock at baseline, and, on average, households experienced three shocks. Table 3.3 provides a full comparison of individual and household characteristics for males and females at baseline.[29]

[27]I include engagements along with marriages in my outcome variable because engagements are often the first step to marriage. Additionally, youth may not have had ample time between survey rounds to officially enter into marriage as it may take some time to find a suitable partner and finalize negotiations with both families and village leaders, as necessary. In Malawi, engagements are typically bound with an official celebration sanctioned by the village chief and attended by both partners' family members and close friends (Siyabu, 2011). Therefore, engagements serve as a cue for marriages to come.

[28]Even though MTM youth were never-married at baseline, some were engaged. These individuals are kept in the sample since engagements can vary over time (i.e., youth may end an engagement before marriage, or they may be engaged to different people from round one compared to in round two).

[29]While the significance of the difference between genders is reported, I would not expect these two groups to be equally balanced on every observable characteristic given that the study sample was randomized at the EA level and stratified by age and gender.

Determinants of Youth Marriage

Before adding in shocks and the interaction terms, I run a preliminary LPM analysis of the determinants of marriage/engagement based on baseline characteristics. Table 3.4 shows that currently attending school is found to be a protective factor, regardless of gender, as it significantly reduces the likelihood of marriage by about 40 pp for females and about 20 pp for males, on average. Figure 2 further illustrates this trend by comparing the likelihood of marriage by in-school status for males and females. Furthermore, age is predictive of marriage for youth as each additional year is associated with a 4.6 pp increase in the probability of being married or engaged, and females are about 4 pp more likely to get married or engaged. Additionally, a household's baseline wealth index has relatively little predictive power for males' marriage outcomes and is insignificant for females' outcomes, though father's education is a significant predictor of marriage for females.[30] Furthermore, the number of other male youth in the household aged 14-26 or female youth in the household aged 13-23 (the prime age range for getting married in this context) has no predictive ability in determining whether youth marry or get engaged.

Effect of Negative Shocks on Youth Marriage

Building on the analysis above, Tables 3.5 and 3.6 present the results from the analysis looking at the relationship between lagged shocks and marriage outcomes for females and males, respectively. For each of these tables, Column 1 reports estimates from the analysis using a LPM model with village level control variables, the results in column 2 are from the LPM model using village FEs, and columns 3-6 repeat the aforementioned analyses by in-school status at baseline

[30]This null effect of wealth on marriage remains consistent whether using the continuous wealth index or the poorest quintile or quartile compared to everyone else. In this case, a household's assets may not be a good proxy for income, and it is likely the latter is the key influencer in marriage decisions.

as schooling was found to be a protective factor in the analysis above. Additionally, each panel presents coefficients from a different regression using various definitions of shocks as identified in the panel header. In particular, Panel A examines the effect of experiencing any negative shock, Panel B disaggregates the effect of a shock by covariate and idiosyncratic shocks, and Panel C differentiates the effect between economic and family shocks. I also test effects including interactions between the shock subtypes but find my results to be qualitatively similar to those excluding the interactions so only present that latter (see Table B.11 in the Appendix for results from these models).[31] The results in both Tables 3.5 and 3.6 strongly follow the a priori hypotheses; it appears that reporting a negative shock in the prior year is significantly associated with an increased likelihood of marriage for females in patrilineal societies, and a lower likelihood for those in matrilineal societies, and the opposite is true for males, though most results are not found to be significant for males. Also, for females, results are strongest for those out of school. Since the coefficients are similar between the models using village controls and village FE, I will discuss only those from the models using the latter for the remainder of the paper. Specifically, any negative shock reported the period before is associated with an increased likelihood of marriage for females in patrilineal societies by 38 pp while the influence on marriage in matrilineal societies is only about 5 pp, on average (Table 3.5, Panel A, Column 2). More specifically, the likelihood of marriage for girls in patrilineal households increased from 31% to 69%, and from 41% to 46% for those in matrilineal households. The strength of the relationship increases to about 61 pp (from 44% to 101%) and 2 pp (from 57% to 59%), respectively, for those out of school at baseline (Table 3.5, Panel A, Column 6). Not surprisingly, the majority of these relationships appear to be driven by economic shocks with family shocks

[31]Specifically, I test one model with covariate shocks, idiosyncratic shocks and the interaction between them, and another model with economic shocks, family shocks, and the interaction between the two.

providing little to no explanatory power (Panel C). Correspondingly, the coefficients mostly trend in the opposite direction for males, though few are statistically significant (Table 3.6). This is not unexpected given that males may be better able to smooth their consumption by increasing their paid labor, delaying marriage until they have accumulated a sufficient bride price, or marrying early. A few surprising results of note for males appear in the out of school sample experiencing economic shocks; the estimates suggest that those in patrilineal households are actually more likely to get married or engaged while those in matrilineal households are less likely to do so.

As mentioned earlier, the results from the LPM model based on equation 2 could be biased due to household-level time invariant endogeneity. There is some dispute in the economics community regarding whether idiosyncratic shocks are actually exogenous. If not, there may be some factor at the household level that affects both the propensity for a household to experience shocks as well as their decisions to marry off daughters. For instance, if a household is characterized by risk aversion its members may be less likely to engage in behaviors that increase the odds of a family member getting ill or dying (e.g., treating their water or seeking treatment for an illness), and, similarly, may engage in behaviors that reduce the likelihood of the daughter getting married such as not encouraging her to engage in early sexual initiation (often seen as preparation for marriage).To address this, I run an individual FE model according the following specification:

$$(3) \quad Married_{ihvt} = \alpha + \beta_1 shock_{hv(t-1)} + \beta_2\left(mat_{hv} * shock_{hv(t-1)}\right) + \theta \boldsymbol{X}_{ih} + \gamma \boldsymbol{Z}_{hvt} + \pi_i + \mu_h + \omega_t + \varepsilon_{ihvt}$$

where π_i denotes the individual FE. While the introduction of the individual-level FEs should eliminate endogeneity due to individual and household level unobserved characteristics, there may not be enough variation within individuals by lineage system to detect an effect with this model. Since there were only 48 households in which more than one youth were surveyed, and youth move households for various reasons throughout the course of the study, including when they enter into marriage, a household FE model is not possible with this data. Tables 3.7 and 3.8 present results from the individual FE model for females and males, respectively. There are no clear trends materializing using this new specification, and the results on the whole suggest no associations. In an attempt to further clarify these results, I present a summary table of means by sex and in-school status in Tables 3.9 and 3.10. These tables show, for example, that this FE analysis is not highly powered to detect effects for all subgroups, particularly in patrilineal households, as sample sizes are very small. There are only 75 females and 87 males in patrilineal households, and the number decreases when disaggregating by in-school status (Table 3.9 and 3.10, Columns 4 and 7). Moreover, it appears the variation in getting married or engaged for youth in patrilineal households is larger between waves one and two than between the two follow-up rounds. Whereas for youth in matrilineal households, there is still a fairly sizeable increase between these latter rounds. The use of lagged shocks results in the models being identified off the change in marriage between waves two and three, precisely when the increase in marriage rates is larger in matrilineal households. For out of school females, for example, the proportion getting married or engaged increases 25 pp between round one and two for matrilineal girls (Table 3.9 Column 3, Rows 1 to 2) and 50 pp for patrilineal girls (Column 4, Rows 1 to 2). Comparatively, the change between round two and three for matrilineal girls is 13 pp while there is no change for patrilineal girls (Rows 2 to 3). Table 3.9, Column 6, Row 2 to 3 shows girls

matrilineal households who were in school at baseline exhibit similar changes between the two final waves while Column 10, Row 2 to 3 shows there is actually a decrease for girls in patrilineal households. This table helps explain the null and sometimes reverse relationships produced by the FE model shown in Tables 3.7 and 3.8.

Overall, the results from Tables 3.5-3.8 suggest that even with small samples, there is still enough variation within villages between matrilineal and patrilineal households for the village FE model to produce results for all groups. Unfortunately, the individual-level FE model is overly restrictive and the variation is reduced such that the model produces null results for patrilineal households. Therefore, while the remainder of the paper presents results from both models, the village FE model is my preferred model as it maintains some of that variation, and, assuming all shocks are plausibly exogenous, still produces unbiased estimates.

Effect of Negative Shocks on Transactional Sexual Relationships

To provide supplemental evidence to support the hypothesis that negative shocks are indeed inducing behavior changes in regards to partnership formation, I next analyze outcomes of transactional sexual relationships. As mentioned, this information is only available for females so males are excluded from this analysis. Table 3.11 shows the results for both the LPM models (columns 1-6) as well as the FE model (columns 7-9).

When analyzing the relationship between shocks and engaging in transactional sexual relationships, the results align with the a priori hypotheses for any negative shock and economic shocks. Panels A and C indicate that females in patrilineal societies are more likely to engage in such relationships (14.5 pp) while those in matrilineal societies are less likely to do so (-5 pp). As discussed, females in patrilineal societies are more commoditized which may propel them into such relationships more frequently than those in matrilineal societies. Unlike results from

the marriage analysis, however, these effects are driven by females in school who may be more likely to need small gifts to cover school fees and uniform expenses to stay in school. Moreover, transactional relationships are likely seen as a relatively 'quick fix' for an economic problem, and are, therefore, likely to be induced by the first instance of a shock (i.e., a shock between rounds one and two). As mentioned above, results from the FE model are identified off only the variation in outcomes between rounds two and three which is likely why there are no consistent results in Table 3.11.

Since it is often difficult to disentangle the truth about transactional sexual relationships (they may not be correctly reported), I also test for the relationship between shocks and whether or not female youth obtained new boyfriends with whom they were sexually active. I use this as a proxy to support the transactional sex results. I find that experiencing a negative shock the period before increased the likelihood of beginning in a relationship for females in patrilineal households by 41.5 pp and by only 6.6 pp for those in matrilineal households (see Table 3.12 Panel A, Column 2). Again, the results are slightly stronger for those in patrilineal households experiencing negative economic shocks (42.9 pp), and strongest for those out of school at baseline (66 pp – see Panel C, Column 6). Given that transactional relationships are likely underreported, and not all of the newly formed dating partnerships are purely transactional in nature, use these results to form an upper and lower bound of the true relationship. Therefore, the estimated relationship between any negative shock and transactional sexual relationships for females in patrilineal societies is an increased probability of between the bounds of 14.5 and 41.5 pp. For matrilineal females, the estimated likelihood of engaging in these relationships after a negative shock falls between the bounds of -5 and 6.6 pp implying there may, in fact, be no association for these households.

Comparisons of Bride Price and Marriage Transfers

While it was the intention of this paper to follow Corno, Hildebrandt & Voena's (2017) analysis of the effect of shocks on bride price amounts, there are few reports of bride price for married youth (either from lack of reporting or lack of bride price transactions in their marriages). Fewer than 20% of ever married or engaged youth report any bride price – 20% of females and 8% of males. Instead, I draw comparisons on the reported mean amounts in Malawi Kwacha (MWK) across various subgroups. Table 3.13 provides this comparison of means for those that both reported a transfer at marriage and reported an amount (cash and in-kind). Each panel corresponds to a different subgroup: Panel A is all females, Panel B is just those females in matrilineal households, and Panel C is females in patrilineal households. This table shows evidence of the average transfer amount differing significantly between females in households who experienced shocks and those who did not with the total bride price exchanged in the former group being smaller than in the later. The sample sizes are fairly small (total N=170), especially for those from patrilineal households (N=6) deeming the information purely suggestive, but illustrative of the hypothesized influence of shocks on household decision-making in regards to youths' marriage outcomes.

The community level surveys provide some additional contextual information regarding the practice of bride price. Of those communities that trace one's descent solely through their father, 71% also reported bride price to be a common practice. When descent works through the mother, only 55% of communities reported commonly engaging in bride price transactions at marriage. Similarly, 73% of the communities who primarily transfer land through the father and 59% of those that transfer land through the mother report bride price being a common practice. The proportion of those communities with more matrilineal characteristics (i.e., descent and land

transfer through the mother) reporting practicing bride price is somewhat surprising but seems to align with the overall trend towards virilocal residence in Malawi (Phiri, 1983).

Of the 74 communities included in the study, bride price is reported to be a common practice in 55% with the average bride price being 6,939 MWK (or roughly US$10) within those communities. The mean values in Panels A and B closely align with this community averages. When considering all communities regardless of the commonality of bride price, the average community-level bride price falls to 3,979 MWK (US$5). Overall, the findings suggest shocks may be a defining factor in the value that is offered/accepted in marital agreements. Unfortunately, few females in patrilineal societies responded to this subsection of questions, which is a function of being a small proportion of the sample and an even smaller portion of the followed cohort that entered into marriage. Even so, these findings bode well for future analyses examining bride price differences in different lineage societies as a result of shocks.

Assessment of Marriage Quality

Another interesting facet of marriage unions is the perceived quality of the marriage as measured by age and education differentials; larger disparities have been found to align with increased odds of IPV and lower bargaining power for females (UNICEF, n.d.). Again, the small sample sizes prohibit a multivariate analysis, but Table 3.14 presents averages for those youth getting married or engaged over the course of the project. The average age of marriage for females in this sample is 17 years, qualifying over half of all females' marriages child marriages. This is compared to an average age of marriage for males of 21 years. On average, females appear to be marrying older men with over 60% reporting an age gap of 5 or more years with their spouse. Such an age-disparate relationship is found to increase the incidence of HIV infection in young women as well as the likelihood of experiencing IPV (for example, see

Nydegger et al., 2017 and Schaefer et al., 2017). In regards to education gaps, females, on average, are one level behind their partners in terms of educational attainment. This implies that females with a primary education are marrying males with a secondary level education, on average, which can imply power differentials within the household in regards to decision making and overall agency. Overall, there are few differences in marriage quality based on in-school status, but similar statistics are presented for females in each of these groups in Table 3.15. On the whole, both the age gap and education gap among males and their partners is substantially lower – all of the means significantly differ from those of females. Taken together, these results imply that the females in the sample are marrying older, more educated males outside of the MTM sample which, as mentioned, heightens their risk of both HIV infection and IPV, as well as other related risks.

Discussion

These results suggest that shocks likely play a role in both a household's decision-making as well as an individual's decision-making when it comes to their youths' partnership formation. The direction of the effect depends most prominently on the type of shock as well as the traditional lineage system to which the household belongs. Females are more likely to get married or engaged after a negative shock with the relationship being significantly stronger for females in patrilineal households compared to those in matrilineal households. Similarly, the influence of shocks is stronger for those out-of-school, compared to those who were in-school at baseline. The reverse is true for males with larger magnitudes being realized for those in matrilineal households and in school at baseline. While any negative shock boasts significant influences on marriage outcomes, it is specifically the economic shocks which produce the largest influence in all instances.

The results from this current study, though larger in magnitude, are comparable in terms of the direction of the effect, and the differentials based on the practice of bride price. As discussed, Corno, Hildebrandt & Voena (2018) similarly study the effects of shocks on marriage, focusing exclusively on droughts and find that draughts increase the hazard into marriage for girls in bride price societies by 3% and decrease the hazard by 4% in dowry societies. They likewise find discrepancies in bride price amounts based on shocks. Relatedly, Corno & Voena (2015) find that in Tanzania (a country whose tribes traditionally practice the custom of bride price), experiencing a drought (as measured by a one standard deviation in rainfall) at the age of 18 is associated with 9.3 pp increase in the probability of marriage for females. They also do not find any significant effect for males. Lastly, Hoogeveen, van der Klaauw & van Lomwel (2011) show that idiosyncratic shocks related to a household's livestock wealth are highly predictive of marriage while rainfall shocks have a positive though nonsignificant effect on the marriage of a daughter in Zimbabwe. Specifically, they find that if a household loses two cows due to an unexpected event (e.g., theft), the likelihood that their daughter gets married increases 22%. However, all of these studies restrict their analyses to only examine rainfall- and livestock-related shocks which potentially limits their understanding of the use of child marriage as a household coping strategy.

Similar trends are realized for females engaging in transactional sexual relationships with females in patrilineal households being 14.5 pp more likely to engage in such relationships while the likelihood of those in matrilineal households reduces by 5 pp. Results of a similar magnitude have been found in other studies examining the influence of shocks on risky sexual behavior. LoPiccalo, Robinson & Yeh (2012) as well as Robinson & Yeh (2011) find that sex workers in Western Kenya increasingly engage in risky behaviors (i.e., unprotected sex and anal sex) with

clients in response to health shocks – illness of herself or a household member – by about 20%. These acts earn premiums over basic encounters with clients, so are a way for sex workers to directly influence their income after experiencing a shock. Similarly, Gong, de Walque & Dow (2015) find that negative shocks (defined by food insecurity) in Tanzania increased sexually transmitted infections by 36% and resulted in unmarried women being three times more likely to report having been paid for sex, and married women reporting higher rates of extramarital sex. Likewise, Burke, Gong & Jones (2014) show that rainfall-related income shocks explain up to 20% of the variation in HIV prevalence across 19 African countries. They go on to test whether transactional sexual relationships are driving this increase in disease prevalence and find that shocks increased non-spouse sexual partnerships by 10-20%. The similarities in effect sizes amongst different populations and in different contexts lends support to the overall effect on transactional sexual relationships found here.

One importation difference being that this paper examines the differential influence on shocks by in-school status and I find the influence of negative shocks is stronger for individuals in school. It is understandable that females in school, when their households are hit with a negative shock, may scramble to find the means to pay for school fees, uniforms, materials, cell phones, etc. (Calves et al., 1996; MacPhail & Campbell, 2001; Kaufman & Stavrou, 2002). One oft used manner of procuring such things outside of the household while maintaining in-school status, is through transactional sexual relationships in which the male partner provides monetary or in-kind gifts in exchange for partnership and, most often, sex (Hunter, 2002; Luke, 2003; Poulin, 2007). Those who were already out of school, would not likely be in a similar bind, and might be more likely to opt into marital arrangements following a negative shock and skip over the transactional relationship as a coping mechanism. While the association between shocks and

transactional sexual relationships provides supportive evidence of individual coping mechanisms, it also provides supplemental evidence to suggest an overall trend towards partnership formation, more broadly, as a general coping mechanism undertaken by households and individuals alike. Therefore, the results from both the transactional relationship and dating analyses may be biased downwards.

Since sexual activity and behaviors are often viewed as taboo subjects in many developing countries, it has proven difficult to disentangle the intricacies of sexual relationships to identify their true prevalence or nature (e.g., transactional v. non-transactional). Therefore, it is likely that there is underreporting of such relationships in the current data (Luke & Kurz, 2002; Moore, Biddlecome & Zulu, 2007). Accordingly, I attempt to identify an upper bound by examining the relationship between a negative shock and obtaining a boyfriend within the following year. The results here are stronger, as expected, than relying solely on reported transactional relationships. With regards to beginning a relationship with a boyfriend after a shock, both any negative shock and any negative economic shock produce significant results and follow the same general pattern as before; females are more likely to enter into them with the strongest relationship exhibited for those in patrilineal households and out of school as compared to their matrilineal and in school counterparts. Although no a priori hypotheses for dating relationships existed, it is possible that finding a partner to date is simply the first step in forming a relationship with a future spouse. As such, I would expect to see stronger relationships for dating outcomes as compared to marriage outcomes. Relatedly, dating relationships may serve as a proxy for transactional relationships as the latter are often underreported. As such, taking the difference in the coefficients produced from the model looking at transactional sex and those from the model looking at having a boyfriend suggest the true magnitude of the relationship with

severe negative shocks falls somewhere between 14.5-41.5 pp for females in patrilineal households and -5 to 6.6 pp for females in matrilineal households.

While the results are promising, this study is not without a few limitations. First, researchers have concerns about the accuracy of reports of relationships as studies have found respondents are more likely to fail to report marriages or relationships that were short or unsuccessful as compared to those that were longer or current (Reniers, 2008; Boileau et al., 2009; Chae, 2016). Relatedly, the classification of specific partnerships as marriage has similarly been found to change over time with those that have ended, where a cash or in-kind bride price was never exchanged, or those which did not produce children being less likely to be considered a marriage after the fact (Van de Walle, 1993; Chae, 2016). As such, there may be under- or mis-reporting of relationships in this data. However, the structure of the MTM project, specifically in regards to the youth cohort all being never-married at baseline, proves encouraging to reduce such occurrences.

Another measurement concern stems from the blending of the traditional lineage systems and customs in Malawi, especially in the Central region. As discussed, this region boasts the most diversity out of all the regions both in terms of tribes and lineage systems. Because of that, societies have begun to exhibit norms and customs of other nearby societies which makes it more difficult to disentangle which practices a household actually follows. This could easily be fixed in the future by obtaining more detailed information in surveys relating to marriage in this region. For the current study, however, the inclusion of village level FEs should help in netting out the consistent community-level differences, leaving the tribe/lineage system of the household one of the few remaining determinants of differences in the effects on marriage outcomes.

Conclusion

This paper aimed to fill the gaps in the literature that looks at the relationship between shocks and behaviors by expanding the definition of shocks used, focusing on a population of rural youth in Malawi, and examining impacts on a more comprehensive array of outcomes from sexual behavior to bride price. Moreover, little is known about how to effectively reduce the incidence of child marriages across the globe. The results of this paper add to the literature on safe transitions to adulthood by providing suggestive evidence of a potential pathway through which child marriages may come about. While more data is needed to flesh out some of the nuances in regards to lineage systems in Malawi as well as influences on bride price and marriage quality, this study provides a starting point for understanding the decision-making process for households in rural Malawi. Future research is also needed to determine other types of potential programs that would prove beneficial to combating the existence of child marriage, age- and education-discrepant marriages, and the reliance on bride price as a coping mechanism. It is doubtful that policies such as the Marriage, Divorce, and Family Relations Bill will provide enough of a deterrent to the continuation such practices. Therefore, this paper also reinforces the need for policies or programs to be put in place to help smooth consumption for households, especially those most affected by negative, specifically economic, shocks so they refrain from engaging in risky coping strategies. To date only 11 empirical studies meeting systematic review quality standards have been published examining interventions' effects on child marriage, with only six finding positive effects in increasing the age at marriage or reducing the proportion of child marriages (Kalamar, Lee-Rife & Hindin, 2016). Of those programs that were found to be effective, most were economic interventions that focused on reducing the vulnerability of households or on removing barriers related to schooling. Results from these studies lend support

to the role of cash transfer programs, both unconditional and conditional, in reducing the incidence of child marriage as such programs have, on the whole, succeeded in helping households cope with shocks and increasing schooling outcomes, especially for girls (for example, de Janvry, et al., 2006; Aguila, Kapteyn & Perez-Arce, 2017; Lawlor, Handa & Seidenfeld, 2017; World Bank, 2017; Uchiyama, 2018). This study corroborates the finding that one mechanism to reduce child marriage is to provide economic support to vulnerable households as a means of smoothing consumption and enabling them to better safeguard against negative shocks. Future research can continue to fill this knowledge gap by assessing which type of program is best suited and most cost-effective for reducing child marriage as a means of coping after negative shocks.

Tables and Figures

Table 3.1. Comparison of shocks reported at baseline for analytic sample

	N	Baseline				Midline			
		All	Male	Female	P-value of diff.	All	Male	Female	P-value of diff.
Negative shock	1,003	0.90	0.91	0.88	0.08	0.90	0.92	0.89	0.07
Covariate shock	1,003	0.73	0.79	0.69	**0.00**	0.87	0.90	0.84	**0.00**
Drought/Flood*	1,003	0.51	0.57	0.45	**0.00**	0.67	0.71	0.63	**0.00**
Crop disease*	1,003	0.42	0.49	0.35	**0.00**	0.22	0.19	0.25	**0.02**
Large drop in crop prices*	1,003	0.15	0.16	0.14	0.43	0.08	0.08	0.08	0.71
High price of food*	1,003	0.41	0.43	0.38	0.12	0.68	0.69	0.67	0.41
Idiosyncratic shock	1,003	0.76	0.79	0.74	0.07	0.68	0.66	0.70	0.18
Illness of family member†	1,003	0.37	0.40	0.34	0.09	0.36	0.39	0.34	0.07
Death of family member†	1,003	0.31	0.30	0.31	0.80	0.35	0.32	0.38	0.08
Household bus. failure*	1,003	0.19	0.22	0.16	**0.02**	0.19	0.17	0.20	0.25
Death of livestock*	1,003	0.42	0.43	0.41	0.69	0.24	0.23	0.24	0.63
Loss of paid employment*	1,003	0.05	0.06	0.04	0.17	0.04	0.04	0.04	0.99
End of aid/remittances*	1,003	0.08	0.08	0.07	0.34	0.05	0.04	0.06	0.09
Household breakup†	1,003	0.07	0.08	0.06	0.15	0.02	0.02	0.02	0.71
Theft*	1,003	0.15	0.14	0.15	0.84	0.12	0.13	0.11	0.36
Dwelling damaged*	1,003	0.14	0.14	0.14	0.90	0.09	0.12	0.07	**0.02**
Economic shocks	1,003	0.84	0.87	0.82	0.06	0.89	0.91	0.87	**0.03**
Family shocks	1,003	0.54	0.56	0.52	0.12	0.53	0.52	0.55	0.38

Note: Each of the covariate and idiosyncratic shocks also fall under the category of either economic or family shocks. *Denotes economic shocks †Denotes family shocks. Bold denotes significance at the alpha=0.05 level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the EA level.

Figure 3.1. Probability of Marriage or Engagement by Endline by Baseline Age and Sex

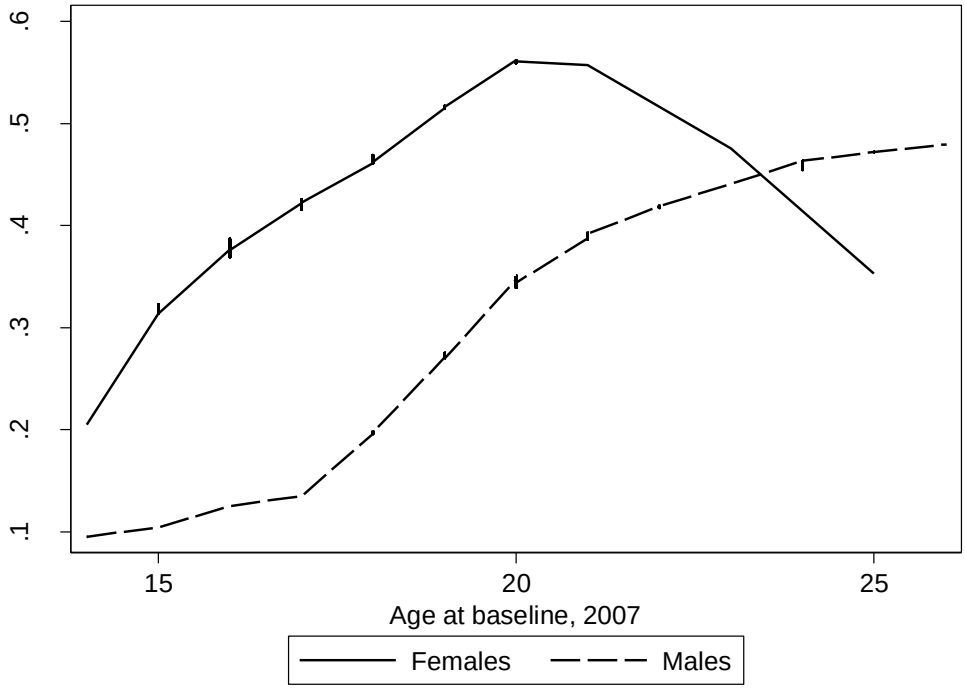

Table 3.2. Summary statistics of marriage and engagement for youth by sex and lineage system

	Total		Females						Males					
			All		Matrilineal		Patrilineal		All		Matrilineal		Patrilineal	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Round One (2007)	0.23	229	0.22	117	0.23	114	0.12	3	0.24	112	0.24	106	0.21	6
Round Two (2008)	0.40	398	0.43	226	0.43	216	0.40	10	0.36	172	0.37	163	0.31	9
Round Three (2009)	0.52	523	0.57	302	0.58	292	0.40	10	0.47	224	0.47	210	0.38	11
Observations		*3,009*		*1,584*		*1,509*		*75*		*1,425*		*1,338*		*87*

Note: In-school status refers to youths' status at baseline.

Table 3.3. Comparison of core respondent characteristics for analytic sample at baseline

	N	All	Male	Female	P-value of diff.
Youth Characteristics					
Age	1,003	18.42	20.35	16.68	**0.00**
Currently in school	1,003	0.44	0.31	0.56	**0.00**
Highest education level					
Preprimary	1,003	0.01	0.02	0.01	0.18
Primary	1,003	0.69	0.65	0.72	**0.02**
Secondary	1,003	0.27	0.28	0.26	0.54
University	1,003	0.00	0.01	0.00	0.16
Training college	1,003	0.01	0.01	0.00	**0.01**
Ever had sex	1,003	0.56	0.76	0.38	**0.00**
# sex partners ever	560	2.56	3.22	1.35	**0.00**
Had sex last 12 months	1,003	0.39	0.52	0.28	**0.00**
# sex partners last 12 months	386	1.50	1.71	1.15	**0.00**
Ever gave birth (or fathered child for males)	1,003	0.05	0.06	0.05	0.49
Household Characteristics					
Tribe					
Yao	1,003	0.19	0.18	0.19	0.71
Chewa	1,003	0.64	0.65	0.63	0.50
Other	1,003	0.17	0.17	0.18	0.64
Religion					
Christian	1,003	0.65	0.66	0.64	0.33
Muslim	1,003	0.24	0.22	0.26	0.17
Religion, other	1,003	0.10	0.10	0.11	0.73
No religion	1,003	0.01	0.01	0.00	**0.01**
Father any schooling	1,003	0.79	0.81	0.78	0.17
Mother any schooling	1,003	0.84	0.85	0.82	0.26
Household size	1,003	6.37	6.45	6.30	0.32
Own their home	1,003	0.81	0.84	0.79	0.07
Home electrified	1,003	0.12	0.11	0.12	0.72
# of rooms in home	1,003	3.08	3.21	2.96	**0.00**

Permanent roofing - not grass	1,003	0.31	0.30	0.32	0.55
Piped water source	1,003	0.20	0.19	0.20	0.80
Pump/protected spring source	1,003	0.62	0.64	0.61	0.29
Unprotected well/spring/reservoir	1,003	0.18	0.17	0.19	0.28
Other water source	1,003	0.00	0.00	0.00	0.94
Flush toilet	1,003	0.04	0.04	0.05	0.32
Latrine style toilet	1,003	0.80	0.80	0.80	0.99
Has no toilet	1,003	0.15	0.16	0.15	0.64
Demographic Composition					
# age 0-5	1,003	0.76	0.70	0.82	0.05
# age 6-11	1,003	1.09	1.07	1.10	0.70
# age 12-17	1,003	1.43	1.18	1.65	**0.00**
# age 18-23	1,003	1.13	1.51	0.78	**0.00**
# age 24-64	1,003	1.73	1.75	1.72	0.55
# age 65+	1,003	0.24	0.24	0.23	0.74
# females aged 13-23	1,003	1.14	0.69	1.53	**0.00**
# males aged 14-26	1,003	1.18	1.79	0.64	**0.00**
Total # siblings	1,003	1.27	1.39	1.17	**0.02**
Total # male siblings	1,003	0.51	0.62	0.42	**0.00**
Total # female siblings	1,003	0.51	0.62	0.42	**0.00**
Dependency ratio	990	1.54	1.18	1.88	**0.00**
Labor constrained (dep. ratio >3)	1,003	0.09	0.04	0.13	**0.00**

Note: Bold denotes significance at the alpha=0.05 level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the EA level.

Table 3.4. LPM results of the baseline determinants of marriage/engagement for balanced panel by sex

	Dependent Variable: Marriage/engagement			
	Females		Males	
	(1)	(2)	(3)	(4)
Matrilineal	0.008	0.022	0.0002	0.007
	(0.059)	(0.065)	(0.057)	(0.064)
Age (years)	0.041***	0.042***	0.043***	0.049***
	(0.008)	(0.009)	(0.010)	(0.010)
In school	-0.407***	-0.393***	-0.227***	-0.197***
	(0.028)	(0.033)	(0.035)	(0.040)
Have disability	0.038	0.053	-0.019	-0.017
	(0.031)	(0.034)	(0.049)	(0.055)
Household size	-0.001	-0.005	0.010	0.013*
	(0.006)	(0.007)	(0.007)	(0.007)
Wealth index	0.005	0.003	-0.040**	-0.041
	(0.016)	(0.020)	(0.019)	(0.026)
Father any schooling	0.098***	0.081**	0.037	0.043
	(0.031)	(0.033)	(0.040)	(0.044)
Mother any schooling	0.023	0.006	-0.041	0.004
	(0.035)	(0.042)	(0.049)	(0.057)
Labor constrained	0.0001	-0.016	-0.103	-0.115
	(0.031)	(0.035)	(0.079)	(0.090)
No. females aged 13-23	0.01			
	(0.021)			
No. males aged 14-26			0.00386	
			(0.0386)	
Village controls	X	--	X	--
Village FE	--	X	--	X
Observations	1,584	1,584	1,425	1,425
R-squared	0.230	0.277	0.109	0.173

Note: Coefficients are from LPM models run separately for males and females. All controls are included in the table above. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 3.2. Probability of Marriage by Endline by Baseline Age, Sex, and In-School Status

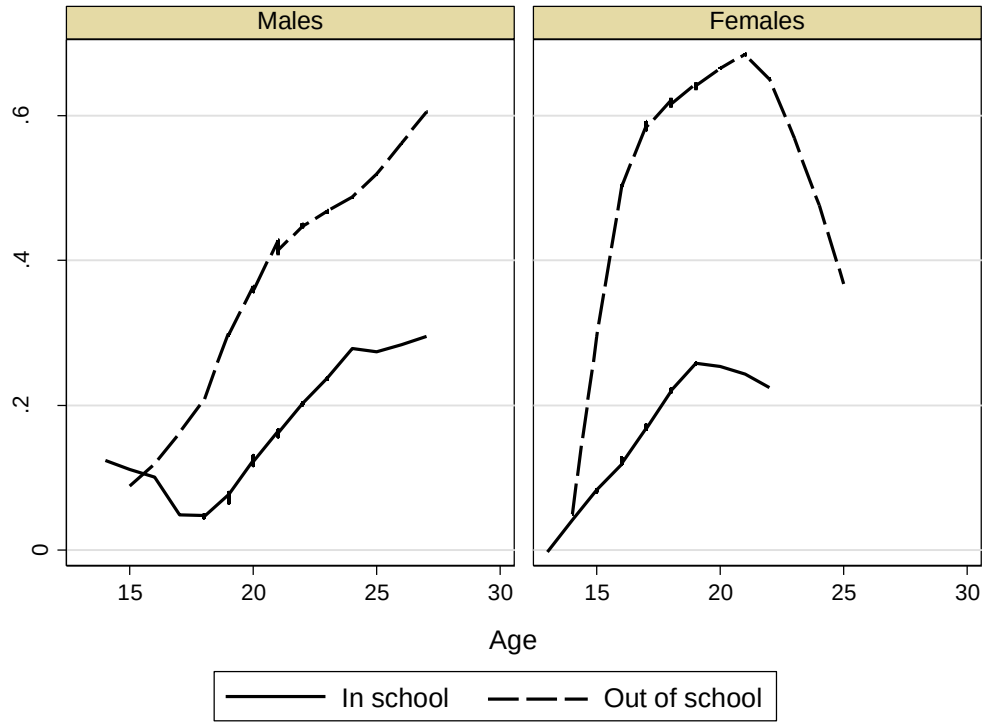

Table 3.5. LPM estimates for balanced panel of relationship between shocks and marriage/engagement for females

	Dependent variable: Married/engaged					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.377***	0.377***	0.368***	0.393**	0.546**	0.613**
	(0.113)	(0.131)	(0.095)	(0.177)	(0.211)	(0.258)
(Any negative shock) X Matrilineal	-0.352***	-0.328**	-0.335**	-0.319	-0.549**	-0.629**
	(0.125)	(0.141)	(0.139)	(0.210)	(0.231)	(0.273)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.050	-0.001	-0.057	-0.016	0.052	0.142
	(0.122)	(0.125)	(0.125)	(0.138)	(0.261)	(0.244)
(Any covariate shock) X Matrilineal	0.038	0.020	0.092	0.119	-0.050	-0.167
	(0.122)	(0.122)	(0.126)	(0.137)	(0.270)	(0.253)
Any idiosyncratic shock	0.135	0.137	0.264*	0.300	0.044	0.062
	(0.115)	(0.123)	(0.148)	(0.193)	(0.212)	(0.202)
(Any idiosyncratic shock) X Matrilineal	-0.138	-0.136	-0.270	-0.306	-0.074	-0.113
	(0.125)	(0.133)	(0.163)	(0.207)	(0.229)	(0.222)
Panel C: Economic and family shocks						
Any economic shock	0.347***	0.358***	0.353***	0.385***	0.461**	0.522**
	(0.106)	(0.110)	(0.098)	(0.135)	(0.212)	(0.247)
(Any economic shock) X Matrilineal	-0.358***	-0.338***	-0.295**	-0.270	-0.509**	-0.578**
	(0.118)	(0.121)	(0.134)	(0.170)	(0.221)	(0.246)
Any family shock	-0.004	0.035	-0.025	-0.094	0.460**	0.413*
	(0.129)	(0.144)	(0.128)	(0.149)	(0.207)	(0.214)
(Any family shock) X Matrilineal	0.006	-0.037	0.025	-0.095	-0.460**	-0.429*
	(0.130)	(0.143)	(0.135)	(0.153)	(0.215)	(0.227)
Village controls	X	--	X	--	X	--
Village fixed effects	--	X	--	X	--	X
Observations	1,056	1,056	588	588	468	468

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.6. LPM estimates for balanced panel of relationship between shocks and marriage/engagement for males

	Dependent variable: Married/engaged					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	-0.105	-0.124	-0.208	-0.239*	0.266	0.175
	(0.133)	(0.123)	(0.125)	(0.123)	(0.216)	(0.195)
(Any negative shock) X Matrilineal	0.121	0.130	0.249*	0.385**	-0.260	-0.176
	(0.149)	(0.140)	(0.146)	(0.163)	(0.235)	(0.217)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.132	-0.139	-0.269*	-0.277	0.058	-0.019
	(0.125)	(0.121)	(0.160)	(0.205)	(0.214)	(0.191)
(Any covariate shock) X Matrilineal	0.096	0.103	0.273	0.316	-0.091	-0.031
	(0.124)	(0.120)	(0.172)	(0.215)	(0.213)	(0.190)
Any idiosyncratic shock	-0.041	-0.043	0.057	0.007	-0.003	0.012
	(0.145)	(0.147)	(0.124)	(0.142)	(0.213)	(0.233)
(Any idiosyncratic shock) X Matrilineal	0.104	0.102	0.038	0.109	0.037	0.041
	(0.150)	(0.155)	(0.126)	(0.147)	(0.219)	(0.241)
Panel C: Economic and family shocks						
Any economic shock	-0.133	-0.139	-0.428***	-0.462**	0.467**	0.403*
	(0.145)	(0.146)	(0.154)	(0.197)	(0.210)	(0.230)
(Any economic shock) X Matrilineal	0.090	0.077	0.406**	0.497**	-0.524**	-0.492**
	(0.146)	(0.149)	(0.169)	(0.206)	(0.225)	(0.245)
Any family shock	-0.091	-0.131	0.184	0.009	-0.321*	-0.414**
	(0.128)	(0.135)	(0.110)	(0.177)	(0.167)	(0.169)
(Any family shock) X Matrilineal	0.143	0.178	-0.122	0.010	0.357**	0.465***
	(0.121)	(0.131)	(0.112)	(0.183)	(0.164)	(0.167)
Village controls	X	--	X	--	X	--
Village fixed effects	--	X	--	X	--	X
Observations	950	950	290	290	660	660

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.7. Individual-level FE estimates for balanced panel of relationship between shocks and marriage/engagement for females

	Dependent variable: Married/engaged		
	Total	In school	Out of school
	(1)	(2)	(3)
Panel A: Any negative shock			
Any negative shock	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
(Any negative shock) x Matrilineal	0.058	0.129	-0.001
	(0.057)	(0.089)	(0.084)
Panel B: Covariate and idiosyncratic shocks			
Any covariate shock	0.024	-0.000	0.211
	(0.108)	(0.133)	(0.167)
(Any covariate shock) X Matrilineal	0.021	0.135	-0.179
	(0.108)	(0.143)	(0.175)
Any idiosyncratic shock	-0.083	0.000	-0.158
	(0.132)	(0.208)	(0.128)
(Any idiosyncratic shock) X Matrilineal	0.099	0.042	0.106
	(0.137)	(0.217)	(0.135
Panel C: Economic and family shocks			
Any economic shock	0.000	0.000	-0.000
	(0.010)	(0.000)	(0.000)
(Any economic shock) X Matrilineal	0.008	0.107	-0.039
	(0.047)	(0.085)	(0.058)
Any family shock	-0.042	0.000	0.000
	(0.040)	(0.000)	(0.000)
(Any family shock) X Matrilineal	0.088*	0.045	0.032
	(0.050)	(0.055)	(0.048)
Observations	1,056	588	468

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.8. Individual-level FE estimates for balanced panel of relationship between shocks and marriage/engagement for males

	Dependent variable: Married/engaged		
	Total	In school	Out of school
	(1)	(2)	(3)
Panel A: Any negative shock			
Any negative shock	-0.006 (0.011)	0.000 (0.000)	0.000 (0.000)
(Any negative shock) x Matrilineal	0.099 (0.064)	0.154** (0.075)	0.069 (0.083)
Panel B: Covariate and idiosyncratic shocks			
Any covariate shock	-0.128 (0.119)	-0.231 (0.201)	0.000 (0.000)
(Any covariate shock) X Matrilineal	0.162 (0.124)	0.271 (0.201)	0.033 (0.056)
Any idiosyncratic shock	0.041 (0.053)	0.077 (0.076)	0.000 (0.000)
(Any idiosyncratic shock) X Matrilineal	-0.020 (0.067)	-0.033 (0.088)	0.008 (0.048)
Panel C: Economic and family shocks			
Any economic shock	-0.136 (0.178)	-0.400 (0.299)	0.071 (0.072)
(Any economic shock) X Matrilineal	0.163 (0.183)	0.462 (0.298)	-0.060 (0.101)
Any family shock	-0.109 (0.142)	0.200 (0.208)	-0.214 (0.142)
(Any family shock) X Matrilineal	0.156 (0.144)	-0.159 (0.214)	0.262* (0.148)
Observations	475	145	330

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.9. Summary statistics of marriage and engagement for female youth by lineage system, and in-school status

	Females													
	All		Out of School						In School					
			All out of school		Matrilineal		Patrilineal		All in school		Matrilineal		Patrilineal	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Round One (2007)	0.22	117	0.36	85	0.36	84	0.17	1	0.11	32	0.12	30	0.11	2
Round Two (2008)	0.43	226	0.61	143	0.61	140	0.67	4	0.28	83	0.27	76	0.37	7
Round Three (2009)	0.58	302	0.73	173	0.74	169	0.67	4	0.44	129	0.45	123	0.32	6
Observations		*1,584*		*702*		*684*		*18*		*882*		*825*		*57*

Table 3.10. Summary statistics of marriage and engagement for male youth by lineage system, and in-school status

	Males													
	All		Out of School						In School					
			All out of school		Matrilineal		Patrilineal		All in school		Matrilineal		Patrilineal	
	(8)		(9)		(10)		(11)		(12)		(13)		(14)	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Round One (2007)	0.24	112	0.29	95	0.29	92	0.20	3	0.12	17	0.11	14	0.21	3
Round Two (2008)	0.36	172	0.45	149	0.45	141	0.53	8	0.16	23	0.17	22	0.07	1
Round Three (2009)	0.47	221	0.59	194	0.59	186	0.53	8	0.19	27	0.18	24	0.21	3
Observations		*1,425*		*990*		*945*		*45*		*435*		*393*		*42*

Table 3.11. LPM and Individual FE estimates for balanced panel of relationship between shocks and transactional sex for females

	Dependent variable: Transactional sexual relationship					
	LPM Model					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.064	0.145*	0.078	0.196*	0.038	0.041
	(0.041)	(0.077)	(0.048)	(0.114)	(0.060)	(0.115)
(Any negative shock) X Matrilineal	-0.099*	-0.198**	-0.057	-0.180	-0.156*	-0.209
	(0.054)	(0.086)	(0.064)	(0.120)	(0.089)	(0.142)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.025	-0.005	-0.023	-0.023	0.017	0.028
	(0.079)	(0.086)	(0.100)	(0.104)	(0.030)	(0.069)
(Any covariate shock) X Matrilineal	-0.007	-0.036	0.005	-0.006	-0.060	-0.083
	(0.082)	(0.006)	(0.103)	(0.108)	(0.051)	(0.086)
Any idiosyncratic shock	-0.026	-0.006	-0.049	0.056	-0.013	-0.014
	(0.070)	(0.089)	(0.098)	(0.134)	(0.017)	(0.027)
(Any idiosyncratic shock) X Matrilineal	0.032	0.001	0.052	-0.051	0.009	-0.006
	(0.076)	(0.094)	(0.106)	(0.143)	(0.048)	(0.053)
Panel C: Economic and family shocks						
Any economic shock	0.066	0.144**	0.085*	0.193**	0.043	0.074
	(0.040)	(0.064)	(0.051)	(0.080)	(0.060)	(0.123)
(Any economic shock) X Matrilineal	-0.108**	-0.192**	-0.092	-0.200**	-0.133	-0.180
	(0.054)	(0.074)	(0.073)	(0.096)	(0.089)	(0.148)
Any family shock	0.004	0.009	-0.017	0.082	-0.009	-0.111
	(0.065)	(0.079)	(0.073)	(0.090)	(0.037)	(0.072)
(Any family shock) X Matrilineal	-0.016	-0.037	0.025	-0.095	-0.031	0.048
	(0.074)	(0.084)	(0.082)	(0.099)	(0.057)	(0.088)
Village controls	X	--	X	--	X	--
Village fixed effects	--	X	--	X	--	X
Observations	1,036	1,036	578	578	458	458

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, Columns 1, 2, and 7 also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.11. LPM and Individual FE estimates for balanced panel of relationship between shocks and transactional sex for females (cont.)

	Dependent variable: Transactional sexual relationship		
	FE Model		
	Total	In school	Out of school
	(7)	(8)	(9)
Panel A: Any negative shock			
Any negative shock	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
(Any negative shock) X Matrilineal	-0.053 (0.057)	0.068 (0.059)	-0.182** (0.085)
Panel B: Covariate and idiosyncratic shocks			
Any covariate shock	-0.070 (0.068)	-0.079 (0.092)	0.000 (0.000)
(Any covariate shock) X Matrilineal	-0.000 (0.077)	0.057 (0.106)	-0.126* (0.070)
Any idiosyncratic shock	-0.083 (0.082)	-0.132 (0.138)	0.000 (0.000)
(Any idiosyncratic shock) X Matrilineal	0.08 (0.092)	0.134 (0.146)	-0.010 (0.065)
Panel C: Economic and family shocks			
Any economic shock	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
(Any economic shock) X Matrilineal	-0.058 (0.055)	0.023 (0.067)	-0.146* (0.079)
Any family shock	-0.001 (0.007)	0.000 (0.000)	0.000 (0.000)
(Any family shock) X Matrilineal	-0.071** (0.032)	-0.046 (0.045)	-0.101* (0.055)
Village controls	--	--	--
Village fixed effects	--	--	--
Observations	1,036	578	458

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, Columns 1, 2, and 7 also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.12. LPM and Individual FE estimates for balanced panel of relationship between shocks and dating for females

	Dependent variable: Dating relationship					
	LPM Model					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.400***	0.415***	0.300***	0.312*	0.604***	0.591**
	(0.101)	(0.136)	(0.107)	(0.164)	(0.183)	(0.241)
(Any negative shock) X Matrilineal	-0.322***	-0.349**	-0.171	-0.194	-0.593***	-0.556**
	(0.104)	(0.137)	(0.111)	(0.162)	(0.206)	(0.276)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	0.103	0.112	0.109	0.086	0.088	0.045
	(0.137)	(0.154)	(0.146)	(0.161)	(0.330)	(0.376)
(Any covariate shock) X Matrilineal	-0.047	-0.064	-0.051	-0.016	-0.028	-0.001
	(0.141)	(0.157)	(0.153)	(0.171)	(0.336)	(0.385)
Any idiosyncratic shock	0.070	0.075	0.064	0.151	0.147	0.145
	(0.120)	(0.130)	(0.128)	(0.162)	(0.258)	(0.298)
(Any idiosyncratic shock) X Matrilineal	-0.051	-0.051	-0.027	-0.118	-0.156	-0.153
	(0.119)	(0.130)	(0.129)	(0.166)	(0.262)	(0.302)
Panel C: Economic and family shocks						
Any economic shock	0.415***	0.429***	0.309***	0.314**	0.624***	0.661***
	(0.108)	(0.134)	(0.107)	(0.133)	(0.186)	(0.233)
(Any economic shock) X Matrilineal	-0.364***	-0.393***	-0.233*	-0.230	-0.605***	-0.630**
	(0.112)	(0.137)	(0.117)	(0.142)	(0.191)	(0.241)
Any family shock	-0.092	-0.083	-0.032	0.050	-0.116	-0.269
	(0.134)	(0.151)	(0.128)	(0.131)	(0.279)	(0.356)
(Any family shock) X Matrilineal	0.102	0.095	0.066	-0.027	0.097	0.217
	(0.134)	(0.150)	(0.136)	(0.143)	(0.271)	(0.351)
Village controls	X	--	X	--	X	--
Village fixed effects	--	X	--	X	--	X
Observations	1,088	1,088	605	605	483	483

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, Columns 1, 2, and 7 also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.12. LPM and Individual FE estimates for balanced panel of relationship between shocks and dating for females (cont.)

	Dependent variable: Dating relationship		
	FE Model		
	Total	In school	Out of school
	(7)	(8)	(9)
Panel A: Any negative shock			
Any negative shock	0.400*	0.250	1.000***
	(0.221)	(0.219)	(0.000)
(Any negative shock) X Matrilineal	-0.368	-0.163	-1.020***
	(0.222)	(0.220)	(0.075)
Panel B: Covariate and idiosyncratic shocks			
Any covariate shock	0.200	0.092	0.526**
	(0.145)	(0.161)	(0.239)
(Any covariate shock) X Matrilineal	-0.211	-0.109	-0.533**
	(0.154)	(0.180)	(0.254)
Any idiosyncratic shock	0.000	-0.013	0.105
	(0.155)	(0.209)	(0.157)
(Any idiosyncratic shock) X Matrilineal	-0.011	0.084	-0.206
	(0.154)	(0.220)	(0.166)
Panel C: Economic and family shocks			
Any economic shock	0.333*	0.200	1.000
	(0.195)	(0.181)	(0.000)
(Any economic shock) X Matrilineal	-0.335	-0.159	-1.044***
	(0.201)	(0.195)	(0.067)
Any family shock	-0.000	0.000	0.000
	(0.056)	(0.048)	(0.000)
(Any family shock) X Matrilineal	0.009	0.067	-0.055
	(0.073)	(0.087)	(0.042)
Village controls	--	--	--
Village fixed effects	--	--	--
Observations	1,088	605	483

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, Columns 1, 2, and 7 also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3.13. Bride price differences by gender, shocks, and lineage system

	Overall (1)	No Shock (2a)	Any Negative Shock (2b)	p-value of diff. (2c)	No Economic Shock (3a)	Any Economic Shock (3b)	p-value of diff. (3c)
Panel A: Females - total							
Total bride price - monetized (MWK)	5,615.84	9,088.75	4,779.30	**0.00**	8,640.05	4,654.66	**0.00**
Panel B: Females in matrilineal households							
Total bride price - monetized (MWK)	5,597.52	8,435.27	4,909.58	**0.01**	8,106.05	4,788.32	**0.01**
Panel C: Females in patrilineal households							
Total bride price - monetized (MWK)	6,116.67	30,000.00	1,340.00	**0.00**	30,000.00	1,340.00	**0.00**

Note: Bold denotes significance at the 5% level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the EA level. Limited bride price information was reported even for those that had a new marriage during the study period. Sample sizes for the different panels are as follows: Panel A: N=170; Panel B: N=164; Panel C: N=6.

Table 3.14: Comparison of marriage quality for all married/engaged youth

	N	All	Male	Female	P-value of diff.
Age at marriage	342	18.94	21.42	17.46	**0.00**
How old was your spouse when you got married?	148	22.05	18.88	23.57	**0.00**
Age gap with spouse	144	3.21	-2.42	5.77	**0.00**
Age gap with spouse > 5 years	144	0.43	0.00	0.63	**0.00**
Highest level of education	486	2.28	2.27	2.28	0.91
What is the highest level of schooling your spouse attained?					
Primary education	148	0.66	0.83	0.57	**0.00**
Secondary education	148	0.28	0.13	0.36	**0.00**
Tertiary education	148	0.01	0.00	0.02	0.16
Education gap with spouse	130	0.58	0.11	0.84	**0.00**
What is the highest level of schooling your PTM/chitomelo attained?					
Primary education	250	0.56	0.66	0.47	**0.00**
Secondary education	250	0.34	0.28	0.40	**0.04**
Tertiary education	250	0.04	0.02	0.06	0.06
Education gap with PTM/chitomelo	250	0.70	0.36	1.03	**0.00**

Note: PTM = promise-to-marry or fiancé. Chitomelo = Chewa word for fiancé. Bold denotes significance at the alpha=0.05 level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the EA level.

Table 3.15: Comparison of marriage quality for all married/engaged females by in-school status

	N	All	Out of School	In School	P-value of diff.
Age at marriage	214	17.46	17.65	17.03	**0.03**
How old was your spouse when you got married?	100	23.57	23.83	23.21	0.67
Age gap with spouse	99	5.77	5.40	6.26	0.32
Age gap with spouse > 5 years	99	0.63	0.61	0.64	0.77
Highest level of education	641	1.28	1.15	1.50	**0.00**
What is the highest level of schooling your spouse attained?					
Primary education	100	0.57	0.62	0.50	0.24
Secondary education	100	0.36	0.28	0.48	**0.04**
Tertiary education	100	0.02	0.02	0.02	0.82
Education gap with spouse	85	0.15	0.18	0.11	0.63
What is the highest level of schooling your PTM/chitomelo attained?					
Primary education	127	0.47	0.59	0.17	**0.00**
Secondary education	127	0.40	0.28	0.71	**0.00**
Tertiary education	127	0.06	0.04	0.11	0.23
Education gap with PTM/chitomelo	113	2.19	2.02	2.34	0.16

Note: PTM = promise-to-marry or fiancé. Chitomelo = Chewa word for fiancé. Bold denotes significance at the alpha=0.05 level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the EA level.

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CHAPTER 4: ON THE PSYCHOLOGY OF POVERTY: EVIDENCE FROM THE FIELD

Introduction

Standard economic explanations of the shortsightedness displayed by individuals living in poverty include liquidity constraints and the urgency to meet immediate needs. The consequences of this myopia and their related behaviors help explain the persistence of poverty among individuals over time and across generations. However, insights from the psychology of poverty could further our understanding about why those living under severe material deprivation make decisions that effectively perpetuate their economic condition. This line of reasoning proposes that poverty affects economic choices through its influence on psychological states—stress and affect—as well as through the psychological toll of scarcity (Mullainathan & Shafir, 2013; Haushofer & Fehr, 2014). Material deprivation and its immediate correlates such as exposure to disease, crime, and violence cause negative affect and chronic or 'toxic' stress, and these psychological states then exert an additional and separate effect on forward looking behavior and time discounting.

Economists as far back as the 19th century recognized the idea that economic decisions, particularly those involving intertemporal choice, may be influenced by psychological factors. John Rae (1834), among others, described the factors inhibiting the 'effective desire of accumulation' to include impulse control, visceral influences and emotion, as well as the habit of prudence and reflection. More recent reviews of intertemporal choice have continued to highlight

the importance of emotion and current psychological states on behavior, citing evidence on these relationships from laboratory studies conducted by psychologists (Frederick et al., 2002; Lowenstein, 2000). The psychological consequence of poverty is further manifested through the phenomenon of scarcity, which creates a mindset that draws attention to the immediate shortage and away from long-term considerations (Mullainathan & Shafir, 2013). For those in extreme poverty for whom food or water is scarce, all available resources, mental and physical, are devoted to addressing this immediate need to the neglect of other concerns. This extreme focus or 'tunneling' is not a behavior that only affects the poor.

Regardless of income, the combination of scarcity and negative affect may overburden the mind and lead to lower cognitive performance and sub-optimal decision-making. Recent results from laboratory-based experiments have shown that both rich and poor individuals perform similarly on cognitive and impulse control tests when presented with manageable scenarios (i.e., low stress, low cost) (Mani, Mullainathan, Shafir & Zhao, 2013). However, when the hypothetical scenarios become insurmountable (e.g., the proposed costs in the scenario exceeded real life budgets), poorer individuals scored much worse than richer individuals on these same tests. Similar studies highlight how the level of one's initial resource endowment encourages tunneling behavior of participants. After randomly assigning participants to differing levels of available time, guesses, and budgets, participants were asked to perform a variety of tasks which involved multiple rounds of play with resources from a later round being eligible for borrowing at high interest rates in earlier rounds. The results revealed participants assigned to lower endowments performed worse than participants randomly assigned to higher endowments due to the low resource group's tunneling on the current task at the expense of future consequences (Shah, Mullainathan & Shafir, 2012). Specifically, compared with the more

resource rich individuals, the resource poor individuals were more likely to borrow resources, and to do so at high interest rates, which ultimately led to reduced performance. Results from such studies lend support to the notion that it is not simply the lack of financial resources associated with being in poverty that causes lower performance and near-sighted decision-making, instead it is due to the focus on scarcity and the stress associated with it stemming from everyday situations faced by those living in poverty. Otherwise, as the lab experiments show, both rich and poor individuals perform similarly on these cognitive and impulse tests in the absence of external or internal stressors.

A few studies have used exogenous variation in income to study the link between poverty and psychological states such as affect and subjective well-being (SWB). A lump-sum cash transfer (as compared to predictable monthly transfer) to poor individuals provided by the non-governmental organization Give Directly in Kenya increased SWB and happiness relative to a randomly-assigned control group, though the stress hormone, cortisol, was only affected in the group receiving larger transfers (Haushofer & Shapiro, 2016). Qualitative evidence from four cash transfer programs in Sub-Saharan Africa also report positive effects of the programs on the psychosocial well-being of beneficiaries (Attah et al., 2016). A review of 25 quantitative studies that report on the effect of poverty on psychological well-being revealed that 18 demonstrated positive and significant effects of poverty alleviation on aspects of psychological well-being or stress (Haushofer & Fehr, 2014).

Despite the growing evidence linking poverty to psychological states, the evidence on the link between psychological states and economic decisions is limited to laboratory settings. Pharmacological elevation of the stress hormone cortisol increased time discounting among

males aged 18-35 in a study in Amsterdam (Cornelisse et al., 2013), and negative affect (induced through film clips) also reduced time discounting among individuals aged 18-63 in the US (Lerner, Li &Weber, 2013). There is no evidence outside the lab setting on these relationships. Are the economic decisions of the poor really influenced by their psychological state, or do these decisions simply reflect liquidity constraints and related financial circumstances? If they do, this provides an additional explanation for the behaviors that seemingly lead to poverty traps and the perpetuation of poverty.

We address this question using secondary data from two longitudinal randomized-control trials (RCTs) that were conducted by the Transfer Project to evaluate the impact of national cash transfer programs in Malawi and Zambia. Both programs reach a large number of extremely poor beneficiaries and are implemented by the Social Welfare Departments of the respective governments. As part of these two evaluations, we administered a module on intertemporal choice, savings and SWB to the main respondent, typically the designated beneficiary of the cash transfer. Both programs had positive impacts on various dimensions of SWB including positive affect, subjective future well-being, worrying about food and (in Malawi only) perceived stress. Most importantly, these psychological states predict the decision to save money or to wait for future money. For example, happiness leads to an increase of between 5 and 9 percentage points in the likelihood of waiting for future money in both programs. Most results are robust across the two programs despite their very different target groups, strengthening the argument that they are due to the underlying consequences of deep poverty rather than the uniqueness of the demographic characteristics of the study participants. These results add to the scant evidence demonstrating in a field setting that psychological and emotional states have a direct effect on economic decisions.

The Malawi Social Cash Transfer Program

Program Design

The Malawi SCTP, an unconditional cash transfer program targeted to ultra-poor, labor-constrained households in Malawi, is administered by the Ministry of Gender, Children and Social Welfare.[32] The program began as a pilot in the Mchinji district in 2006, and was expanded to an additional eight districts by 2009, and further expanded starting in 2014. Beneficiary households receive bimonthly payments of varying amounts depending on household size and the number of primary and secondary school-aged children in the home. By endline, the average monthly per capita transfer amount received by beneficiary households was equivalent to US$1.25 a month or about US$60 per household annually. Payments are made in cash every other month through a local pay-point manager to the main beneficiary, and there are no conditions to receive the money. Payments represent approximately 20 percent of pre-program consumption for beneficiary households. The overarching objective of the SCTP is to reduce extreme poverty and hunger, and to increase school enrollment among the ultra-poor.

Study Design

A cluster-randomized, longitudinal study consisting of a baseline and two follow-up surveys was designed to assess the impact of the SCTP.[33] Our present study uses data from the

[32]The Operations Manual of the SCTP defines ultra-poor as a household that is unable to meet the most basic urgent needs, including food and essential non-food items such as soap and clothing, while labor constrained refers to a household with a dependency ratio (ratio of 'fit to work' to 'not fit to work') of more than three or with no individuals who are fit to work. An individual who is considered not fit to work is someone under the age of 18, over the age of 64, or within the age range 18 to 64 but suffering from a chronic illness or disability or is otherwise unable to work (Handa et al. 2014).

[33]Survey instruments were reviewed for ethical considerations and approved by the UNC-CH Institutional Review Board and Malawi's National Commission for Science and Technology, National Committee for

baseline survey conducted mid-2013, the first follow-up survey conducted in late 2014 through early 2015, and the final follow-up survey conducted in late 2015. The SCTP study consisted of both quantitative and qualitative components. The household questionnaire, the main survey instrument, covered a comprehensive list of topics including household composition, consumption, health, education, economic activity, time, and SWB, among others. The study was designed around the Government of Malawi's plans to extend and expand coverage of the SCTP starting in 2014. Two districts, Salima and Mangochi, were chosen for the evaluation study to align the evaluation with the expansion plans. Randomization took place at multiple levels within these two districts starting with TAs down to VCs. Two TAs were randomly selected in each district to participate in the study. Based on a targeting procedure instituted by the ministry, eligibility lists in each VC in the study sites were created. The study team randomly assigned numbers to the VCs in each TA using the random number generator in Excel and sent the lists to the ministry. Once baseline data collection was complete, the District Commissioner's Office in each district conducted a public coin toss to determine whether the top or bottom half of the randomly ordered list would enter the program first, with the rest comprising a delayed-entry group. The coin toss thus determined the treatment group and resulted in 14 clusters being assigned to treatment with the remaining 15 assigned to the delayed-entry control arm.[34]

Power for the study was calculated based on the three key program objectives – consumption, school enrollment and child nutritional status – using intra-class correlation

Research in Social Sciences and Humanities (UNC IRB Study No. 12-2496; Malawi NCST Study No. RTT/2/20).

[34]Control households were not aware they were receiving the transfer at a later date. The study team additionally checks for anticipation effects in the control group at endline right before these households were scheduled to start receiving payments and found no effects.

estimates from the most recent Malawi Demographic and Health Survey for nutrition, and the Malawi Integrated Household Survey for consumption and schooling. Per these calculations, a sample size of 3,500 households in 29 VCs was necessitated, or an average of 121 households per VC. The final sample size was 3,531 households – 1,678 in treatment VCs. Since limited financial resources prevented the inclusion of all households in program districts at once, the final ethically feasible study sample represents approximately 47 percent of all eligible households from the four TAs. For additional details on the sampling procedure and power calculations to determine optimal sample size, see the publicly available study baseline report (Handa et al. 2014).

The Zambia Child Grant Program

Program Description

The Zambia CGP was started as a demonstration project by the Zambian Ministry of Community Development, Mother and Child Health in 2010 in the districts of Kalabo, Kaputa, and Shangombo. These districts are in the remotest parts of Zambia (along the border of Angola on the West and Democratic Republic of Congo in the North-East) and among the most deprived districts in the country. The CGP targeted any household with a child under 5 years of age.[35] Recipient households received approximately US$12 per month irrespective of household size, an amount deemed sufficient to purchase one meal a day for an average sized household for one month. Payments were made in cash every other month through a local pay-point manager to the caregiver of the focal child, and there were no conditions to receive the money. Payments

[35]While the eligibility criteria for the CGP targeted households with children under age 5, the evaluation targeted those with children under age 3 at baseline so they would remain eligible for the program throughout the entirety of the initial study period (3 years).

represent approximately 27 percent of pre-program consumption for beneficiary households. The overarching objective of the CGP was to reduce extreme poverty and improve the health and nutrition of children.

Study Design

Similar to the SCTP, the evaluation for the CGP was a conducted as a multi-site RCT. This design was ethically feasible given that the program was still in pilot phase and due to financial constraints, not all eligible households within pilot districts could be reached. The evaluation consisted of a baseline survey in October-November 2010 and follow-up surveys conducted 24-, 30-, and 36-months after baseline.[36,37] The first payments to beneficiaries began in January 2011. The CGP study consisted of both quantitative and qualitative components with the household questionnaire again serving as the main, comprehensive survey instrument.

As in Malawi, the randomization process was conducted publicly by the government. In the first stage, 30 Community Welfare Assistance Committees (CWACs) per district were randomly selected by lottery to participate in the study—this process was conducted by the provincial and district social welfare officers at the ministry headquarters in Lusaka in June 2010. After the CWACs were randomly selected, the ministry targeted all eligible households within them, which resulted in a list of more than 100 eligible households within each CWAC. Of these eligible households, 28 were randomly sampled from each CWAC and were included in the study. This

[36]The Zambia CGP evaluation study included an additional round collected at 48-months but are excluded from this present study for comparability since some of the individuals would have graduated from the program by the 48-month follow-up.

[37]Survey instruments were reviewed for ethical considerations and approved by the American Institutes for Research and UNC-CH's Institutional Review Boards as well as the University of Zambia's Research Ethics Committee.

resulted in a final sample of 2,519 households. After baseline, the Ministry's Permanent Secretary conducted a public coin flip to determine which half of a randomly ordered list of CWACs would be assigned to treatment and which to the delayed control arm. See the publicly available baseline report of the study for additional details on the study design, sampling procedure and instruments (Seidenfeld, et al. 2011).

Measures

For each study, we estimate the impact of the cash transfer on two economic decisions that involve self-control and long-term planning. The first is whether or not the respondent had saved any cash in the last thirty days for an emergency or to buy something special in the future. The second is a hypothetical intertemporal choice task where the respondent was asked if s/he would wait one month and take a future (higher) amount if she were to receive $X today. The higher amounts ranged from one to four times the value of the current amount. Since a large proportion of respondents never waited for any future value, we use a dichotomous indicator of whether the respondent ever chose to wait for future money. As mentioned, this subset of questions was hypothetical in nature meaning respondents were not incentivized and no monetary rewards were exchanged. While there is a debate in the literature over the merit of hypothetical versus incentivized choice modules, studies have found both types lead to similar responses, and hypothetical questions afford researchers the additional advantage of testing a broader range of values across a larger sample (Camerer & Hogarth, 1999; Delavande et al., 2011; Harrison et al., 2002; Harrison et al., 2007; Holt & Laury, 2002; Johnson & Bickel, 2002; Kirby, 1997). Researchers must remain within their budget constraint, so incentivizing such tasks necessitates smaller sample sizes and lower future value ranges as the costs associated with paying out the rewards can quickly add up. Conversely, with hypothetical tasks, researchers are

provided the opportunity to sample more individuals and use a much larger spread of future values. Since reviews show that preferences and discount rates stemming from each type are similar, it follows that the use of such hypothetical questions for this study is reasonable and that the responses are valid and believable.

The psychological variables we use are broken down into those that measure the respondent's stress and those that measure their affect and SWB. The former group consists of a stress index created using variations of the Cohen's Perceived Stress Scale (PSS) (Cohen, Kamarck and Mermelstein 1983) (10-item scale in Zambia, 4-item scale in Malawi[38]), and a dichotomous variable denoting whether or not the respondent reported worrying about having enough food for their family over the recall period. To ascertain respondent's affect and general feelings of well-being, we look at whether they believe their life will be better one year from the date of the interview, whether they reported generally feeling happy, and their score on a quality of life scale. The quality of life scale is an 8-item module in which respondents were asked how strongly they agreed or disagreed with eight positive statements about their life. This module was not administered in Zambia so is only used as an additional measure in the Malawi analysis. Full details and the definition of all variables used in the analysis are provided in the Appendix C.

Malawi SCTP

The SCTP baseline evaluation report tested for balance across all primary indicators plus variables that were thought to be important determinants of the primary indicators such as age, education, and marital status of the main beneficiary. Of the 350 indicators tested, 10 were

[38]Of the full 10-item Cohen's PSS, only 4-items were included in all three waves of the Malawi SCTP survey. Even though all 10 items were administered in both follow-up rounds, we only use the 4-item scale for study so as to compare the same items over time.

statistically different at baseline (including the main respondent being currently separated/divorced, per capita food specific expenditures, and percent of children who suffered from a fever in the past two weeks) though the magnitude of all differences was small. The analytical sample for this article is restricted to the panel of respondents who responded to the questions on intertemporal choice, affect, and savings in each round. Across the three survey waves, 2,659 households had the same respondent for the individual module on preferences and affect. Table 4.1 Panel A shows baseline balance tests for seven key variables for this restricted panel that are likely to be important determinants of the outcomes considered in this article. None of the means of these seven variables are statistically different across study arms. Similarly, Table 4.1 Panel B shows baseline balance tests on the analytical sample for the six outcomes analyzed in this article for which we have baseline data. Again, none of the means for these outcomes are statistically different across study arms at baseline among the analytical sample.

Attrition

Overall attrition in the SCTP over the three rounds was about 6.5%. The publicly available endline evaluation report investigates attrition by testing for similarities at baseline between (1) treatment and control groups for panel households only (differential attrition) and (2) all households at baseline and the remaining households at follow-up (overall attrition) (Handa et al., 2016). These results show that there was no differential attrition (so balance was preserved across the two arms), but there was a small difference in the composition of households remaining in the sample over time. Panel A of Table 4.2 shows results from attrition analysis of the same set of seven key indicators reported earlier for the analytical sample. Column (8) of this table shows that there is no differential attrition. Panel B reports the same

analysis for the six outcomes that we measured at baseline and confirms that there is no differential attrition for these outcomes.

Zambia CGP

We use data from the evaluation of the Zambia CGP which comprised 2,519 households, approximately half of whom were randomly assigned to control status. Approximately 80 percent of households (1,983 households) maintained the same survey respondent over all four waves and comprise the analytical sample that we use. The aforementioned baseline evaluation report tested for balance across all primary indicators in the study plus variables that were thought to be important determinants of the primary indicators such as age, education and marital status of the main beneficiary and showed strong balance (Seidenfeld et al., 2011). The analytic sample for this article is restricted to the panel of respondents who responded to the questions on intertemporal choice, affect, and savings in each round. We further dropped the 1 percent of respondents who were males. Table 4.3 Panel A shows baseline balance tests for seven key variables for this restricted panel that are likely to be important determinants of the outcomes considered in this article. None of the means of these seven variables are statistically different across study arms. Similarly, Table 4.3 Panel B shows baseline balance tests on the analytical sample for four outcomes analyzed in this article for which we have baseline data. None of the means for these outcomes are statistically different across study arms at baseline among the analytical sample.

Attrition

Attrition over the three periods was less than 6 percent, and primarily driven by households in Kaputa, where the drying up of Lake Cheshi forced households that relied on the lake for fishing and farming to move as they followed the edge of the lake. This problem

affected treatment and control households equally. The publicly available 36-month evaluation report investigates attrition by testing for similarities at baseline between (1) treatment and control groups for panel households only (differential attrition) and (2) all households at baseline and the remaining households at the follow-up (overall attrition) (American Institutes for Research, 2014). These results show that there was no differential attrition (so balance was preserved across the two arms), but there was a small difference in the composition of households remaining in the sample, specifically, slightly fewer households in Kaputa than at baseline. Table 4.4 reports attrition analysis of the same set of key indicators reported earlier for the analytical sample used here. Column (8) of this table shows that there is no differential attrition—none of the means are different across the two arms. Panel B of Table 4.4 reports the same analysis for the four outcomes that we had measured at baseline, and this confirms that for these four outcomes there is no differential attrition.

Methods

For both studies, we use the same essential statistical methodology in the analyses. First, we identify the average effect of treatment (the cash transfer) on individuals' time discounting, propensity to have any cash savings, and psychological indicators. For outcomes with baseline information we estimate difference-in-difference (DD) models, pooling all follow-up waves to generate an average treatment effect over the three (Zambia) or two (Malawi) follow-up waves.[39] For variables which were not collected at baseline, we present single difference estimates using the pooled follow-up (post-intervention) data.

$$(1) \qquad Y_{it} = \alpha + \beta_1(T_i * P_t) + \beta_2 T_i + \beta_3 P_t + \beta_4 X_{it} + e_{it}$$

[39]Due to potential seasonality issues with the timing of various follow-up rounds of data collection (i.e., some during the lean season, some in harvest season), we choose to present only ATEs for each program to account for these differences.

Equation (1) shows our basic empirical specification where Y_{it} denotes the individual, time-specific outcome of interest and β_1 – the coefficient on the indicator for receiving the transfer (T_i) in the post periods (P_t) – signifies the average effect of the cash transfer. X_{it} is a vector of controls measured at baseline including the main respondent's age, gender (Malawi only, all respondents are female in Zambia), education, and district/TA of residence. We then looked at whether the treatment effect on savings and time discounting operated through the psychological states by adding each psychological variable to the models. All standard errors are clustered at the VC (Malawi) or CWAC (Zambia) level; in Malawi we also implement the wild bootstrap (Cameron, Gelbach & Miller, 2008) to account for the fact that we only have 29 clusters.

Finally, we report the direct effect of the psychological measures on economic decisions controlling for the potential endogeneity of these measures using two approaches. Simply using the psychological variables to predict economic decisions fails to account for endogeneity at the individual level. There is likely some factor affecting both the main respondent's psychological state as well as their decision to save or ever wait for a future payment. To address this endogeneity, we instrument the psychological variables (equation 2a), and use the fitted values to predict the economic decisions (equation 2b):

$$Psych_{it} = \alpha + \beta_1 T_i + \beta_2 X_{it} + e_{it} \quad \text{(2a)}$$

$$Econ_{it} = \alpha + \delta_1 \widehat{Psych}_{it} + \gamma_1 X_{it} + \nu_{it} \quad \text{(2b)}$$

We exploit the random assignment to treatment as our instrument. This approach is only used when the treatment has no direct effect on the economic outcomes after controlling for the effect of the psychological variables (see below), in other words, when the instrument satisfies the

exclusion restriction, and when treatment is shown to strongly predict the psychological variables (produces an F-statistic larger than 10).

Our second and preferred approach is a FE model, which controls for time invariant unobserved differences across respondents. The essential relationship is illustrated in equation (3) where ν_i represents the time invariant source of endogeneity.

$$Econ_{it} = \alpha_i + \beta_1 Psych_{it} + \beta_2 X_{it} + e_{it} + \nu_i \quad (3)$$

The key assumption for the FE model to deliver unbiased estimates is that the joint determination of psychological states and economic decisions emanate from an individual characteristic that is fixed over time. In the FE estimation, when there is baseline information we use data from four waves in Zambia and three waves in Malawi. When there is no baseline information, the FE estimates use post-treatment data and thus show the average difference (change) in the post-treatment periods only.

Results

Malawi SCTP

First, we identify the average effect of treatment (the cash transfer) on individuals' time discounting, propensity to have any cash savings, and psychological indicators. For outcomes with baseline information we estimate DD models, pooling all follow-up waves to generate an average treatment effect over the two follow-up periods. For savings, which was only collected at endline, we present single difference estimates using the pooled follow-up (post-intervention) data. We find that the respondents in the treatment group are 8.6 pp more likely to ever be willing to wait for a future payout compared to those in the control group (Table 4.5, column 2), and treatment is associated with a 16 pp increase in the probability that an individual had any savings at endline (Table 4.5, column 1). Furthermore, we see highly significant treatment

effects for all of the psychological variables (Table 4.5, columns 3-7). Program beneficiaries are less stressed and more optimistic about their lives currently and projected in the following year. Specifically, receipt of the transfer, on average, increases individuals' score on the four-item PSS (where 1 is the most stressed and 20 is the least stressed) by a little over one point, increases their likelihood of not worrying about having enough food by 21 pp, increases the likelihood of generally feeling happy as well as believing life will be better in one year by 19 pp, and increases the score on the quality of life scale by about half a point (Kilburn et al., 2018). Thus, the induction of an exogenous variation in income has noted improvements in respondents' levels of stress, affect, and economic decisions related to intertemporal choice.

Next, we looked at whether the treatment effect on savings and time discounting operates through the psychological states by adding each psychological variable to the models in columns (1) and (2) of Table 4.5—these are shown in Table 6. For both savings (Panel A) and willingness to wait (Panel B), we find only a partial mediating effect. For savings, the strongest mediation pathway is through 'never worrying about food' (Panel A, column 2) where the treatment effect decreases from 16 pp to 13.3 pp, or about 17 percent. The effect on waiting for a future payment, on the other hand, was most influenced by the quality of life scale which reduced the impact of treatment from an 8.5 pp increase in likelihood to a 5.8 pp increase, a reduction of 32 percent (Table 4.6, Panel B, column 11). However, in all of the regressions shown in Table 4.6, the psychological variables have a statistically significant predictive ability for the economic decisions. For example, generally feeling happy and thinking life will be better in a year is associated with an increase in the likelihood of waiting for future money by 5.1 pp and 7.3 pp respectively, and an increase in the likelihood of saving money by 4.7 pp and 5.9 pp, respectively. Interestingly, when all potential psychological mediators are included in the same

regression, some of the effects disappear. For instance, generally feeling happy and quality of life scale score are no longer shown to be significant predictors of saving money; rather, this behavior is most influenced by the stress scale, not worrying about food, and believing life will be better in a year (Column 6). Relatedly, willingness to wait for money is predicted by not worrying about food, believing life will be better in a year, and the quality of life scale score with the latter boasting the strongest influence (Column 12).

Stronger causal estimates of stress and affect on the economic decisions using IV and FE are shown in Table 4.7. We omitted savings from these analyses for two reasons. First, the treatment indicator is not a valid instrument for the psychological variables because it continues to have a direct effect on savings even after controlling for the psychological variables in Panel A of Table 4.6. Second, savings was only collected at the second follow-up and so cannot be used in the fixed-effects analysis, which requires at least two periods of data.

Results from the IV analysis in column (2) of Table 4.7 confirm that all five psychological measures have a significant effect on time discounting. The FE analyses in column (1) of Table 4.7 generally confirm these results as well, with four of the five psychological indicators displaying a significant relationship with time discounting, the exception being not worrying about food. Point estimates are large; a 1.22 change in the 4-item Cohen Stress Scale (the program effect reported in Table 4.5) increases the likelihood of waiting for future money by 11.7 pp, a 19 percent increase over the baseline mean of 62 percent.

Zambia CGP

The CGP had a strong impact on the economic decision to save, increasing the likelihood of holding any savings in the last 30 days by 18 pp, representing a doubling of the baseline savings rate (Table 4.8, column 1) (Natali et al., 2016). In contrast to the SCTP however, the

CGP did not affect the propensity to wait for future money (Column 2). The CGP did affect several dimensions of SWB such as whether or not the beneficiary worried about food in the past four weeks, generally felt happy, or felt life would be better in one year (Natali et al., 2018). The CGP had no effect on the ten-item PSS (Hjelm et al., 2017).

Results in Panel A of Table 4.9 suggest that even though there are strong effects of the cash transfer on savings and psychological states, the latter explain very little of the direct effect of the cash on savings. When the psychological variables are added to the regressions predicting savings, the treatment dummy variable continues to be highly statistically significant and its effect reduced by only 1-2 pp. For example, adding the variable 'not worried about food in the last four weeks' to the regression reduced the treatment effect from 17.8 pp to 15.8 pp (Table 4.9, Panel A, Column 2). On the other hand, three of the four psychological variables are predictive of the savings decisions: stress, worrying about food and 'life will be better in 1 year'.

Panel B in Table 4.9 introduces the psychological variables to the regressions predicting time discounting. As there was no treatment effect on this indicator, these estimates primarily serve to demonstrate the importance of psychological states in the intertemporal choice decision. Results are consistent with those from Panel A: three of the four psychological indicators are statistically significant predictors of the probability of waiting for future money, the exception this time being whether the respondent was worried about food. The estimates in column 8 of Panel B indicate that generally feeling happy leads to a 9 pp increase in the likelihood of waiting for future money, an 11 percent increase over the baseline mean.

Stronger evidence on the causal effects of the psychological indicators on economic decisions is provided in Table 4.10 where we use individual FE and IV to control for unobserved factors that simultaneously determine psychological states and economic decisions. Results in

Panel A of Table 4.9 show that the treatment indicator is not a valid instrument for the psychological variables in the savings regression, and is a valid instrument only in columns (7) and (9) in Panel B. On the other hand, for all psychological indicators we have multiple waves of data and can therefore use FE estimation to eliminate unobserved (time-invariant) individual heterogeneity from the regressions. In the case of happiness and stress, we only have post-treatment data, so the FE estimates measure change in the post-intervention time-period only.

Similar to the results from Malawi, psychological states are highly predictive of economic decisions. All four indicators are statistically significant determinants of savings (column 1, Table 4.10). For time discounting, five out of the six coefficients estimated are statistically significant in the hypothesized direction. What is interesting is that stress and happiness are statistically significant in the FE models. Since these are only measured post-intervention, they indicate that differences along psychological dimensions continue to influence economic decisions several years after program initiation rather than simply a difference that occurs due to an initial jump in affect or stress brought about by the initial enrollment in the cash transfer.

Discussion and Conclusion

Insights on the psychology of poverty propose a feedback loop whereby poverty leads to negative emotion and stress, which in turn influence economic behaviors, leading to sub-optimal decisions that effectively perpetuate poverty. Our results from government poverty alleviation programs in Malawi and Zambia support this theory and are consistent with results from laboratory settings demonstrating that psychological well-being influences intertemporal choice (Shah, Mullainathan & Shafir, 2012; Mani et al., 2013; Gennetian & Shafir, 2015). Both programs had an impact on various dimensions of psychological well-being, including positive

affect, subjective future well-being, worrying about food, and (in Malawi only) stress. More interesting, however, is the finding that these psychological states were predictive of the decision to save money or to wait for money in the future. For example, results from the FE models showed that feeling happy led to an increase of between 5.6 and 8.5 pp in the likelihood of waiting for future money, and a 5.1 pp increase (in Zambia only) in the likelihood of saving money. Particularly important is the fact that results were consistent across the two programs despite the fact that the demographic profiles of beneficiaries were starkly different. The typical CGP beneficiary is notably younger than in the Malawi SCTP, with an average age of 29 compared to 58 in the SCTP, and virtually all are women as the grant is targeted towards caregivers of children under the age of five years. Other contrasting features of the two samples are that three-fourths of beneficiaries in the CGP are married compared to just half in the SCTP, and average household size is about one person larger than in the SCTP (5.5 versus 4.5 people). However, the average consumption level of the two beneficiary groups was the same at less than 50 cents per person per day. This further strengthens the argument that the relationships shown here are due to the underlying consequence of chronic and abject poverty, rather than the uniqueness of the demographic features of the study participants, which can be a concern in laboratory studies.

While results from this study highlight new ways to think about how policies and programs aimed at reducing poverty affect behavior and psychological states which, in turn, affect poverty, there are a few limitations to consider when interpreting the results. First of all, there is concern over how successful the PSS is when used in developing country contexts as the scale has not been validated with such populations (Hjelm et al., 2017). As such, we may not be obtaining an accurate measure of stress for these individuals. Biomarkers (e.g., measuring

salivary cortisol levels) are increasingly being used in research to ascertain an individual's stress levels, and may produce a more accurate measure (Djuric, et al., 2008). Unfortunately, such data was unavailable to us during this study, but could prove useful as additional measures to be used in future research. Moreover, a few of our key variables were only collected in one (Malawi) or two (Zambia) follow-up waves so we do not have baseline values. Therefore, our causal inference relies on the assumption of equivalence at baseline across treatment and controls groups within each study. However, Tables 1 and 3 show balance of key characteristics at baseline across treatment arms, so we feel this limitation is diminished.

The precise mechanism through which stress and negative emotion influence intertemporal behaviors such as saving and time discounting in a field setting is still not clear. Results from the laboratory suggest that stress may weaken cognitive function and cause individuals to fall back on heuristics or habitual behavior, such as current consumption (Gennetian & Shafir, 2015). Poverty-related stress may also weaken the immune system through increased exposure to latent viral infection, which itself can impede cognitive capacity and inhibit forward-looking behavior (Aiello et al., 2006). Negative affect can also have a direct impact on impulse control and the ability to delay gratification (Loewenstein, 1996). Understanding the underlying mechanisms in a field setting remains a key issue on the research agenda. This in turn can improve the design of various poverty interventions, including cash transfer programs, to address both the financial and behavioral consequences of poverty that lead to poverty traps. If programs can relieve stress, worry, and negative affect, it seems they will be able to, subsequently, alter one's economic decision-making to make them more future-oriented and exhibit more safeguarding behaviors.

Tables

Table 4.1. Malawi SCTP baseline balance tests for key individual and household characteristics

	N	All	Control	Treatment	P-value of difference
Panel A. Key explanatory variables					
Respondent female	2,659	0.88	0.89	0.87	0.33
Respondent age	2,659	56.89	56.08	57.77	0.46
Respondent any school	2,659	0.31	0.30	0.31	0.77
Widow	2,659	0.45	0.44	0.46	0.52
Household size	2,659	4.53	4.55	4.50	0.81
Per capita expenditures (Kwacha)	2,659	44,052.97	42,452.05	45,785.53	0.39
Number of livestock owned	2,659	1.18	1.20	1.15	0.82
Panel B. Key outcomes					
Ever waits for payment	2,659	0.38	0.37	0.39	0.76
Generally feel happy	2,659	0.18	0.18	0.17	0.72
Life better in 1 year	2,659	0.53	0.53	0.53	0.95
Quality of life scale (out of 8)	2,659	2.23	2.26	2.19	0.58
Low stress index (out of 20)	2,659	6.00	5.89	6.12	0.67
Not worried about food	2,659	0.15	0.15	0.14	0.73

Notes: P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the village cluster level

Table 4.2. Malawi attrition analysis of selected indicators at baseline

	Control			Treatment			Difference	
	Attritors (1)	Non-attritors (2)	P-value (3)	Attritors (4)	Non-attritors (5)	P-value (6)	Col(1)-Col(4) (7)	P-value (8)
Panel A. Key explanatory variables								
Respondent female	0.70	0.85	**0.01**	0.79	0.83	0.41	-0.09	0.20
Respondent age	54.50	56.30	0.58	61.19	58.17	0.42	-6.69	0.26
Respondent any school	0.35	0.32	0.66	0.30	0.34	0.64	0.05	0.66
Widow	0.42	0.41	0.83	0.50	0.44	0.48	-0.08	0.54
Household size	4.00	4.64	**0.01**	3.29	4.59	**0.00**	0.71	0.16
Per capita expenditures (Kwacha)	51,533.84	43,020.33	0.23	65,148.46	45,520.7	**0.01**	-13,614.62	0.17
No. of livestock owned	0.76	1.35	**0.03**	1.47	1.38	0.89	-0.71	0.25
Panel B. Key outcomes								
Generally feel happy	0.23	0.19	0.55	0.11	0.17	0.13	0.11	0.15
Life better in 1 year	0.58	0.53	0.32	0.56	0.53	0.60	0.02	0.83
Quality of life scale (out of 8)	2.37	2.26	0.42	1.98	2.19	0.06	0.39	0.08
Low stress scale (out of 20)	6.62	6.00	0.23	5.57	6.16	0.15	1.05	0.21
Not worried about food	0.18	0.15	0.39	0.14	0.15	0.84	0.04	0.51
Ever waits for payment	0.59	0.62	0.50	0.59	0.61	0.76	0.00	0.99
Observations	*172*	*1,726*	*1,853*	*101*	*1,577*	*1,678*		

Notes: Bold denotes differences that alpha=0.05 level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the village cluster level

Table 4.3. Zambia CGP baseline balance tests for key individual and household characteristics

	N	All	Control	Treatment	P-value of difference
Panel A. Key explanatory variables					
Respondent age	2,519	29.53	29.15	29.92	0.20
Respondent any school	2,519	0.71	0.70	0.73	0.41
Married	2,519	0.74	0.72	0.75	0.53
Separated/Divorced/Widowed	2,519	0.16	0.17	0.14	0.30
Household size	2,519	5.68	5.62	5.73	0.52
Per capita expenditures	2,519	39.60	38.72	40.49	0.50
Owned chickens	2,519	0.43	0.42	0.44	0.75
Panel B. Key outcomes					
Holding any savings	2,519	0.17	0.16	0.18	0.51
Ever waits for payment	2,519	0.79	0.77	0.80	0.41
Not worried about food	2,519	0.20	0.20	0.19	0.93
Life better in 1 year	2,519	0.50	0.51	0.50	0.85

Notes: P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the CWAC level

Table 4.4. Zambia attrition analysis of selected indicators at baseline

	Control			Treatment			Difference	
	Attritors (1)	Non-attritors (2)	P-value (3)	Attritors (4)	Non-attritors (5)	P-value (6)	Col(1)-Col(4) (7)	P-value (8)
Panel A. Key explanatory variables								
Respondent age	30.20	29.58	0.56	31.39	29.91	0.11	-1.19	0.43
Respondent any school	0.79	0.70	**0.01**	0.79	0.74	0.16	0.00	0.95
Married	0.75	0.71	0.35	0.69	0.74	0.43	0.05	0.45
Sep./Div./Wid.	0.20	0.17	0.48	0.22	0.14	0.10	-0.02	0.67
Household size	5.66	5.63	0.90	5.71	5.76	0.85	-0.05	0.88
Per capita expenditures	38.32	39.60	0.69	40.83	41.57	0.85	-2.51	0.61
Owned chickens	0.37	0.43	0.15	0.33	0.44	0.02	0.04	0.45
Panel B. Key outcomes								
Holding any savings	0.20	0.16	0.24	0.19	0.18	0.95	0.01	0.81
Ever waits for payment	0.71	0.78	0.09	0.74	0.82	0.09	0.04	0.57
Never worry about food	0.79	0.87	0.35	0.93	0.87	0.36	-0.14	0.19
Life better in 1 year	0.61	0.52	0.15	0.49	0.50	0.67	0.12	0.07
Observations	*126*	*1,133*	*1,259*	*121*	*1,139*	*1,260*		

Notes: Bold denotes differences at the alpha=0.05 level. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the CWAC level

Table 4.5. Effects of the Malawi SCTP on savings, intertemporal choice, and psychological states

	Any savings	Ever waits	Low stress index (4-item)	Not worried about food	Generally feels happy	Life better in 1 year	Quality of life scale
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment effect	0.16***	0.086*	1.22**	0.21***	0.19***	0.19***	0.46***
	(0.03)	(0.05)	(0.54)	(0.04)	(0.04)	(0.07)	(0.11)
Wild bootstrap p-value	0.000	0.101	0.026	0.000	0.000	0.016	0.000
Estimation	Single Difference	Double Difference	Double Difference	Double Difference	Double Difference	Double Difference	Double Difference
Observations	2,641	7,833	7,977	7,976	7,977	7,746	7,977
R-Squared	0.080	0.015	0.091	0.056	0.048	0.064	0.109
Mean of dep. var.	0.03	0.62	6.00	0.15	0.18	0.53	2.23
F-stat.	13.54	9.21	17.14	17.73	13.42	53.93	25.27

Notes: Each column represents a separate regression. All regressions control for a set of baseline characteristics including age and schooling of the respondent, and TA of residence. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0) are shown in row 2. Dependent variable means are averaged across Treatment and Control at baseline except for any savings which uses endline Control means. *** p<0.01, ** p<0.05, * p<0.1.

Table 4.6 The mediating effects of psychological states on savings and intertemporal choice in Malawi

Panel A. Dependent variable: Any savings

	(1)	(2)	(3)	(4)	(5)	(6)
Treatment effect	0.146***	0.133***	0.154***	0.151***	0.145***	0.114***
	(0.026)	(0.023)	(0.027)	(0.028)	(0.027)	(0.023)
Wild bootstrap p-value	0.000	0.000	0.000	0.000	0.000	0.000
Low stress index (4-item)	0.011***					0.004**
	(0.002)					(0.002)
Not worried about food		0.123***				0.111***
		(0.026)				(0.027)
Generally feels happy			0.047***			0.010
			(0.013)			(0.017)
Life better in 1 year				0.059***		0.028**
				(0.013)		(0.013)
Quality of life scale					0.042***	0.015
					(0.012)	(0.015)
Estimation	Single Difference	Single Difference	Single Differenc	Single Difference	Single Difference	Single Difference
Observations	2,641	2,641	2,641	2,585	2,641	2,585
R-Squared	0.090	0.102	0.084	0.088	0.090	0.112

Panel B. Dependent variable: Ever waits

	(7)	(8)	(9)	(10)	(11)	(12)
Treatment effect	0.074	0.072	0.077	0.072	0.058	0.051
	(0.050)	(0.049)	(0.049)	(0.051)	(0.047)	(0.048)
Wild bootstrap p-value	0.146	0.149	0.141	0.190	0.243	0.341
Low stress index (4-item)	0.008***					-0.001
	(0.003)					(0.004)
Not worried about food		0.058***				0.032*
		(0.018)				(0.016)
Generally feels happy			0.051***			-0.014
			(0.015)			(0.022)
Life better in 1 year				0.073***		0.038**
				(0.016)		(0.016)
Quality of life scale					0.062***	0.055***
					(0.011)	(0.015)
Estimation	Double Difference	Double Difference	Double Differenc	Double Difference	Double Difference	Double Difference
Observations	7,833	7,833	7,833	7,606	7,833	7,606
R-Squared	0.018	0.017	0.017	0.021	0.026	0.028

Notes: Each column represents a separate regression. All regressions control for a set of baseline characteristics including age and schooling of the respondent, and TA of residence. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0) are shown in row 2. *** p<0.01, ** p<0.05, * p<0.1.

Table 4.7 The effects of psychological states on intertemporal choice in Malawi

	Willing to Wait for Future Money				
VARIABLES	FE	N	IV	N	F-stat. for instrument
	(1)		(2)		
Low stress index (4-item)	0.007*	7,833	0.096***	7,833	34.677
	(0.004)		(0.020)		
Not worried about food	0.033	7,832	0.673***	7,832	51.170
	(0.023)		(0.064)		
Generally feels happy	0.056**	7,833	0.773***	7,833	32.839
	(0.021)		(0.229)		
Life better in 1 year	0.053***	7,606	0.677***	7,606	54.508
	(0.016)		(0.119)		
Quality of life scale	0.061***	7,833	0.371***	7,833	37.371
	(0.012)		(0.069)		

Notes: Each column and row pair present coefficients from a separate regression. Standard errors, clustered at the village cluster level, are shown below the coefficients in parentheses. IV regressions control for a set of baseline characteristics including age and schooling of respondent, and TA of residence. *** p<0.01, ** p<0.05, * p<0.1

Table 4.8 Effects of the Zambia CGP on savings, intertemporal choice, and psychological states

	Any savings	Ever waits	Low stress index (10-item)	Not worried about food	Generally feels happy	Life better in 1 year
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment effect	0.178***	0.012	0.542	0.198***	0.072***	0.150**
	(0.037)	(0.040)	(0.394)	(0.042)	(0.022)	(0.070)
Estimation	Double difference	Double difference	Single difference	Double difference	Single difference	Double difference
Observations	7,789	7,819	3,953	7,844	3,944	7,823
R-Squared	0.071	0.026	0.012	0.072	0.022	0.068
Mean of dep.	0.166	0.848	29.57	0.196	0.818	0.505
F-stat.	30.87	7.931	5.078	41.34	8.723	30.10

Notes: Each column represents a separate regression. All regressions control for a set of baseline characteristics including age and schooling of the respondent, and district of residence. Standard errors, clustered at the CWAC level, are shown in parentheses below the coefficient. Dependent variable means are averaged across Treatment and Control at baseline except for columns (3) and (5) which use endline Control means. *** p<0.01, ** p<0.05, * p<0.1.

Table 4.9 The mediating effects of psychological states on savings and intertemporal choice in Zambia

Panel A. Dependent Variable: Any Savings

	(1)	(2)	(3)	(4)	(5)
Treatment effect	0.157***	0.158***	0.161***	0.163***	0.128***
	(0.028)	(0.036)	(0.029)	(0.034)	(0.028)
Low stress index (10-item)	0.009***				0.008***
	(0.002)				(0.002)
Not worried about		0.101***			0.085***
		(0.015)			(0.022)
Generally feels happy			0.022		-0.031*
			(0.020)		(0.018)
Life better in 1 year				0.107***	0.088***
				(0.015)	(0.021)
Estimation	Single Difference	Double Difference	Single Difference	Double Difference	Single Difference
Observations	3,951	7,789	3,942	7,770	3,936
R-Squared	0.068	0.082	0.057	0.084	0.083

Panel B. Dependent Variable: Ever Waits

	(6)	(7)	(8)	(9)	(10)
Treatment effect	0.047***	0.016	0.043***	0.008	0.039**
	(0.016)	(0.040)	(0.014)	(0.040)	(0.016)
Low stress index (10-item)	0.003*				0.001
	(0.001)				(0.001)
Not worried about food		-0.010			-0.014
		(0.008)			(0.013)
Generally feels happy			0.090***		0.077***
			(0.025)		(0.024)
Life better in 1 year				0.026**	0.042***
				(0.012)	(0.013)
Estimation	Single Difference	Double Difference	Single Difference	Double Difference	Single Difference
Observations	3,952	7,819	3,943	7,802	3,938
R-Squared	0.030	0.026	0.042	0.027	0.046

Notes: Each column represents a separate regression. All regressions control for a set of baseline characteristics including age and schooling of the respondent, and district of residence. Standard errors, clustered at the CWAC level. *** p<0.01, ** p<0.05, * p<0.1.

Table 4.10 The effects of psychological states on savings and intertemporal choice in Zambia

	Any savings		Willing to Wait for Future Money				
VARIABLES	FE	N	FE	N	IV	N	F-stat for instrument
	(1)		(2)		(3)		
Low stress index (10-item)	0.006**	3,951	0.006***	3,952			
	(0.002)		(0.002)				
Not worried about food	0.104***	7,789	0.002	7,819	0.271**	7,819	47.184
	(0.016)		(0.016)		(0.120)		
Generally feels happy	0.051**	3,942	0.085**	3,943			
	(0.024)		(0.033)				
Life better in 1 year	0.133***	7,770	0.052***	7,802	0.377**	7,802	28.276
	(0.016)		(0.014)		(0.161)		

Notes: Each column and row pair presents coefficients from separate regressions. Standard errors, clustered at the CWAC level, are shown below the coefficients in parentheses. IV regressions control for a set of baseline characteristics including age, schooling of respondent, and district of residence. *** p<0.01, ** p<0.05, * p<0.1

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APPENDIX A: ADDITIONAL TABLES FROM CHAPTER 2

Table A-1. Determinants of Youth's Time Discounting using Caregiver's Endline Discount Rate

	11,500 MWK	13,000 MWK	15,000 MWK	17,000 MWK	20,000 MWK	Impatience – dichotomous	MRS	Discount Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Caregiver's Discount Rate	-0.073***	-0.092***	-0.096***	-0.098***	-0.094***	0.094***	0.450***	0.169***
	(0.015)	(0.016)	(0.015)	(0.016)	(0.015)	(0.015)	(0.072)	(0.026)
Wild bootstrap p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Treatment	0.080*	0.079*	0.039	0.038	0.008	-0.002	-0.055	-0.048
	(0.044)	(0.046)	(0.037)	(0.034)	(0.036)	(0.035)	(0.167)	(0.063)
Youth's age	-0.014**	-0.017***	-0.023***	-0.024***	-0.019***	0.019***	0.094***	0.037***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.027)	(0.010)
Youth male	-0.186***	-0.193***	-0.142***	-0.110***	-0.064***	0.063***	0.382***	0.192***
	(0.033)	(0.039)	(0.033)	(0.029)	(0.023)	(0.022)	(0.109)	(0.044)
Youth enrolled in school	0.019	0.010	-0.015	-0.030	-0.021	0.020	0.085	0.025
	(0.022)	(0.028)	(0.028)	(0.025)	(0.023)	(0.023)	(0.107)	(0.039)
Caregiver age	0.000	-0.001	-0.000	-0.001	-0.001	0.001	0.003	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Caregiver female	0.016	0.031	0.009	0.001	-0.016	0.014	0.049	0.007
	(0.034)	(0.034)	(0.026)	(0.029)	(0.035)	(0.034)	(0.150)	(0.049)
Caregiver any schooling	0.039	0.034	-0.014	-0.024	-0.016	0.016	0.061	0.012
	(0.023)	(0.024)	(0.028)	(0.028)	(0.026)	(0.027)	(0.124)	(0.045)
Any covariate shock	0.018	0.106***	0.070**	0.048	0.046	-0.049	-0.244	-0.096*
	(0.032)	(0.030)	(0.029)	(0.029)	(0.034)	(0.034)	(0.154)	(0.053)
Observations	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.09
R-Squared	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728

Notes: Each column and row pairing represent a different OLS regression. All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver age, sex, and schooling, week of interview, any covariate shock, TA of residence, contemporaneous community level prices, and an indicator for SCTP treatment households. The key independent variables on shown as row headers, while dependent variables are listed as column headers. Variables for future values and impatience represent descriptive outcomes used to aid in simply describing the data, while the MRS and the discount rate are the main youth outcomes of interest. Numbers in the table show the coefficients obtained from OLS regression analyses. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H_0=0) are shown in Row 2 and 4. *** p<0.01, ** p<0.05, * p<0.1.

Table A-2. Determinants of Youth's Time Discounting using Caregiver's Endline MRS

	11,500 MWK	13,000 MWK	15,000 MWK	17,000 MWK	20,000 MWK	Impatience – dichotomous	MRS	Discount Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Caregiver's Discount Rate	-0.018***	-0.023***	-0.025***	-0.026***	-0.025***	0.025***	0.121***	0.045***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.020)	(0.007)
Wild bootstrap p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Treatment	0.083*	0.083*	0.042	0.041	0.010	-0.005	-0.066	-0.053
	(0.044)	(0.047)	(0.038)	(0.034)	(0.036)	(0.036)	(0.168)	(0.063)
Youth's age	-0.014**	-0.017***	-0.023***	-0.024***	-0.019***	0.019***	0.094***	0.037***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.027)	(0.010)
Youth male	-0.186***	-0.193***	-0.142***	-0.111***	-0.064***	0.064***	0.384***	0.192***
	(0.033)	(0.039)	(0.033)	(0.029)	(0.023)	(0.022)	(0.109)	(0.044)
Youth enrolled in school	0.018	0.009	-0.015	-0.030	-0.021	0.020	0.085	0.025
	(0.022)	(0.028)	(0.028)	(0.025)	(0.023)	(0.023)	(0.107)	(0.039)
Caregiver age	0.000	-0.001	-0.000	-0.001	-0.001	0.001	0.003	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Caregiver female	0.016	0.031	0.009	0.001	-0.016	0.014	0.048	0.006
	(0.034)	(0.034)	(0.026)	(0.029)	(0.035)	(0.034)	(0.150)	(0.049)
Caregiver any schooling	0.039	0.034	-0.014	-0.024	-0.016	0.016	0.061	0.012
	(0.023)	(0.024)	(0.028)	(0.028)	(0.026)	(0.026)	(0.124)	(0.045)
Any covariate shock	0.018	0.106***	0.070**	0.048	0.046	-0.049	-0.243	-0.096*
	(0.032)	(0.030)	(0.029)	(0.029)	(0.034)	(0.034)	(0.155)	(0.054)
Observations	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08
R-Squared	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728

Notes: Each column and row pairing represent a different OLS regression. All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver age, sex, and schooling, week of interview, any covariate shock, TA of residence, contemporaneous community level prices, and an indicator for SCTP treatment households. The key independent variables on shown as row headers, while dependent variables are listed as column headers. Variables for future values and impatience represent descriptive outcomes used to aid in simply describing the data, while the MRS and the discount rate are the main youth outcomes of interest. Numbers in the table show the coefficients obtained from OLS regression analyses. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H_0=0) are shown in Row 2 and 4. *** p<0.01, ** p<0.05, * p<0.1.

Table A-3. First Stage Results Predicting Caregiver's MRS (N=1,728)

Instrument set:	Treatment only	Treatment, Baseline Prices X Treatment & NS Cluster Mean MRS
	(1)	(2)
Treatment	-0.874***	-0.491
	(0.256)	(2.780)
Lagged NS cluster mean MRS	--	0.479**
		(0.203)
Baseline prices X Treatment	--	X
Caregiver's Age	0.005	0.006
	(0.006)	(0.006)
Caregiver Female	-0.191	-0.139
	(0.282)	(0.286)
Caregiver any schooling	-0.033	-0.022
	(0.177)	(0.174)
Any covariate shock	-0.255	-0.180
	(0.264)	(0.266)
Week of interview	0.348***	0.264*
	(0.113)	(0.140)
Salima - Ndindi	0.694***	0.860**
	(0.226)	(0.389)
Mangochi - Jalasi	-0.709*	-0.307
	(0.408)	(0.257)
Mangochi – Mbwana Nyambi	-0.323	-0.184
	(0.365)	(0.342)
F-test instruments (F-stat)	11.694	54.801
F-test instruments (F-prob)	0.0019	0.0000
Wild bootstrap F-test p-value	0.0070	0.0000
Partial R^2 for instruments	0.0071	0.0214
Lagrange Multiplier p-value	N/A	0.0848

NOTE: The lagged difference refers to the difference in caregiver's MRS between waves. Standard errors, clustered at the VC level, are shown in parentheses below the coefficient. F-statistics produced using clustered standard errors, not wild bootstrapping. *** p<0.01, ** p<0.05, * p<0.1.

Table A-4. OLS and IV Estimates of the Relationship between Youth's and Caregiver's MRS at Endline

	Dependent Variable: Youth MRS		
	OLS	IV Treatment only	IV Full Instrument Set
	(1)	(2)	(3)
Caregiver MRS	0.121***	0.195	0.185*
	(0.021)	(0.199)	(0.108)
Wild bootstrap p-value	0.0010	0.4450	0.2580
Hausman test p-value	N/A	0.699	0.779
Observations	1,728	1,728	1,728

NOTE: Instruments include random assignment to treatment (Column 2), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Column 3). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table A-5. IV Estimates of the Relationship Between Youth's and Caregiver's MRS by Youth Sex

	Dependent Variable: Youth MRS		
	IV Treatment only	IV Full Instrument Set	
	(1)	Male (2)	Female (3)
Caregiver MRS	-0.388	0.077	0.232**
	(0.479)	(0.110)	(0.116)
Wild bootstrap p-value	0.4610	0.6230	0.2140
Caregiver MRS x Male	0.323	--	--
	(0.292)	--	--
Wild bootstrap p-value	0.2810	--	--
Observations	1,728	920	808

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth sex. Instruments include random assignment to treatment (Column 1), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 2 and 3). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the level of randomization, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table A-6. IV Estimates of the Relationship between Youth's and Caregiver's MRS by Youth Age

	Dependent Variable: Youth MRS											
	IV Treatment only			IV Full Instrument Set								
				All Youth			In household since baseline			Entered household after baseline		
	All Youth (1)	In household since baseline (2)	Entered household after baseline (3)	Age 15-16 (4)	Age 17-19 (5)	Age 20-22 (6)	Age 15-16 (7)	Age 17-19 (8)	Age 20-22 (9)	Age 15-16 (10)	Age 17-19 (11)	Age 20-22 (12)
Caregiver MRS	0.182	0.287*	2.452	0.150	0.036	0.253**	0.082	0.035	0.211*	-0.040	0.084	-0.017
	(0.191)	(0.170)	(4.733)	(0.097)	(0.187)	(0.101)	(0.108)	(0.163)	(0.112)	(0.114)	(0.172)	(0.189)
Wild boot. p-value	0.4480	0.1510	0.3870	0.2000	0.8910	0.1510	0.5190	0.8740	0.2760	0.7740	0.7550	0.9600
Caregiver MRS x Age 17-19	0.062	0.045	0.326	--	--	--	--	--	--	--	--	--
	(0.049)	(0.057)	(0.748)	--	--	--	--	--	--	--	--	--
Wild boot. p-value	0.2550	0.4450	0.5160	--	--	--	--	--	--	--	--	--
Caregiver MRS x Age 20-22	0.066	0.051	0.435	--	--	--	--	--	--	--	--	--
	(0.067)	(0.078)	(1.249)	--	--	--	--	--	--	--	--	--
Wild boot. p-value	0.3350	0.5300	0.5820	--	--	--	--	--	--	--	--	--
Observations	1,728	1,556	172	697	718	313	630	652	274	67	66	39

NOTE: All models estimated using 2SLS. Those in columns 1-3 are run with interactions terms in a single regression while those in columns 4-12 are run separately stratified by when youth entered the household and age groups. Regressions associated with columns 1, and 4-6 include the full analytical sample of youth while those for columns 2, and 7-9 include only youth who have resided in the household since baseline. Columns 3, and 10-12 are include only youth who have entered the household since baseline data collection Instruments include random assignment to treatment (Columns 1-3), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 4-12). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table A-7. IV Estimates of the Relationship between Youth's and Caregiver's MRS by Youth Age and Gender

	Dependent Variable: Youth MRS							
	IV Treatment only		IV Full Instrument Set					
			Males			Females		
	Males (1)	Females (2)	Age 15-16 (3)	Age 17-19 (4)	Age 20-22 (5)	Age 15-16 (6)	Age 17-19 (7)	Age 20-22 (8)
Caregiver MRS	0.284	0.229	-0.039	-0.158	-0.0002	0.103	0.052	0.372***
	(1.508)	(0.208)	(0.120)	(0.153)	(0.089)	(0.147)	(0.143)	(0.097)
Wild bootstrap p-value	0.5890	0.5480	0.8280	0.4360	0.9950	0.5620	0.8180	0.0670
Caregiver MRS x Age 17-19	-0.003	0.225*	--	--	--	--	--	--
	(0.084)	(0.133)	--	--	--	--	--	--
Wild bootstrap p-value	0.9010	0.1270	--	--	--	--	--	--
Caregiver MRS x Age 20-22	0.092	0.082	--	--	--	--	--	--
	(0.106)	(0.170)	--	--	--	--	--	--
Wild bootstrap p-value	0.4530	0.6830	--	--	--	--	--	--
Observations	920	808	368	379	173	329	339	140

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth sex Instruments include random assignment to treatment (Columns 1 and 2), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 3-8). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table A-8. IV Estimates of the Relationship between Youth's and Caregiver's MRS by Caregiver Sex and Caregiver-Youth Gendered Pairs

	Dependent Variable: Youth MRS							
	IV Treatment only		IV Full Instrument Set					
			Male Caregiver			**Female Caregiver**		
	(1)	(2)	All (3)	Male-Female (4)	Male-Male (5)	All (6)	Female-Female (7)	Female-Male (8)
Caregiver MRS	0.209	0.154	0.142	0.155	-0.133	0.237**	0.312***	0.112
	(0.189)	(0.201)	(0.107)	(0.169)	(0.131)	(0.114)	(0.094)	(0.141)
Wild bootstrap p-value	0.3750	0.5680	0.2770	0.6040	0.4820	0.1750	0.0610	0.5820
Caregiver MRS x Female Caregiver	-0.006	--	--	--	--	--	--	--
	(0.070)	--	--	--	--	--	--	--
Wild bootstrap p-value	0.9340	--	--	--	--	--	--	--
Caregiver MRS x Female-Male Pair	--	0.136***	--	--	--	--	--	--
	--	(0.043)	--	--	--	--	--	--
Wild bootstrap p-value	--	0.0120	--	--	--	--	--	--
Caregiver MRS x Male-Female Pair	--	0.063	--	--	--	--	--	--
	--	(0.111)	--	--	--	--	--	--
Wild bootstrap p-value	--	0.5800	--	--	--	--	--	--
Caregiver MRS x Male-Male Pair	--	0.108	--	--	--	--	--	--
	--	(0.140)	--	--	--	--	--	--
Wild bootstrap p-value	--	0.5090	--	--	--	--	--	--
Observations	1,728	1,728	179	66	113	1,549	742	807

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth sex. Instruments include random assignment to treatment (Columns 1 and 2), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 3-8). Columns 3 and 5 restrict the sample by the sex of the caregiver. Columns 4, 5, 7, and 8 restrict the sample by caregiver-youth gendered pairs. For example, Column 4 presents coefficients for female youth with male caregivers. All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table A-9. IV Estimates of the Relationship between Youth's and Caregiver's MRS by Youth-Caregiver Relationship

	Dependent Variable: Youth MRS				
	IV Treatment only	IV Full Instrument Set			
	(1)	Child (2)	Grandchild (3)	Niece/Nephew (4)	Other Relation (5)
Caregiver MRS	0.197	0.248**	0.381**	0.367***	0.029
	(0.195)	(0.108)	(0.150)	(0.115)	(0.121)
Wild bootstrap p-value	0.4200	0.1480	0.1330	0.2200	0.8640
Caregiver MRS x Grandchild	0.039	--	--	--	--
	(0.089)	--	--	--	--
Wild bootstrap p-value	0.6640	--	--	--	--
Caregiver MRS x Niece/Nephew	-0.028	--	--	--	--
	(0.137)	--	--	--	--
Wild bootstrap p-value	0.8610	--	--	--	--
Caregiver MRS x Other Relation	0.014	--	--	--	--
	(0.149)	--	--	--	--
Wild bootstrap p-value	0.9300	--	--	--	--
Observations	1,728	1,017	567	45	99

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 -5 are run separately by youth's relationship to the caregiver. Instruments include random assignment to treatment (Column 1), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 2-5). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

Table A-10. IV Estimates of the Influence of Socialization on the Relationship between Youth's and Caregiver's MRS

	Dependent Variable: Youth MRS		
	IV Treatment only	IV Full Instrument Set	
		High PSS (≥4)	Low PSS (<4)
	(1)	(2)	(3)
Caregiver MRS	0.203	0.136	0.075
	(0.200)	(0.101)	(0.670)
Wild bootstrap p-value	0.4300	0.3850	0.7470
Caregiver MRS x High PSS Score	-0.033	--	--
	(0.047)	--	--
Wild bootstrap p-value	0.5110	--	--
Observations	1,728	950	778

NOTE: All models estimated using 2SLS. Those in column 1 are run with interactions terms in a single regression while those in columns 2 and 3 are run separately by youth's PSS scale score. Instruments include random assignment to treatment (Column 1), and treatment, the interaction of treatment and baseline prices as well as the lagged non-self cluster mean of caregiver's discounting (Columns 2 and 3). All regressions control for a set of baseline characteristics including youth age, sex, and schooling, caregiver's age, sex, and schooling, whether the household experienced a covariate shock, and TA of residence. Regressions also controlled for week of interview to account for potential seasonality issues. Standard errors, clustered at the village cluster level, are shown in parentheses below the coefficient. Wild bootstrapping p-values for the impact coefficient (1000 reps, H0=0). *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX B: ADDITIONAL TABLES FROM CHAPTER 3

Table B.1. MTM Sample Breakdown

Women			Men		
Age	Target sample	Actual sample	Age	Target sample	Actual sample
13	0	1	14	0	1
14	0	27	15	0	1
15	60	124	17	0	15
16	180	154	18	60	82
17	180	120	19-20	180	223
18	120	84	21-22	300	201
19-21	60	87	23-25	60	63
23	0	1	26	0	1
Total	600	598	*Total*	600	587

Note: Actual sample is the sample from the baseline survey collected in summer 2007 (Beegle & Poulin, 2017).

Table B.2. Attrition analysis of key indicators at baseline

	Male			Female			Difference	
	Attritors (1)	Non-attritors (2)	P-value (3)	Attritors (4)	Non-attritors (5)	P-value (6)	Col(1)-Col(4) (7)	P-value (8)
Youth Characteristics								
Age	20.42	20.35	0.78	17.13	16.68	0.05	3.29	**0.00**
Currently in school	0.25	0.31	0.32	0.49	0.56	0.32	-0.24	**0.00**
Highest education level								
Preprimary highest level	0.00	0.02	**0.02**	0.00	0.01	0.10	0.00	1.00
Primary highest level	0.57	0.65	0.19	0.61	0.72	0.06	-0.04	0.61
Secondary highest level	0.36	0.28	0.16	0.33	0.26	0.22	0.03	0.71
University highest level	0.01	0.01	0.93	0.00	0.00	0.32	0.01	0.32
Training college highest level	0.01	0.01	0.61	0.01	0.00	0.33	-0.01	0.76
Ever had sex	0.75	0.76	0.72	0.30	0.38	0.25	0.44	**0.00**
# sex partners ever	3.02	3.22	0.58	1.48	1.35	0.44	1.55	**0.00**
Had sex last 12 months	0.49	0.52	0.55	0.26	0.28	0.77	0.23	**0.01**
# sex partners last 12 months	1.43	1.71	**0.04**	1.22	1.15	0.56	0.21	0.12
Ever gave birth (or fathered child for males)	0.06	0.06	0.84	0.03	0.05	0.40	0.03	0.20
Household Characteristics								
Tribe								
Yao	0.27	0.18	0.12	0.14	0.19	0.35	0.13	**0.03**
Chewa	0.44	0.65	**0.00**	0.55	0.63	0.19	-0.11	0.12
Other	0.29	0.17	**0.02**	0.30	0.18	**0.01**	-0.01	0.82
Religion								
Christian	0.57	0.66	0.14	0.67	0.64	0.62	-0.09	0.21
Muslim	0.29	0.22	0.27	0.19	0.26	0.20	0.10	0.10
Other	0.11	0.10	0.76	0.12	0.11	0.83	-0.01	0.90
None	0.03	0.01	0.41	0.03	0.00	0.17	-0.00	0.95
Father any schooling	0.85	0.81	0.17	0.83	0.78	0.26	0.02	0.65
Mother any schooling	0.82	0.85	0.31	0.73	0.82	0.13	0.09	0.20
Household size	6.23	6.46	0.41	6.29	6.30	0.97	-0.06	0.88
Wealth index (based on assets)	0.34	-0.08	0.00	0.34	-0.03	0.05	-0.01	0.97
Own their home	0.74	0.84	**0.02**	0.71	0.79	0.19	0.03	0.73
Home electrified	0.25	0.11	**0.01**	0.26	0.12	**0.01**	-0.02	0.77
# of rooms in home	3.33	3.21	0.48	3.00	2.96	0.81	0.33	0.13
Permanent roofing - not grass	0.46	0.30	**0.01**	0.43	0.32	0.13	0.03	0.73
Water Source								
Piped water source	0.35	0.19	**0.00**	0.32	0.20	0.07	0.04	0.65
Pump/protected spring source	0.54	0.64	0.10	0.54	0.61	0.29	0.00	1.00
Unprotected well/spring/reservoir	0.10	0.17	0.05	0.14	0.19	0.33	-0.04	0.43

Other water source	0.01	0.00	0.45	0.00	0.00	0.32	0.01	0.32
Toilet								
Flush toilet	0.10	0.04	0.05	0.09	0.05	0.36	0.01	0.64
Latrine style toilet	0.85	0.80	0.33	0.78	0.80	0.72	0.06	0.25
Has no toilet	0.05	0.16	**0.00**	0.12	0.15	0.43	-0.06	0.21
Shocks								
Any negative shock	0.85	0.91	0.06	0.86	0.88	0.58	-0.01	0.86
Any covariate shock	0.71	0.78	0.10	0.68	0.69	0.87	0.03	0.69
Any idiosyncratic shock	0.66	0.79	**0.01**	0.70	0.74	0.54	-0.03	0.66
Demographic Composition of Household								
# age 0-5	0.64	0.70	0.55	0.78	0.82	0.77	-0.15	0.29
# age 6-11	0.93	1.07	0.20	0.96	1.10	0.26	-0.03	0.83
# age 12-17	1.11	1.18	0.54	1.67	1.65	0.93	-0.56	**0.00**
# age 18-23	1.60	1.51	0.38	0.84	0.78	0.63	0.76	**0.00**
# age 24-64	1.69	1.75	0.60	1.61	1.72	0.32	0.08	0.54
# age 65+	0.36	0.24	0.09	0.28	0.23	0.57	0.09	0.30
# females aged 13-23	0.67	0.69	0.82	1.57	1.53	0.73	-0.89	**0.00**
# males aged 14-26	1.99	1.79	0.06	0.71	0.64	0.57	1.28	**0.00**
Total # siblings	1.27	1.39	0.50	1.26	1.17	0.67	0.01	0.96
Total # male siblings	0.69	0.62	0.58	0.52	0.42	0.35	0.17	0.34
Total # female siblings	0.69	0.62	0.58	0.52	0.42	0.35	0.17	0.34
Dependency ratio	0.99	1.18	**0.03**	1.77	1.88	0.54	-0.79	**0.00**
Labor constrained (dep. ratio >3)	0.02	0.04	0.11	0.13	0.13	0.97	-0.11	**0.01**
Community Characteristics								
Distance/isolation index	-0.28	-0.29	0.93	-0.33	-0.28	0.73	0.05	0.77
Market in community	0.59	0.51	0.20	0.55	0.51	0.54	0.04	0.61
Observations	109	475	584	70	528	298		

Note: Bold denotes significance at the alpha=0.05 level. T-tests based on standard errors clustered at the EA level.

Table B.3. Comparison of sample characteristics in the NAS and the MTM

	Females			Males		
	NSA (N = 1,055)	MTM (N = 395)	p-value of diff.	NSA (N = 1,126)	MTM (N = 275)	p-value of diff.
Ever attended school	0.95	0.98	**0.016**	0.97	0.97	0.852
Currently attending	0.57	0.57	0.806	0.70	0.49	**0.000**
Highest level completed[1]						
No schooling	0.05	0.02	**0.016**	0.03	0.03	0.852
Preprimary	0.05	0.00	**0.000**	0.03	0.02	0.547
Primary	0.72	0.73	0.757	0.75	0.69	0.120
Secondary	0.23	0.25	0.558	0.22	0.24	0.551
Higher/Tertiary	0.00	0.00	0.317	0.00	0.01	0.454
Tribe						
Yao	0.12	0.18	**0.003**	0.15	0.22	**0.023**
Chewa	0.40	0.63	**0.000**	0.34	0.62	**0.000**
Other	0.47	0.19	**0.000**	0.50	0.16	**0.000**
Religion						
Christian	0.85	0.63	**0.000**	0.84	0.64	**0.000**
Muslim	0.11	0.24	**0.000**	0.12	0.26	**0.000**
Other	0.04	0.11	**0.000**	0.02	0.09	**0.005**
None	0.00	0.00	0.978	0.01	0.01	0.681
Household characteristics						
Household size	6.41	6.26	0.274	6.43	6.83	0.052
Father any schooling	0.59	0.63	0.238	0.64	0.64	0.945
Mother any schooling	0.50	0.65	**0.000**	0.51	0.67	**0.001**
Home electrified	0.14	0.13	0.562	0.13	0.13	0.846
Number of rooms	3.23	2.98	**0.004**	3.34	3.20	0.173
Owns home	0.83	0.79	0.123	0.84	0.82	0.507
Water source						
Piped	0.16	0.21	0.102	0.14	0.21	**0.011**
Pump/protected spring	0.31	0.60	**0.000**	0.33	0.59	**0.000**
Unprotected source	0.37	0.19	**0.000**	0.39	0.17	**0.000**
Other	0.15	0.00	**0.000**	0.15	0.01	**0.000**
Toilet						
Flush	0.08	0.05	**0.031**	0.05	0.03	**0.036**
Latrine	0.83	0.80	0.215	0.89	0.83	**0.033**
No toilet	0.09	0.15	**0.001**	0.05	0.15	**0.000**
Sexual activity status						
Ever sex not last 12 mos.	0.75	0.71	0.410	0.66	0.47	**0.000**
Had sex in last 12 mos.	0.25	0.29	0.410	0.34	0.53	**0.000**
# lifetime partners	1.48	1.38	0.185	2.55	3.08	**0.015**
# partners last 12 mos.	3.00	1.10	**0.000**	5.37	1.60	**0.016**
Ever had live birth	0.82	0.04	**0.000**	0.72	0.02	**0.000**

Note: To ease individual-level comparisons, the MTM sample was restricted to individuals aged 13-19 to better align with the NSA sample of youth aged 15 to 19. Bold denotes statistical significance at the 5 % level or better. N's in the NSA are weighted. [1] Among the reduced sample who have ever attended school. Males NSA (N = 1,091), males MTM (N = 195), females NSA (N = 1,007), females MTM (N = 512).

Table B.4. Comparison of schooling characteristics of youth aged 15-25 in the IHS2 and the MTM

	Females			Males		
	MTM	IHS2	IHS2 Central	MTM	IHS2	IHS2 Central
	(N = 598)	(N = 3,743)	(N = 1,488)	(N = 585)	(N = 3,684)	(N = 1,442)
Highest level completed[1]						
Preprimary	0.01	**0.12**	**0.13**	0.01	**0.09**	**0.11**
Primary	0.71	0.67	0.66	0.64	**0.54**	**0.56**
Secondary	0.27	**0.20**	**0.19**	0.29	**0.35**	0.32
Higher/Tertiary	0.00	0.00	**0.01**	0.02	0.02	0.02

Note: To ease individual-level comparisons, the IHS2 sample was restricted to females aged 15-21 and males aged 18-25 and then further limited to only those adolescents in the Central region. IHS2 age groups are limited to females ages 15 to 21 and males age 18 to 25. Ns and mean values are weighted. Bold denotes statistical significance at the 5 % level or better. [1] Never attended/pre-school category in IHS2 is ambiguous. Prompt on questionnaire codes 0 as pre-school while data set codes 0 as none. Assumption is that 0 corresponds to pre-school or none.

Table B.5. Comparison of household-level characteristics in the IHS2 and the MTM

	MTM	IHS2	IHS2 Central	IHS2 Restricted
	(N = 1,183)	(N = 7,427)	(N = 2,930)	(N = 4,414)
Household characteristics				
Household size	6.35	**5.46**	**5.65**	6.47
Home electrified	0.14	**0.09**	**0.09**	0.13
Number of rooms	3.10	**2.78**	**2.77**	3.11
Owns home	0.80	0.80	0.81	0.81
Permanent roof	0.33	0.31	**0.29**	**0.40**
Water source				
Piped	0.22	**0.25**	0.20	**0.28**
Pump/protected spring	0.61	**0.44**	**0.39**	**0.42**
Unprotected well/spring/reservoir/lake	0.17	**0.31**	**0.41**	**0.30**
Toilet				
Flush	0.05	0.05	0.06	**0.07**
Latrine	0.80	0.82	0.80	0.83
No toilet	0.14	0.14	0.14	**0.10**

Note: To ease individual-level comparisons, the IHS2 sample was restricted to females aged 15-21 and males aged 18-25 and then further limited to only those adolescents in the Central region. A final IHS2 comparison sample was created by restricting the full sample to include only households containing at least one adolescent within the MTM sample age ranges since it is likely household characteristics differ between those with and without adolescents. IHS2 means and N's are weighted. Bold denotes statistical significance at the 5 % level or better.

Table B.6. Breakdown of tribes by traditional lineage system

Lineage system	Tribe
Matrilineal	Chewa
	Yao
	Lomwe
	Ngoni
Patrilineal	Tumbuka
	Sena
	Tonga
	Senga
	Nyanja

Table B.7. LPM estimates for unbalanced panel of relationship between shocks and marriage/engagement for females

	Dependent variable: Married/engaged					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.391***	0.385***	0.364***	0.351**	0.613***	0.673***
	(0.112)	(0.129)	(0.095)	(0.158)	(0.162)	(0.170)
(Any negative shock) X Matrilineal	-0.371***	-0.344**	-0.326**	-0.276	-0.627***	-0.699***
	(0.123)	(0.139)	(0.136)	(0.191)	(0.190)	(0.197)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.083	-0.040	-0.062	-0.03	-0.010	0.063
	(0.119)	(0.122)	(0.123)	(0.136)	(0.262)	(0.228)
(Any covariate shock) X Matrilineal	0.078	0.065	0.107	0.138	0.013	-0.081
	(0.122)	(0.122)	(0.125)	(0.137)	(0.268)	(0.235)
Any idio.shock	0.129	0.135	0.268*	0.297	-0.002	0.023
	(0.103)	(0.110)	(0.143)	(0.184)	(0.171)	(0.166)
(Any idio.shock) X Matrilineal	-0.138	-0.142	-0.269*	-0.301	-0.042	-0.089
	(0.117)	(0.125)	(0.157)	(0.198)	(0.189)	(0.189)
Panel C: Economic and family shocks						
Any economic shock	0.203	0.211	0.346***	0.346***	0.251	0.271
	(0.160)	(0.155)	(0.094)	(0.124)	(0.209)	(0.227)
(Any economic shock) X Matrilineal	-0.214	-0.194	-0.281**	-0.233	-0.304	-0.332
	(0.167)	(0.161)	(0.127)	(0.155)	(0.218)	(0.234)
Any family shock	0.029	0.070	-0.009	0.100	0.545***	0.518**
	(0.122)	(0.134)	(0.124)	(0.145)	(0.193)	(0.212)
(Any family shock) X Matrilineal	-0.035	-0.079	0.006	-0.100	-0.561***	-0.547**
	(0.124)	(0.136)	(0.129)	(0.147)	(0.205)	(0.228)
Village controls	X		X		X	
Village fixed effects		X		X		X
Observations	1,088	1,088	605	605	483	483

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B.8. LPM estimates for unbalanced panel of relationship between shocks and marriage/engagement for males

	Dependent variable: Married/engaged					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	-0.080	-0.108	-0.167	-0.167	0.269	0.173
	(0.134)	(0.125)	(0.143)	(0.150)	(0.222)	(0.184)
(Any negative shock) X Matrilineal	0.084	0.103	0.207	0.287	-0.272	-0.184
	(0.147)	(0.136)	(0.157)	(0.179)	(0.236)	(0.200)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.178	-0.210	-0.236	-0.225	-0.120	-0.212
	(0.126)	(0.131)	(0.165)	(0.211)	(0.207)	(0.189)
(Any covariate shock) X Matrilineal	0.143	0.168	0.244	0.257	0.086	0.157
	(0.125)	(0.130)	(0.174)	(0.218)	(0.210)	(0.192)
Any idio. shock	-0.005	-0.005	0.091	0.045	0.027	0.041
	(0.144)	(0.142)	(0.130)	(0.148)	(0.209)	(0.209)
(Any idio. shock) X Matrilineal	0.068	0.066	-0.004	0.065	0.001	0.016
	(0.147)	(0.148)	(0.132)	(0.153)	(0.213)	(0.214)
Panel C: Economic and family shocks						
Any economic shock	-0.137	-0.148	-0.411***	-0.416**	0.418*	0.334
	(0.141)	(0.140)	(0.152)	(0.196)	(0.219)	(0.218)
(Any economic shock) X Matrilineal	0.098	0.083	0.400**	0.444**	-0.469**	-0.427*
	(0.142)	(0.140)	(0.162)	(0.200)	(0.229)	(0.228)
Any family shock	-0.025	-0.067	0.247**	0.227	-0.237*	-0.292**
	(0.120)	(0.131)	(0.113)	(0.173)	(0.137)	(0.142)
(Any family shock) X Matrilineal	0.063	0.102	-0.190	-0.142	0.256*	0.326**
	(0.116)	(0.130)	(0.117)	(0.175)	(0.138)	(0.146)
Village controls	X		X		X	
Village fixed effects		X		X		X
Observations	998	998	302	302	696	696

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B.9. LPM estimates for unbalanced panel of relationship between shocks and transactional sexual relationships for females

	Dependent variable: Transactional sexual relationship					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.057	0.133*	0.070	0.159	0.026	0.026
	(0.038)	(0.075)	(0.047)	(0.103)	(0.049)	(0.085)
(Any negative shock) X Matrilineal	-0.099*	-0.191**	-0.061	-0.153	-0.142*	-0.186
	(0.051)	(0.082)	(0.063)	(0.109)	(0.081)	(0.117)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.029	-0.010	-0.029	-0.041	0.012	0.023
	(0.072)	(0.079)	(0.098)	(0.102)	(0.028)	(0.063)
(Any covariate shock) X Matrilineal	-0.001	-0.030	0.013	0.014	-0.050	-0.075
	(0.076)	(0.083)	(0.101)	(0.105)	(0.051)	(0.082)
Any idiosyncratic shock	-0.020	0.002	-0.045	0.074	-0.007	-0.006
	(0.063)	(0.081)	(0.090)	(0.130)	(0.015)	(0.024)
(Any idiosyncratic shock) X Matrilineal	0.018	-0.012	0.037	-0.081	0.001	-0.005
	(0.069)	(0.086)	(0.098)	(0.136)	(0.047)	(0.053)
Panel C: Economic and family shocks						
Any economic shock	0.054	0.123**	0.076	0.162**	0.029	0.017
	(0.038)	(0.055)	(0.049)	(0.074)	(0.051)	(0.073)
(Any economic shock) X Matrilineal	-0.101*	-0.174***	-0.090	-0.174*	-0.118	-0.119
	(0.050)	(0.062)	(0.069)	(0.088)	(0.081)	(0.105)
Any family shock	0.009	0.019	-0.016	0.095	-0.004	-0.078
	(0.062)	(0.075)	(0.071)	(0.089)	(0.028)	(0.051)
(Any family shock) X Matrilineal	-0.018	-0.041	0.027	-0.104	-0.031	0.023
	(0.071)	(0.081)	(0.079)	(0.097)	(0.047)	(0.066)
Village controls	X		X		X	
Village fixed effects		X		X		X
Observations	1,067	1,067	594	594	473	473

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B.10. LPM estimates for unbalanced panel of relationship between shocks and dating relationships for females

	Dependent variable: Dating relationship					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.348***	0.399***	0.249***	0.269*	0.553***	0.582**
	(0.090)	(0.125)	(0.093)	(0.156)	(0.190)	(0.236)
(Any negative shock) X Matrilineal	-0.282***	-0.345***	-0.135	-0.162	-0.545**	-0.564**
	(0.096)	(0.127)	(0.101)	(0.254)	(0.217)	(0.273)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	0.032	0.060	0.070	0.055	-0.022	-0.46
	(0.132)	(0.151)	(0.137)	(0.156)	(0.375)	(0.421)
(Any covariate shock) X Matrilineal	0.026	-0.012	-0.014	0.015	0.084	0.092
	(0.139)	(0.157)	(0.147)	(0.167)	(0.379)	(0.427)
Any idiosyncratic shock	0.058	0.061	0.070	0.164	0.101	0.089
	(0.110)	(0.117)	(0.134)	(0.155)	(0.210)	(0.240)
(Any idiosyncratic shock) X Matrilineal	-0.046	-0.050	-0.039	-0.137	-0.112	-0.104
	(0.110)	(0.119)	(0.134)	(0.160)	(0.217)	(0.249)
Panel C: Economic and family shocks						
Any economic shock	0.197	0.239	0.247**	0.261**	0.074	0.064
	(0.157)	(0.178)	(0.094)	(0.127)	(0.437)	(0.529)
(Any economic shock) X Matrilineal	-0.149	-0.206	-0.176*	-0.175	-0.053	-0.038
	(0.161)	(0.181)	(0.104)	(0.132)	(0.447)	(0.539)
Any family shock	-0.057	-0.056	-0.019	0.075	0.102	0.001
	(0.120)	(0.137)	(0.122)	(0.127)	(0.303)	(0.345)
(Any family shock) X Matrilineal	0.063	0.062	0.049	-0.057	-0.126	-0.063
	(0.120)	(0.137)	(0.128)	(0.137)	(0.297)	(0.346)
Village controls	X		X		X	
Village fixed effects		X		X		X
Observations	1,088	1,088	605	605	483	483

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B.11. LPM estimates for balanced panel of relationship between shocks and marriage/engagement for females - extended

	Dependent variable: Married/engaged					
	Total		In school		Out of school	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Any negative shock						
Any negative shock	0.377***	0.377***	0.368***	0.393**	0.546**	0.613**
	(0.113)	(0.131)	(0.095)	(0.177)	(0.211)	(0.258)
(Any negative shock) X Matrilineal	-0.352***	-0.328**	-0.335**	-0.319	-0.549**	-0.629**
	(0.125)	(0.141)	(0.139)	(0.210)	(0.231)	(0.273)
Panel B: Covariate and idiosyncratic shocks						
Any covariate shock	-0.038	0.024	-0.037	-0.027	-0.087	0.115
	(0.126)	(0.136)	(0.126)	(0.146)	(0.364)	(0.366)
(Any covariate shock) X Matrilineal	0.030	-0.005	0.071	0.125	0.099	-0.136
	(0.125)	(0.134)	(0.123)	(0.140)	(0.369)	(0.375)
Any idio. shock	0.134	0.136	0.261*	0.300	-0.069	0.033
	(0.115)	(0.126)	(0.149)	(0.197)	(0.341)	(0.323)
(Any idio. shock) X Matrilineal	-0.133	-0.133	-0.257	-0.304	0.041	-0.085
	(0.126)	(0.135)	(0.164)	(0.212)	(0.352)	(0.341)
Both covariate & idio. shocks	0.034	0.063	0.056	-0.026	-0.305	-0.072
	(0.077)	(0.106)	(0.114)	(0.165)	(0.427)	(0.438)
(Both cov. & idio.) X Matrilineal	-0.089	-0.099	-0.133	-0.021	0.250	-0.005
	(0.089)	(0.117)	(0.124)	(0.173)	(0.439)	(0.453)
Panel C: Economic and family shocks						
Any economic shock	0.377***	0.397***	0.376***	0.411***	0.374*	0.399*
	(0.109)	(0.122)	(0.104)	(0.152)	(0.218)	(0.226)
(Any economic shock) X Matrilineal	-0.386***	-0.376***	-0.318**	-0.297	-0.414*	-0.452**
	(0.123)	(0.133)	(0.137)	(0.181)	(0.224)	(0.219)
Any family shock	-0.041	-0.004	-0.044	0.084	0.541**	0.519*
	(0.109)	(0.117)	(0.118)	(0.137)	(0.249)	(0.283)
(Any family shock) X Matrilineal	0.045	0.002	0.045	-0.085	-0.539**	-0.537*
	(0.109)	(0.116)	(0.126)	(0.141)	(0.258)	(0.283)
Both econ. & fam.shocks	0.172	0.181	0.112	0.099	0.716***	0.736***
	(0.138)	(0.155)	(0.139)	(0.149)	(0.222)	(0.227)
(Both econ. & fam.) X Matrilineal	-0.202	-0.215	-0.118	-0.080	-0.767***	-0.816***
	(0.144)	(0.158)	(0.152)	(0.159)	(0.221)	(0.232)
Village controls	X	--	X	--	X	--
Village fixed effects	--	X	--	X	--	X
Observations	1,056	1,056	588	588	468	468

Note: Each column-panel pair represents a separate analysis. All regressions use lagged shocks and control for youth age, whether the youth has a disability, and whether the household is matrilineal as well as baseline household characteristics including household size, wealth index, parents' schooling, and whether the household is labor constrained. Additionally, the first two columns also control for youth's in-school status. Standard errors clustered at the EA level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

APPENDIX C: ADDITIONAL TABLE FROM CHAPTER 4

Table C.1— Key Variable Definitions, Measurement, And Collection

			Waves collected	
	Definition	Measurement	Malawi	Zambia
Never waits	Dichotomous variable denoting whether respondents were ever willing to wait for any future value or not in the hypothetical intertemporal choice module.	If respondents ever said they would wait one month to receive a future value, they were coded 0. If they always opted to receive the present value today, they are coded 1.	W1, W2, W3	W1, W2, W3, W4
Any savings	Dichotomous variable denoting whether or not the respondent has any cash savings.	Respondents asked whether or not they had saved any cash in the last thirty days for an emergency or to buy something special in the future. 1/Yes 0/No	W3	W1, W2, W3, W4
Stress index	A stress index comprised of Likert scale responses (1=never to 5=always) to each item. The higher the value, the more stressed the individual is. The scale score is the simple sum of responses across each item.	In Zambia the ten-item Cohen's Perceived Stress Scale (PSS) is implemented. In Malawi a validated 4-item version of the PSS is implemented.	W1, W2, W3	W3, W4
Worries about food	Dichotomous variable denoting whether the respondent worried about having enough food for their family in the past 7 days.	In Malawi the question asks if over the past 7 days, the respondent worried that their household would not have enough food. Responses of 'Yes'=1, and responses of 'No'=0. In Zambia, this item is taken from the Household Food Insecurity Access Scale, and refers to the past four weeks, and is coded 1 if they worried three or more times, and 0 otherwise.	W1, W2, W3	W1, W2, W3, W4
Life better in 1 year	Dichotomous variable denoting whether respondents believed their life would be better in one year from date of interview.	Respondents asked "Do you think your life will be better in 1 year from now?" Yes=1, No=0	W1, W2, W3	W1, W2, W3, W4

Generally feels happy	Dichotomous variable denoting whether respondents agreed or strongly agreed that they generally feel happy.	This was one item in a larger module. In Malawi, respondents ranked the extent to which they agreed with the statement "I generally feel happy" on a scale from 1=strongly disagree to 5=strongly agree. Responses of 'agree' or 'strongly agree' coded as 1/Yes. Responses of 'strongly disagree' 'disagree' and 'neutral' coded 0/No. In Zambia, the question asked 'do you generally feel happy' with response options 'yes' or 'no.'	W1, W2, W3	W3, W4
Quality of life scale	An average quality of life index score from 1 to 5 based on Likert scale responses to the eight questions. The higher the value, the higher the quality of life the individual has.	An 8-item quality of life module was used in which respondents were asked how strongly the agree or disagree with 8 positive statements one might say about their life such as "I am satisfied with my health" or "The conditions in my life are excellent."	W1, W2, W3	Not administered

Notes: In each study W1 is the baseline. In Malawi survey years are 2013, 2014 and 2015. In Zambia survey years are 2010, 2012, 2013 (June), 2013(November).