Social context and child-rearing environments:
How social structure shapes female competition throughout her lifetime

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Abstract

Despite the consistent gender gap in competitiveness found in most studies, recent research shows that the gap varies by culture and within women's lifetimes. Using data from experiments with women ages 12 through 90 in matrilocal and patrilocal communities within the same economic setting in rural Malawi, we demonstrate that competitiveness in women is related to stages of motherhood and proximity to genetically related kin. All women who live in matrilocal society are as competitive as men, while women in patrilocal society pass through stages in which they decrease and then increase their expression of competitiveness. Specifically, we find that women of childbearing age who live in patrilocal communities and do not have a child past the critical survival age are 20 points less competitive than men as well as all other women. The results suggest that the gender gap commonly found in the literature is driven, not by differences in competitive preferences, but by environmental constraints on its expression, constraints that vary with gender, age, fertility, and social structure.

Key Words: gender, competition, inclusive fitness, child-rearing environments, socialization.

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Competition, like cooperation, is a ubiquitous part of human interaction, and yet we are still learning much about how it operates, how it manifests among different types of individuals, and how its pervasive presence and consequences affect different populations. Most studies show that the average man seeks competition, and the average woman avoids it (Almås et al., 2016; Flory et al., 2015; Gneezy et al., 2003; Gneezy and Rustichini, 2004; Niederle and Vesterlund, 2007). A deeper understanding of differences in competitiveness and the reasons it varies across gender is important not only for the efficient allocation of talent and labor in the economy but also from an equity perspective. Lower levels of competitiveness can result in women choosing different career paths and strategies at early stages in their lives (Berge et al., 2015; Buser et al., 2014; Flory et al., 2015), and these choices often have significant financial consequences.

However, many papers show that the systematic variation *within* women is as large as the variation *between* men and women. The competitiveness of women changes sharply at adolescence (Andersen et al., 2012), with age in general (Mayr et al., 2012), across critical aspects of social organization (Gneezy et al., 2009), and with menopause (Flory et al., 2018). Competitiveness also varies with the framing of the task; Healy and Pate (2011) show that women behave differently when they are competing for teams, Cassar et al. (2016) find that women compete differently when a task is performed on behalf of their children, Bursztyn et al. (2017) show that unmarried women are less competitive in the presence of unmarried men, and Alan and Ertac (2019) show that changing the framing of gender roles increases competitiveness in girls. Furthermore, Falk and Hermle (2018) show that women's preferences for a host of outcomes from altruism to risk aversion change with the level of gender equality exhibited across cultures. Liu and Zuo (2019) also demonstrate that preferences are malleable within a culture showing that risk aversion changes as students from different cultures mix in school. As variation among women seen in these studies cannot be driven by the biological fact of gender and the changes are at least as large as the gender gap between men and women, these results highlight the need for a better understanding of what drives the expression of competition among women themselves.

To build on these recent advances, we examine variation in competitiveness by child-rearing environment, specifically whether women have and raise their children in the same communities in which they were born and therefore in the presence of their natal families—matrilocal societies—or if they move away from their natal families to where they have no

related kin to have and raise children—patrilocal societies. As these practices have deep historical origins, the variation in childrearing customs can be considered exogenous to the characteristics of the individuals in our sample allowing us to isolate the impact of society on behavior.

To identify the stages and transitions at which we expect competitiveness to change, we develop a theory of the expression of competitiveness following the insight of Linney et al. (2017) that the imperatives of raising children play a critical role in the expression of competitiveness. This view contrasts with the simplified evolutionary psychology theory of gender differences in competitiveness that is often cited in this literature. That theory suggests that, because mothers played a unique role in infant survival and had limited potential fertility, competing exposed their infants to significant risk with little potential for additional offspring (Campbell, 2004, 2002; Daly and Wilson, 1983; Niederle and Vesterlund, 2007). However, by focusing on the fact that only women could bear children, that theory is incapable of explaining the variation within women or gender gap reversals across society. In contrast, our theory distinguishes between women who are at different stages in their child-rearing experience. Importantly, our theory suggests testable hypotheses that are driven by biological features of gender (adolescence and menopause),[1] hypotheses driven by lifecycle (whether a woman has a child who has survived the most vulnerable stages of childhood) and hypotheses driven by society (the availability of genetically related kin).

We use the Niederle and Vesterlund (2007) experimental protocol in a sample of women between the ages of 12 and 90 from matrilocal and patrilocal communities in rural Malawi to show that the expression of competitiveness is not constant and that it depends on the type of society in which a woman lives and the stages of a woman's life. There are sharp differences in the average choices that women make at precisely the points predicted by the theory, supporting the idea that competitiveness is not driven by gender, but by social organization. In patrilocal society, where women raise children isolated from their genetically related kin, women become

[1] Some research points to hormones as a possible candidate for explaining changes in preferences at puberty and menopause (Buser, 2012; Wozniak et al., 2014). Note that these papers find contradictory results on the role of hormones in female competitiveness and that Apicella et al. (2011) find no role for androgens in male competitiveness, calling into question simple theories of the link between hormones and competitiveness.

less competitive than men after adolescence (as in Andersen et al. (2012)), but the 20-percentage point gender gap is eliminated when they have a child who survives early childhood. In contrast, in matrilocal society, where women raise their children surrounded by genetically related kin, all women are as competitive as men at all stages of their life (as in Gneezy, Leonard, and List (2009)). Importantly, women of childbearing age who do not have a child who has survived early childhood and who raise their children in isolation from genetically related kin *are the only group* of women who are significantly less competitive than either men or other women in either society.

The changes observed when a woman has a child past the vulnerable age in patrilocal communities, and the broader contrast between matrilocal and patrilocal communities cannot be explained by differences in gender or biological changes within the lifecycle and, therefore, represent significant challenges to the idea that competitiveness is a characteristic of gender. Importantly, we show that post-adolescent females in non-matrilocal communities – a demographic widely used in experimental studies to demonstrate the persistent gender gap – are the least competitive group in our sample and do, in fact, increase their competitiveness at later stages in life. Although college-aged women are an important demographic, particularly when studying how people choose careers, the understanding that women are temporarily avoiding competition would fundamentally change our understanding of labor market outcomes.

The choice of rural Malawi to help understand the underlying drivers of the gender-competition relationship is deliberate, taking advantage of the specific history of Malawi and its location on the eastern edge of the African 'matriliny belt' (Giuliano and Nunn, 2018; Lowes, 2020).[2] The history of Malawi reflects the pressures of the continued Bantu expansion from the Congo in the 15th century (which brought matriliny and matrilocality with the Chewa), the arrival of the Portuguese and the slave trade in the 16th century, the arrival of the Ngoni who fled the Zulu from what is now South Africa in the 19th century and colonial pressures throughout the 19th and 20th centuries. Through this period of mixing, some groups were able to maintain their

[2] Note that not all matrilineal cultures practice matrilocal marriage, and this affects a critical variable – proximity of mothers to close kin. This is important in understanding differences between this paper, which examines the impacts of matrilocality, and Lowes (2020), which examines matrilineality. Note that the Khasi, studied in Gneezy, Leonard, and List (2009) are similar to this sample in Malawi in that they practice both matrilineality and matrilocality.

marriage and inheritance customs; others were converted from their original customs rapidly by the Ngoni or slowly by the British; and in some cases, the aggressors (some groups of Ngoni, for example) adopted the customs of the oppressed (Phiri, 1983). The Chewa ethnicity, for example, includes communities that have always been matrilocal, communities that were matrilocal in the distant past but have been patrilocal for hundreds of years (due to pressure from the Ngoni) and communities that more recently transitioned away from matrilocal customs (due to pressures from the British colonialists who believed that matrilocality and matriliny were contrary to modernity). Maize was introduced to Malawi in the 17th century (Iliffe, 2017), and all the regions of Malawi are now settled agricultural economies based on maize as the primary food crop. Furthermore, Malawi is a small country, and there is less variation across rural areas in access to education, health care, and markets than is typical in larger countries. Thus, the different groups of people share a similar economic setting but, due to historical events, observe differing marriage and inheritance institutions.

Our sampling strategy sought—through interviews with key informants—communities which were both historically and currently identified with matrilocal or patrilocal marriage patterns. This community-based sampling resulted in a sample that includes participants primarily drawn from one of eight ethnic groups: the Chewa, Yao, Sena, Nyanja, Ngoni, Tumbuka, Lomwe, and Mang'anja. The Chewa, Yao, Sena and Nyanja are identified in an ethnographic database as having originally followed matrilocal marriage customs and the Ngoni and Tumbuka are identified as traditionally following patrilocal marriage (Giuliano and Nunn, 2018). The Lomwe and Mang'anja are not listed in the database but sources suggest the Lomwe are closely related to the Yao, and the Mang'anja are closely related to the Nyanja, which implies both groups historically practiced matrilocal marriage customs (Kayira and Banda, 2013). However, consistent with the history of Malawi, marriage patterns have changed and our sample includes both matrilocal *and* patrilocal communities of Chewa, Mang'anja, Lomwe and Ngoni as well as patrilocal communities of Sena. The Yao continue to practice matrlocal marriage and the Tumbuka continue to practice patrilocal marriage. In our sample, the Nyanja are only associated with matrilocal marriage customs.

Focusing on communities that have been practicing their current marriage customs for multiple generations allows us to exploit the variation in social customs to understand current conditions. This follows established literature on the use of history to understand current

economic conditions (see Nunn, 2009 for a detailed description of the literature). Although much of that literature focuses on identifying the geographic or colonial origins of present institutions or cultural norms across countries and regions within countries (Acemoglu et al., 2001; Banerjee and Iyer, 2005; Dell, 2010), we study societies that formed in disparate geographical settings and historical experiences now sharing the same geographic location. This is similar to Fisman and Miguel (2007)—who show that adherence to unenforceable norms in New York City is partially explained by the degree of corruption in the home countries of diplomats—except that we study individuals who have shared a common setting for many generations. Comparable examples include farmers in the Midwest descended from Irish and German immigrants who still follow the different inheritance norms common in their communities of origin (Salamon, 1980) and second-generation immigrant women in the United States whose labor force participation and fertility choices can be traced to the home countries (and cultures) of their parents (Fernández and Fogli, 2009).

Although the historical origins of these different institutions may have been the differing original environmental conditions faced by these groups,[3] the variation in the present is not the result of differing environments, but of Malawi's unique history of successive invasions, immigration, and forced assimilation to outside customs. Despite being isolated from the original conditions in which they were formed, the continued existence of these institutions is not particularly surprising given that many institutional forms are slow to change (even in cases where they are no longer optimal responses to current conditions). Marriage customs, in particular, are highly stable because parents make choices that reflect not only their idiosyncratic preferences but also their beliefs about the preferences (and beliefs) of the parents of potential marriage matches (Bisin and Verdier, 2001, 2000).

We show that the patterns observed in women's behavior are the same across three different definitions of marriage customs; the description of key informants of the community-level customs, the proportion of people within the community who practice a particular marriage

[3] In general, matriliny is found in agricultural communities which depend on unsettled agriculture (slash and burn, for example), where wealth is in human capital rather than storable, transferable assets (Kaplan, Hooper, and Gurven 2009). It is not associated with use of large domesticated animals (Alesina, Giuliano, and Nunn 2013) and is not present in pastoral communities (Mace and Holden 2005) but is common in fishing communities (BenYishay, Grosjean, and Vecci 2015).

custom, and whether an individual in the sample is following a particular marriage custom. Importantly, the patterns we find are the strongest when marriage customs are defined according to key informants in the community, and not according to how individual participants define their own practices. Thus, although our theory suggests a reason why *individuals* should seek or avoid competition, the data are consistent with behavior that conforms to *societal* norms, norms which themselves are consistent with the logic of the theory.

In the following section, we outline the theory and its predictions. Section II outlines the methodology employed in this study. Section III presents the results of the experimental sessions, comparing the behavior of women in matrilocal and patrilocal communities using two different definitions of matrilocal and patrilocal. In Section IV, we examine the evidence that these patterns are caused by socialization (rather than individual incentives). Finally, Section V concludes.

I. Expressed Competitiveness Driven by Inclusive Fitness

To better understand the reasons why competitiveness might vary over the lifecycle and society, we describe a theory of expressed competitiveness driven by the imperatives of inclusive fitness. The theory we describe here is based on the idea that children are raised in an environment surrounded by female kin (female philopatry) or in an environment surrounded by male kin (male philopatry). This definition does not perfectly align with all forms of matrilocal and patrilocal cultures. For example, in some matrilocal cultures, men travel between their sister's and their wife's communities. Furthermore, male and female philopatry are not automatically correlated with matrilineal and patrilineal inheritance customs (the primary focus of Lowes, 2020). In the data analyzed in this paper, we have been careful to select communities (and confirm with exit interviews) that the matrilocal and patrilocal communities are places in which women (or men) are more likely than men (or women) to move away from their natal community at marriage, and therefore when they begin raising children.

A rich literature in evolutionary biology has long recognized that for animals living in a cooperative society, individual reproductive success is only part of a broader overall drive to maximize inclusive fitness. Inclusive fitness refers to the degree to which the genes one carries are present in subsequent generations – which can occur by directly passing on one's genes (individual reproduction) or by helping close genetic relatives pass on their genes (Hamilton,

1964; Stockley and Campbell, 2013). For humans, maximizing inclusive fitness implies maximizing the survival and fitness not only of their children, but also of their grandchildren, siblings, children of siblings, and cousins. Thus, alloparents (individuals other than the parent engaged in parenting a child) and alloparenting play an essential role in human society (Hrdy, 1999). The importance of kin with which we share genes (genetic kin) suggests that the social system in which a woman raises her children (in particular, proximity to and ease of sharing resources with her genetic kin) can have a strong effect on individual behavior.

We can systematically describe the differences in a woman's strategy to compete using the logic of inclusive fitness across different child-rearing environments. Consider the different implications of maximizing inclusive fitness for a woman living in a male philopatry system, a society organized around patrilocal marriage in which women leave their natal community to join their husbands' households, compared to a female philopatry system, a society organized around matrilocal marriage in which women live their entire lives in their natal community. In a female philopatry system, not only does a woman have greater ability to invest in the fitness of her genetic kin (among whom she is living), but the presence of genetic relatives all around her decreases the dangers posed by competitiveness because inclusive fitness implies her genetic kin also care about her own and her children's survival and genetic fitness. Indeed, evidence shows that genetic kin of the mother play a more important role than genetic kin of the father in child-rearing and survival (Fisher and Moule, 2013; Hawkes et al., 1998; Hrdy, 2011, 1999; Linney et al., 2017; Sear and Mace, 2009, 2008).[4] In addition, women who are living far from their own genetic kin have far less ability to invest in the fitness of their genetic kin.

Importantly, not only will the competitiveness of women vary across philopatry systems, but it will also vary with motherhood stages across systems. Women in male philopatry communities move from being surrounded by their own family at birth, to being completely isolated from their genetic kin, to having some children, to having multiple children and grandchildren. We should expect transitions in the expressions of competitiveness at these

[4] This is an empirical finding; it is not immediately clear why family related to the child but not the mother is less helpful than family related to mother as well as the child. Possibilities include paternal uncertainty (for which there is no equivalent in mothers) and poorer communication and coordination between the mother and the family of the child.

stages, even if a competitive disposition is constant across a woman's lifetime, evenly distributed across types of society and even across men and women.

We begin by outlining these stages in male philopatry society. First, note that an early adolescent female has no offspring and, in any society, is surrounded by kin. She can share resources won via contests with her kin (siblings, nieces, nephews, cousins, mothers and aunts, etc.) to increase their reproductive success. Moreover, the reproductive cost of competitiveness at this stage is minimal since an adolescent has no young offspring of her own. Thus, at this pre-menarchal stage, competitiveness maximizes inclusive fitness in both societal types.

After early adolescence, the environments faced by women across the two systems sharply diverge. In a patrilocal society (the male philopatry environment), women move away from their natal community when they marry; therefore, a woman at this point has no genetic kin in which she can invest, narrowing her strategies of inclusive fitness to individual reproductive success. In addition, any harm to her ability to care for her offspring has significant consequences in an environment without genetic kin who can serve as alloparents. These factors in patrilocal society simultaneously reduce the benefits of competitiveness and increase the cost.

Having a child who survives the vulnerable early childhood years represents another pivotal stage. Young children are uniquely dependent on their mothers and face higher mortality rate than older children, a fact reflected in customs which define an age at which a child is ready to enter the care of other adults. This transition should mark a change in the specialized role of mothers in the outcomes of their children. For a woman in a patrilocal society, while her only available inclusive fitness strategy remains the same (propagate the genes she carries through her direct offspring), the cost of a competitive strategy has changed. A setback in the mother's ability to care for the child is now less dangerous; the child has passed out of the most vulnerable phase, has started to enter society, and has passed partly into the custodial care of other adults (mentors, teachers, etc.). Furthermore, resources acquired in contests can be invested in the child to increase his or her future reproductive success (further advancing the propagation of genes to future generations). These changes encourage greater expression of competitiveness.

For women who are beyond their fertile years (post-menopausal), competition no longer presents a danger to potential children but still offers opportunities to invest in surviving children. Grandmothers in patrilocal society (if they have at least one son) have additional options for advancing inclusive fitness. They can invest in the quality (human capital) of the

children of their sons, the children of their grandsons (their sons' sons), or even in the spouses of their sons. They are also likely to have more direct offspring than do younger women. Thus, the reproductive cost of entering contests disappears for patrilocal women past menopause, and the reproductive benefits are also higher.

The dynamics of motherhood are different for a woman in a matrilocal society because she always lives among her close genetic relatives (parents, grandparents, sisters, unmarried brothers, etc.). This gives her more options for advancing inclusive fitness at all stages than in the patrilocal case – besides individual reproduction; she can help invest in the fitness of her kin. In addition, a mother in the matrilocal environment has a robust custodial safety net of alloparents if something harms her ability to care for her offspring. This would lower the reproductive cost of a competitive disposition for the mother of a young child.

Thus, our theory leads to the following expected patterns. First, early adolescents in both male and female philopatry environments have no reason to suppress their competitiveness. Second, once they enter adulthood, women in male philopatry environments will raise their children in isolation of their genetic kin and therefore have reason to avoid expressing a competitive disposition, whereas women in female philopatry environments have no reason to suppress competitiveness. Third, once a woman in a male philopatry environment has a surviving child, she will no longer need to suppress her competitiveness. In a female philopatry environment, crossing this threshold has less meaning because women were already expressing their disposition. Finally, the same transition should occur when a woman can no longer have children; women in male philopatry environments will express their competitive disposition after menopause, but in female philopatry environments, there will be no such change. Note that men have no reason to suppress a competitive disposition at any age or in any society, and therefore, if the desire to compete is evenly distributed across the genders, women who are willing to express their competitiveness should be as competitive as the average man.

Note that the patterns generated by the combination of motherhood stages and childrearing environments can be summarized most succinctly in one joint hypothesis: the only category of men or women with a reason to avoid expressing their competitive disposition is pre- and early mothers isolated from genetic kin (women who live in a male philopatry environment and are post-adolescent, pre-menopausal and without a child who has survived the vulnerable stages of childhood.) Thus, although we investigate all the patterns posited by our theory, the test

of the theory is more direct: pre- and early mothers isolated from genetic kin are less competitive than all other groups, and no other group is less competitive than any other.

We have deliberately limited our use of the theory to markers that are plausibly exogenous to individual preferences. Events like marriage, divorce, and having larger or smaller families could change the incentives to express competitive behavior, but each of these could also be driven by innate preferences for competitiveness and therefore be indicative of reverse causality. The society of one's birth and one's age are both exogenous to individual preferences; competitive women do not choose to be 14 or 50, and they do not choose to be born in one society or another. On the other hand, although a woman cannot choose to have a child who has survived infancy, this event is necessarily correlated with choosing to have a child, and, in Malawi, choosing to marry. Since marriage and having a child are potentially endogenous, we do include them as controls below to ensure that we are measuring the impact of having a surviving child independent of this influence.

Finally, note that the patterns predicted in patrilocal society are derived from the isolation of women from their genetic kin (not the proximity of men to their genetic kin). If this is correct, the same patterns should be observed in communities that follow neolocal marriage patterns. In a neolocal customs, which is the most common pattern in developed countries, the husband and wife establish a new household and women will therefore raise their children at least somewhat isolated from their kin. Women in such cultures without children older than the vulnerable threshold would therefore be less competitive than women with children past that threshold.

II. Sampling and Experimental Design

Sample

We deliberately sought to conduct experiments in communities which had practiced (for at least 50 years) and were still practicing either matrilocal or patrilocal marriage. The changing nature of marriage customs led us to focus on community- rather than ethnicity-derived definitions of society. Thus, our sampling strategy was to seek villages based on interviews with key informants. Working with local anthropologists and sociologists who study present-day practices in Malawi, as well as agricultural and health extension workers familiar with current customs in the areas they work, a member of our team identified villages reported to be strongly

matrilocal and patrilocal. In addition, the team member had extensive conversations with traditional authorities at all levels (including the chief of the Chewa tribe) seeking information on villages that were the "most" matrilocal and patrilocal. We then visited these villages (staying about two days in each) to follow up through in-depth interviews with multiple key informants per village about the nature, prevalence and duration of chitengwa (virilocal/patrilocal) and chikamwini (uxorilocal/matrilocal) practices.[5] This process resulted in a final sample of 12 villages; 6 matrilocal and 6 patrilocal.

In each of the twelve villages, we began by conducting experiments (outlined below) with adults (aged 18 to 90). The data from these experiments with adults was augmented with data from subjects in the United States and analyzed in Flory et al (2018). This paper augments this data with data on the demographic characteristics of subjects and with experimental evidence collected on a separate visit from children between the ages of 12 and 17. Flory et al (2018) examine the impact of menopause and shows that, across all twelve villages, and in the United States, women 50 and older are more competitive than other women. Flory et al (2018) do not develop an overarching theory that we present here in the context of philopatry, marriage customs, and female life stages, which crticially depends on the augmented sample and survey instruments that this study executes.

The data on children were collected a year after the original data visit in 4 villages, selected to include two matrilocal and two patrilocal communities. Given the order (older people first), the long gap in visits, the unexpected return for a second visit and the unique set of materials, it is not possible that any subject participated in both sets of experiments and unlikely that participants would learn about or practice the task between visits.[6]

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[5] Among other questions, we asked elders and leaders in each village the following:
Do people here practice chikamwini [chitengwa]?
Have there been changes in the degree to which this is practiced?
Do new couples still do this? Are fewer couples doing this over time?

[6] To the degree that subjects in the second study learned from older subjects, the effect (younger than and older than 17) does not interact with any of our tests and is constant across type of visit.

Experimental Design

To measure the expression of competitiveness we follow the design of Niederle and Vesterlund (2007)—henceforth NV—in which subjects (both men and women) perform a task three times—once when they are paid according to individual performance, once when they are paid based on their performance compared to three other individuals, and once when they are given a choice whether to perform the task in a competitive or individual (piece-rate) environment. At the end, they are also asked whether they choose to submit past performance to a competitive setting.

As NV emphasize, an important stumbling block in identifying the effects of a given determinant (e.g., gender) on appetites for competition is the difficulty of isolating preferences for competition from other characteristics such as appetites for risk, aversion to receiving feedback on performance relative to others, and self-confidence. Their protocol resolves this issue by having participants make two choices: choice 1, choosing to compete against others, and choice 2, choosing to submit one's past performance to a competitive evaluation. Both choices are affected by risk preferences, relative feedback aversion, and self-confidence, but only one (choice 1) is affected by a taste for the act of performing competitively. Choice 2, which is affected by risk preferences, feedback preferences, and confidence (but not the latter "taste"), is used as a control in analyses of choice 1, the choice to compete.

Our methodology differs from that of NV only in the task and the choice of subjects. The task that we use is specifically designed to involve a simple cognitive exercise—arranging shapes in a row from smallest to largest.[7] Each participant has a set of six blocks. Each side of a given block has one of six shapes. The relative location of the shapes on each of the six blocks is different. The task is to arrange all six blocks such that a given shape (e.g., star) appears facing up, and to align the six versions of that shape (e.g., all six stars) in order from smallest to largest. Upon completing one shape, the participant moves to the next shape. The blocks are designed so that the order of the blocks for one shape does not confer any advantage in arranging the blocks for the next shape. All participants work with identical blocks and face the same order of shapes

[7] We chose a task that was relatively easy to explain, required no formal education and responded well to effort.

to complete. Participants are paid based on the number of shapes completed in a 3-minute interval. There are four different rounds. Participants are informed that they will be paid for one of the four rounds, selected at random after the game. In round 1 (piece-rate), participants are paid X (0.32 USD) for each set of shapes successfully completed. In round 2 (tournament), they receive 4X (1.28 USD) per success if they complete the most successes in their group of four but receive nothing otherwise. Each group is randomly determined, and participants never know who is in their group. In round 3 (choice 1), they first choose which of the two payment schemes they want to work under (piece-rate or tournament) and then perform the task. In round 4 (choice 2), they do not actually perform the task. Instead, they choose to submit their past performance in round 1 either to the noncompetitive piece-rate scheme or the competition-based pay scheme.

Before making a choice for round 3, participants are informed that if they choose competition, their group is the same group that they were placed in for round 2, and the performances they compete against are the round 2 performances. That is, they would compete with individuals who were required to compete, rather than with individuals who had self-selected into competition. Before making a choice for round 4, participants are again informed that their group is the same group that they were randomly placed in for round 2, and this time the performances they compete against are the round 1 (piece-rate) performances of the group. Thus, if they submit their piece-rate performance to competition, they compete with the (round 1) performance of all individuals in their group, not just with those who chose to compete. After all rounds are completed, participants are asked how they believe their performance compares to the others' performances in their group for rounds 1 and 2, and they earn an additional amount Y (0.13 USD) for correct guesses.

The focus of the exercise is the choice of the compensation scheme for round 3 (choice 1), which is whether participants choose to perform the task under competition against a group of individuals who were required to compete. Rounds 1 and 2 serve to familiarize participants with each payment scheme. In addition, the number of successes in each of the first two rounds allows us to control for the influence of ability in the task (and any potential boost in ability under competition) on the decision to compete. This allows us to ensure, for example, that it is not simply a difference in ability that drives a lower average willingness to compete among women. The choice made in round 4 (choice 2) is whether participants want to submit a past performance to compete against their group's previous performances. As mentioned previously, both choice 1

and choice 2 are subject to the influence of other factors that affect one's willingness to compete (risk-aversion, feedback-aversion, and self-confidence), but only choice 1 is affected by a preference for performing under competition per se. Therefore, the choice to compete in round 3 conditional on the choice in round 4 captures the preference for competitive environments independent of other factors that can influence this choice.

The experiment took place in an isolated location, often inside a schoolhouse, in 12 villages. In each village, we conducted three or four sessions, with each session lasting about an hour. Each session had 16 stations, with a set of blocks and a pile of shape-indicator cards. We used facilitators to fill many of the functions of a computer in a typical experimental lab; facilitators gave subjects silent indication when their task was completed so they could move to the next shape arrangement, kept track of the number of successes and the time it took to complete each task, and recorded subjects' choices and beliefs. The facilitator sat facing the subject, handling two subjects at a time (with a barrier between the two subjects). Visual barriers prevented subjects from being able to observe each other's choices or performance. Communication between facilitators and subjects was nonverbal, using gestures and pictures (e.g., pointing to a card displaying the shape for the next task). The only speaker during the session was the script-reader, who read the instructions for the experiment translated into the local language.

III. Results

The experiment yielded 999 observations (504 women and 495 men) in 12 villages. Every participant in the experiment was asked his or her age and gender and whether they were born in the village. After the experiment, in order to measure motherhood stages, we collected more demographic data from a random subsample of participants.[8] Thus, we have experimental results for 504 women and more complete demographic data on 444 women.

[8] Since we did not have enough enumerators to interview every participant before they left, we interviewed people in a random order as they exited.

Defining Marriage Customs

Each village was chosen based on interviews with key informants in the village describing historical and current marriage patterns. Using the sample of people who completed the demogaphic survey, we can test marriage patterns using the response to the question "were you raised here?" for married individuals. Although is is not uncommon for married men in matrilocal communities to return to their natal community later in life, the responses of men and women to this question should give us a broad sense of the degree to which actual marriage practices conform to those stated by key informants. These reports broadly match the definitions of key informants: 78% of married women but only 51% of married men in matrilocal communities were born in their communities, whereas 48% of married women and 84% of married men in patrilocal communities were born in their communities. [The village and ethnic group marriage customs are reported in Appendix Table 2 and Appendix Table 3, respectively.]

We follow a three-fold strategy to ensure the patterns of behavior that we see derive from the childrearing environment that dominates in the participant's community. First, we use the definition of matrilocal and patrilocal from the interviews with key informants; a village custom is what the village elders consider it to be. Second, we restrict the sample to 8 villages (as opposed to 12) where the patterns among both men and women most closely match the declarations of the key informant. Third, we look at the degree to which married women are living in their natal village and use the percentage of married women living in their natal community as a continuous measure of marriage customs. As we show below, the conclusions from these alternate definitions of childrearing environment match with those based on the key informant definition.

Basic Experimental Results

Table 1 shows the sample statistics of the experimental results disaggregated both by men and women in both types of society as well as across society for men and women. Replicating the other findings on contrasts between matrilocal and patrilocal communities (Andersen et al., 2012; Gneezy et al., 2009; Gong and Yang, 2012), Table 1 shows a statistically significant difference of 10 percentage points between men and women in patrilocal villages ($p = 0.016$), but an insignificant difference of 2 points in matrilocal villages ($p = 0.528$). Although women in

matrilocal villages are more competitive than women in patrilocal villages, this difference is not significant ($p = 0.369$). Within patrilocal villages, women are different from men on several dimensions, but within matrilocal villages, women are broadly similar to men except that they are slightly less confident about their performance in round 2 ($p = 0.004$). Women in matrilocal communities are better at the task than women in patrilocal communities in both rounds ($p = 0.019$, $p = 0.059$). There are no significant differences for men across types of communities. Note that men and women are equally willing to submit their past performance to tournament incentives in each type of society. Since this paper focuses on the behavior of women, we are less concerned about the differences among men and control for differences in the number of successes of women wherever we include the standard NV controls.

Table 2 compares the overall experimental results to those reported in NV. We report the results for the full sample as well as for the sample restricted to participants between the ages of 18 and 25, the approximate range of ages in a university sample. The gender gap is significant in all three samples and almost identical when comparing students at the University of Pittsburgh (a 16-point gap) to participants between 18 and 25 in Malawi (a 14-point gap). This comparison shows that the NV protocol is robust across very different populations and tasks.

Testing the Theory of Expressed Competitiveness

To test the theory that the expression of competitiveness varies across lifetime and society, we need to define the categories in which women fit. We use the widely accepted age range of 15 to 49 for likely fertility[9] and refer to youth from 12 to 14 as early adolescents (who we henceforth call adolescents for simplicity). To examine the role of child survival, we categorize women by whether they have a child past the most vulnerable age. The World Health Organization (WHO) suggests that the ages of zero to eight are the most vulnerable period for early childhood development,[10] although child mortality is traditionally measured up to the age of five. This suggests markers between five and eight are the best candidates for a variable

[9] The Demographic and Health Surveys (DHS), the major source of detailed fertility data in developing countries, only interview women who are between the ages of 15 and 49. Munthali and Zulu (2007) also report that 15 is the median age of menarche in their study in Malawi.

[10] https://www.who.int/topics/early-child-development/en/

indicating that a child has passed the most vulnerable age. We discuss our results with each of these definitions (5, 6, 7 and 8) and focus on the results for being older than seven as the cutoff for vulnerability because it agrees with the WHO definition, is the common age at which children enter school and is a cultural marker of the end of early childhood.[11] The sample of women comprises 444 participants (229 in matrilocal and 215 in patrilocal) categorized into four groups. We have 85 adolescents (49 / 36 in matrilocal and patrilocal, respectively), 166 women between 14 and 49 without a child older than 7 (92 / 74), 115 women between 14 and 49 with a child over 7 (54 / 61) and 77 women older than 49 (34 / 44 in matrilocal and patrilocal, respectively).

Note that our sample size and the endogenous behavior implied in having children limits us from testing more fine-grained hypothesis on the transitions within stages. We do show that having a child is different from having a child who survives early childhood, but we cannot test the differences between survival markers of 5 and 6 for example, because there are too few women who have a child who is exactly 5. Importantly, we cannot test whether the gender of the child makes a difference because that would require a significant number of women who have a suriving boy (girl) but *not* a surviving girl (boy), and we would need to assume that the decision to have a second child was not dependent on the gender of the first child. Although getting married and having a child (and the ages at which these events occur) are both endogenous, controlling for having a child, having a child who is older than 7 is not endogenous.

Figure 1 shows the proportion of each subsample choosing to compete (including men) in each type of community. We show the mutually exclusive categories by age: from early adolescents to post-menopausal. In this way, we can see that women in a patrilocal society experience at least two transitions in their lifecycle: passing out of early adolescence is linked with an estimated 21 percentage point drop in the proportion competing and having offspring survive the vulnerable early years of childhood leads to an estimated 23 percentage point increase in the proportion competing. Menopause leads to an estimated 18 percentage point rise

[11] Leonard (1997) reports an interview with a traditional healer in neighboring Tanzania in which the healer did not consider the mother to have been cured of infertility until the child born to her reached the age of seven.

in the proportion competing compared to women without a child over the age of seven. Note that there are no clear patterns in matrilocal communities.

The most direct statement of our hypothesis is that pre- and early mothers isolated from genetic kin (women between 15 and 49 without a child over 7 in patrilocal communities) are less competitive than all other categories of women and men and that they are the only category less competitive than other groups. To examine this test statistically, Figure 1 shows the p-values for t-tests of the comparisons of each category within and across society. These tests show that pre- and early mothers isolated from genetic kin is the only category less competitive than any other: all other women are as competitive as men in either society. Note that, in this specification, although women with a child over seven and women 50 and older in matrilocal society are 10 and 15 percentage points more competitive than pre- and early mothers isolated from genetic kin, the differences are not significant.

To test this prediction of the theory more directly, we turn to probit regressions. All probit regressions in the paper (except specification tests in the appendix) report the marginal effects in which the standard errors are clustered at the village-visit level with p-values of the coefficients in parentheses. Thus, the coefficients can be read directly as a percentage point change in the proportion of the group choosing to compete compared to the omitted category (which is patrilocal men in this case). In every table, we report the results of probit regressions with and without the NV controls. Recall that the additional NV variables control for the confounding influences of ability, beliefs over ability, risk aversion, and feedback aversion. As such, we include the number of successes in round 1 and the change in the number of successes between rounds 1 and 2, which control for the influence of ability and any potential boost in ability under competition. We also include participant guesses about how their performance in round 2 ranked in comparison to the rest of their group (1=best, 4=worst), which controls for confidence in one's relative ability. The final control variable is the choice made in round 4 – whether to submit the round 1 piece-rate performance to a tournament pay regime.

In Table 3, we show the results of a probit regression on the choice to compete in which all categories of women, as well as matrilocal men, are compared to patrilocal men, the presumptively most competitive category. That table shows results both with and without the NV controls and contains four definitions of vulnerable: children older than 5, 6, 7 and 8. Each regression shows that women between 15 and 49 without a child who has survived past the

threshold age in patrilocal communities are significantly less competitive than men in patrilocal communities (by 21 and 22 percentage points) and that there are no other significant differences from the omitted category. All women in matrilocal communities are as competitive as the men in patrilocal communities. The table includes, at the bottom, the p-value for the Chi-square test of the restriction that all coefficients except that for women between 15 and 49 without a child older than the threshold age in patrilocal communities are jointly equal to zero. This test fails to reject the null that the coefficients are jointly zero in each specification. Thus, this table confirms the joint hypothesis that *only* women in this key category are, in fact, different from other people in the sample. While pre- and early mothers isolated from genetic kin are over 20 percentage points less competitive than men in patrilocal society, every other category of women is not significantly less competitive than men in patrilocal society.

Exploring the Patterns of Expressed Competitiveness

We turn now to examining the patterns over the lifecycle in more detail, comparing adolescents, women with a child who has survived the vulnerable period and women over 50 to women without a child over seven. We restrict the sample to women only and examine whether there are patterns in patrilocal society that do not exist in matrilocal society. Note that in Table 3, we were effectively checking whether pre- and early mothers in patrilocal communities were less competitive than patrilocal men, a dichotomous choice test that is powered to detect differences of about 16 percentage points.[12] However, when we examine the comparisons within types of communities, we are testing for the fact that pre- and early mothers are *not less competitive* than other groups. Thus, we need to be explicit about what it means to reject the null hypothesis. (For a recent review of the implications of power, see Vasilaky and Brock, 2020). For our smallest group, women over 50 in matrilocal communities, we have 34 observations and are powered to detect a difference of 25 percentage points in the basic regression without NV controls and a 15

[12] We could not choose the ages of our participants and therefore, even though age is a "treatment" category, we need to check power after being given the sample size. For a dichotomous variable with 74 pre- and early mothers in patrilocal communties and 255 of patrilocal men, if the null hypothesis is true, we have an 80% chance of detecting a difference between a proportion of 30% and 46% in a one-sided test (α=0.05), and 30% and 48% in a two-sided test (α=0.05).

percentage point gap when we include the NV controls.[13] This second gap is similar in size to the gender gap found in Niederle and Vesterlund (2007). In addition, to be cautious in our interpretation of *not less competitive,* in Table 4 and Table 5, we report both the p-value for the test that the pattern observed in patrilocal communities is significantly different from that reported in matrilocal communities and (for matrilocal communities) the minimum effect size that would be rejected (i.e., the upper tail of the confidence interval for the coefficient). A significant p-value in the first test means that the change in patrilocal is significantly different from the change in matrilocal communities, although it does not necessarily mean the change in matrilocal communities is zero. The minimum rejectable effect size shows that we cannot reject the hypothesis that there are changes smaller than the minimum but that we can reject changes that are larger than the minimum.

Table 4 shows results from a probit regression of women's choice of whether to enter competition with estimated marginal effects for the impacts of age and motherhood status, interacted with the environment in which they raise their children: male or female philopatry. Within each type of society, we divide the sample into four mutually exclusive categories representing motherhood stages: adolescents (younger than 15), women between 15 and 49 without a child older than 7, women between 15 and 49 with a child older than seven and post-menopausal women (50 or older). Note that the omitted categories are women between 15 and 49 without a child over 7. We test this model both directly (Columns 1, 2, 3) and with the standard set of NV controls (Columns 4, 5, 6).[14] To control for the fact that having a child over the age of 7 is associated both with having a child of any age and being married, we include these variables as control variables in Columns 2 and 3 without NV controls and Columns 5 and 6 with NV controls.

Across all specifications, the average woman in matrilocal communities is more competitive than the average woman in patrilocal communities, and there are patterns in patrilocal communities that do not exist in matrilocal communities. The inclusion of variables

[13] For a dichotomous variable with 34 and 92 observations, if the null hypothesis is true, we have an 80% chance of detecting a difference between a proportion of 30% and 55% in a one-sided test (α=0.05) and 30% and 58% in a two-sided test (α=0.05). Assuming the standard deviation of the independent variable is reduced to 0.30 when we include the NV controls, we have an 80% chance of detecting a difference of 15 points in a one-sided test and 17 points in a two-sided test.

[14] The coefficients for the NV controls in this table are shown in Appendix Table 1.

indicating whether a woman has ever married and whether she has a child of any age does not change the magnitude of the key coefficients, although, in columns 2 and 3, being over the age of 50 is no longer significantly different from zero in patrilocal communities. Importantly, these variables were included to test the coefficient for having a child over the age of 7, and they do not change the significance of this variable, which remains robust across all specifications.

The first and fourth columns show that the markers predicted by the theory of childrearing with inclusive fitness are important for female competitiveness in male philopatry environments but not female philopatry environments. In Column 1, the minimum rejectable effect size, reported at the bottom, shows that we can reject any change in matrilocal society larger than 19 points for adolescents, 22 points for women over 50 and 12 points for women with a surviving child over 7. In addition, the p-value comparing the coefficients across society shows that we can reject the null hypothesis that the pattern for women with a surviving child over 7 is the same in matrilocal and patrilocal communities. Importantly, when we include the NV controls, our results become more precise. We can reject any change in matrilocal society larger than 19 points for adolescents, 9 points for women over 50 and 6 points for women with a surviving child over 7. Furthermore, the p-values of the test that the coefficients are different in matrilocal and patrilocal society are all significant at the 10 percent level or lower.

Thus, we see that there are strong and significant patterns in patrilocal society that do not appear in matrilocal society and, when we include the NV controls, we can reject the hypothesis that there are important changes in matrilocal society for women over 50 and women with a child over the age of 7.

Stricter Definitions of Matrilocal and Patrilocal Customs

Although we chose each village in the sample based on interviews with key informants, after we collected the data, it was clear that not all patrilocal villages practiced patrilocal marriage exclusively, and not all matrilocal villages practiced matrilocal marriage exclusively. We can test marriage patterns using the response to the question “were you raised here?” for married individuals. In Appendix Table 2, we report the answers given to this question across the villages in the sample. For example, in one matrilocal village, 82% of married women but only 14% of married men were born in that village, a pattern that clearly matches the key informant declaration. On the other hand, in another matrilocal village, only 67% of married women were

born in that village, but 72% of men were also born in the village, a pattern that does not match what we expect of matrilocal marriage. We use this data to examine whether women are significantly more likely than men to have been raised in the village for communities identified as matrilocal (and the reverse in patrilocal). Restricting our sample to villages where the marriage pattern matches the statement of the key informant generates a sample of 297 women spanning eight villages and eleven sessions.

Figure 2 shows the proportions of each group choosing to compete under this more restrictive definition of marriage customs. Our primary hypothesis—that pre- and early mothers isolated from genetic kin are the only group that is different—is evident in this figure and in the t-tests below. This key category is different from every other group in the data, and no other group is different from any other group. Furthermore, the largest difference among women in matrilocal communities is 9 percentage points, compared to 23 percentage points in patrilocal communities. In contrast to Figure 1, the p-values show that pre- and early mothers isolated from genetic kin are significantly different from women in every other category within patrilocal and matrilocal society as well as men in each type of society.

In Table 5, we use this new definition to reexamine the results in Table 4. The results are broadly similar and, in most cases, more precisely estimated. In particular, the coefficients for the key markers within patrilocal communities are significant in each case, and not significant in matrilocal communities. The results for women 50 and older are less precisely estimated in matrilocal communities and, without the NV controls, the minimum rejectable effect size is relatively large. Even with the NV controls, the difference between the effect in matrilocal and patrilocal communities for this group is only significant at the 16 percent cutoff. For this definition of matrilocality, we do not have enough observations among women 50 and older in matrilocal communities to make strong statements about the absence of economically meaningful patterns.[15]

[15] There are 18 and 31 women 50 and older and 72 and 46 pre- and early mothers in matrilocal and patrilocal communities respectively.

Results in Control Variables and Robustness Tests

In examining the patterns in the control variables (marriage and having a child of any age) across both Table 4 and Table 5, we note that women appear to become less competitive at marriage (Table 4) and that women in matrilocal society become less competitive when they have a child of any age (Table 4 and Table 5). This result could be driven by reverse causality: competitive women in matrilocal and patrilocal society may be less likely to get married, and competitive women in patrilocal society may be less likely to have children. As we control for this in our regressions, it does not affect our results for having a surviving child of any age.

Appendix Table 4 estimates the effect of getting married, having a child and having a child over the ages of 1 through 8 and shows that the results we find are similar for ages 5, 6 and 7. Appendix Table 5 includes three different specifications for the age of the participant to check if the results for women with children surviving the vulnerable period are driven only by the fact that these women are older than other women. That table shows the main results are robust to controlling flexibly for women's age.

Appendix Table 6 examines the model in Columns 1 and 4 of Table 4 as well as Columns 1 and 4 of Table 5 but for men. Our theory suggests there is no reason to expect men to change their expression of competitiveness over their lifetime, and therefore we should see no patterns in either society. However, in order to check that the patterns we see in women are not caused by cohort effects (people over 50 experienced different historical events, for example), we examine the patterns in men to ensure that they are not the same as for women. Although a few markers are significant, the patterns are distinct from those seen among women, suggesting the patterns we see in women are not driven by some external phenomenon that would affect everyone in a community in the same cohort.[16]

In Appendix Table 7, we examine the patterns in Table 4 without clustering and a linear probability model with wild bootstrapped standard errors clustered at the village visit level (Cameron et al., 2008). We see the same patterns in the significance of the coefficients.

[16] There does appear to be an almost opposite pattern to that seen in women which may suggest that as women become more competitive, men become less competitive. This is similar to a result found in Uganda, in which some of the brothers of girls who received an empowerment treatment actually became less competitive (Buehren et al., forthcoming).

IV. Socialization

By showing that the variance in competitive behavior within and across these types of society can be predicted by a theory of expressed competition driven by inclusive fitness, we are able to establish that social organization is an important driver of competitiveness. Because stages of motherhood are driven by age and fertility, we can exclude the reverse causal mechanism that variation in preferences for competition causes differences in motherhood status. For example, the finding that a mother of a 7-year-old child is more competitive than the mother of a 2-year old child cannot be driven by the fact that competitive women are more likely to have 7-year-old children. If competitive women are more likely to have children, we should see increased competitiveness in both women. Furthermore, the fact that marriage institutions are historical and not contemporaneous allows us to exclude the possibility that both marriage institutions and competitive behavior are jointly determined by current economic conditions.

The theory of expressed competitiveness that we have advanced describes the incentives of individual women within the context of their status and society. However, in the modern era, and particularly within the context of our experimental setting, it is unlikely that women are making decisions in our lab experiment based explicitly on maximizing inclusive fitness. Instead, we hypothesize that women's roles in society are conditioned on their motherhood status, and these roles have highly proscribed or prescribed behaviors derived from environmental conditions that are no longer present. However, the results shown in Table 4 and Table 5 do not allow us to determine whether women are individually responding to the pressures of inclusive fitness or whether their society has developed expectations of behavior that reflect past environmental pressures. We do note, with curiosity, that young women without a child in patrilocal communities are less competitive than pre-adolescent girls in those same communities, even though, before they are married, they are not leaving their natal villages at this marker.

From the individual perspective, nothing has changed, but social roles have changed significantly (see Bursztyn et al., 2017 for a discussion of the behavior of unmarried women).[17]

Socialization as seen in Alternative Definitions of Childrearing Environments

To more closely examine the mechanisms driving expressed competitiveness in women, Table 6 examines three potential definitions of society or childrearing environments. Panel A shows the results for the regressions in Table 4 with the three different definitions of society.

In Columns 1 and 2, the definition of society is the declaration of key informants. Note that these columns are, therefore, identical to Columns 1 and 4 from Table 4.

In Columns 3 and 4, we replace this definition with a continuous variable indicating the proportion of married women in the village who follow matrilocal customs as opposed to the simple binary indicator of matrilocality used in previous analyses. For example, Appendix Table 2 shows that in one village, 94% of married women live in their natal village (the most matrilocal community), and in another village, 22% of married women live in their natal village (the most patrilocal community). Column 3 includes no controls, and Column 4 includes the full set of NV controls.

Finally, Columns 5 and 6 define matrilocal and patrilocal environments by the residency of the individual. Thus, a woman who lives in her natal village is considered to face matrilocal pressures, and a woman who does not live in her natal village is considered to face patrilocal pressures (independent of the declaration of key informants). This variable is not a good instrument for culture because it reflects endogenous decisions. However, we include it here as a comparison to the other two definitions, which are exogenous. Here the coefficients show discrete rather than marginal effects. Note that all adolescents live in their natal villages, so there is no coefficient for patrilocal adolescents.

[17] We interviewed key informants in matrilocal and patrilocal villages about initiation ceremonies in which most children in rural Malawi participate. These important ceremonies take place at about the age of the transition from pre-adolescence and are attended by both boys and girls (Munthali and Zulu, 2007). Such ceremonies can serve the purpose of socializing girls about expectations for their roles as adult women, and might contribute to changes in behavior around these ages.

Column 7 uses both the individual residency location and the key informant residency definitions to examine the marginal impact of a key informant declaration condition on the individual residency environment. Thus, for example, "Key inf. Patri 50 or older" shows the marginal impact on older women of living in a village that is declared to be patrilocal, while "Patri and 50 or older" measures the effect of living in a village that is not the natal village.

Panel B shows the number of observations in each of the three definitions. Note that there are progressively fewer observations in patrilocal communities as we move from the key informant declaration to the individual place of residence.

Table 6 displays an interesting phenomenon: the markers have greater magnitude and better predictions the more distant the definition of society is from a woman's individual situation. In other words, whether a woman lives in her natal village is less important than whether a high proportion of women in her village live in their natal village, which is, in turn, less important than what a key informant says about the customs regarding women in the village. Women are reacting to the social setting as defined by declared custom and potentially to the proportion of women who are also following this tradition, but they are not reacting to their own childrearing environment. This is compelling evidence that women are reacting to customs and expectations, not to their individual condition.

How could this work? Evidence for the social mechanism comes from the design of the experiment itself, the NV protocol. We examine the decision to submit past performance to tournament incentives (round 4 choice), a decision that exposes women to all the features of competition (risk, the unknown distribution of ability and confidence) except the act of competition itself.

Table 1 shows that, unlike the willingness to compete (round 3 choice), there is no difference across gender or culture in the willingness to submit to past performance to tournament incentives (round 4 choice). Appendix Table 8 tests this more explicitly by duplicating the basic results in Table 4 and Table 5 using this variable as the dependent variable. That table shows no strong pattern except for Column 1, showing a significant effect for women with a child over the age of seven under the definition of philopatry according to the key village informant, and that coefficient is about half the size of the coefficient in Table 4. This suggests that women with children over the vulnerable age may face a different calculation over whether to compete, but that there is an additional and important effect in patrilocal communities

encouraging women to express their competitiveness (or no longer discouraging them from expressing their competitiveness). The results on framing effects discussed earlier in prior literature (Alan and Ertac, 2019; Cassar et al., 2016) further support this view that decisions are made based, at least in part, on the way women believe they will be perceived rather than solely on the hard calculation of maximum pecuniary benefit.

Overall, these additional results provide evidence that socialization has a vital role to play in the expression of competitiveness across and within communities. Socialization represents a rule of thumb for decision making, or an opportunity to obtain utility from esteem or status by conforming to social expectations of competitiveness (Akerlof, 1980; Bernheim, 1994; Kandori, 1992) and this opportunity is more salient in the public act of competing against others than the private act of submitting past performance to different incentives.

Examining Socialization in a Broader Sample

If, as our results in Malawi suggest, socialization drives the choice to express competitiveness, is it possible that the gender differences seen elsewhere in the world can also be at least partially explained by a similar phenomenon, namely that women are particularly likely to avoid competition only for certain stages of their life and only when isolated from genetically related kin? Here we examine some suggestive results by adding data from Tanzania (with a patrilocal society) and India (with a matrilocal society) (Gneezy et al., 2009) and two samples from the US . These additional samples did not collect data on the ages of women's children, but we can examine the data using age as a proxy for lifecycle stages. Note that most customs within developed countries can be described as neolocal, in which the couple forms a new household after marriage. If, as the theory suggests, the key feature discouraging competition is the isolation from genetic kin, then neolocal cultures should exhibit patterns similar to patrilocal cultures.

In Figure 3, we examine the data from the US, India, Tanzania and Malawi grouping women by 18 to 25, 26 to 50 and 50+. Shown in the figure is the difference of each group from the average man in the same sample. The figure shows that only four groups of women are significantly less competitive than men: all the samples of women between 18 and 25 in non-matrilocal communities. In all other samples (including older women in patrilocal communities

in Tanzania and Malawi), we cannot reject the hypothesis that women are as competitive as men. Note also that, in the samples from Tanzania, Malawi and the US with a broad range of ages, the competition gaps disappear as women get older. Furthermore, in the two matrilocal samples (from Malawi and India), there are no patterns with age.

Though these results are drawn from small samples without good demographic information, they are highly suggestive or consistent socialization patterns across highly varied environments. Note that almost all experimental research is done with samples that look like the NV sample: women between 18 to 25 in non-matrilocal society, but that this sample is the only sample that exhibits a gender gap.

V. Conclusion

Our findings among women in a male philopatry society show that the expression of competitiveness drops at puberty, rises when offspring survive early childhood and rises when a woman exits her fertile years. However, for women in a female philopatry society, there are no changes across these same thresholds. This combination of findings across philopatry environments is consistent with the implications of inclusive fitness and differential availability of alloparents who are related to the mother. In particular, living in a setting with fewer kin reduces the expression of competitiveness for women who do not yet have a child who has survived early childhood. In comparison to this group, early adolescents, post-menopausal women, and women with a surviving child all have much higher expressions of competitiveness.

In contrast to the extant literature on the gender gap in competitiveness, we find that most women have the same expression of competitiveness as men in any environment. In fact, only women of child-bearing age without a surviving child in male philopatry systems are different from men. This suggests that the gender gap commonly found in the literature is driven, not by differences in competitive preferences, but by environmental constraints on its expression. Importantly, the strongest patterns observed in the data come when we examine society-wide definitions of status markers, not when we look at individual's conditions, suggesting that the patterns are driven by expectations of behavior at these markers: socialization.

These patterns in female competitiveness dispel the idea that competitiveness in humans is a "male" characteristic. Not only do most women compete, but such a view also overlooks the fact that competitive women may choose not to compete because of cultural constraints, and this

largely depends on how society is organized. These results suggest that policies aimed at encouraging women to enter competitive environments should consider the social expectations for behavior and recognize that these expectations could vary significantly across settings and maternal status.

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VII. Tables and Figures

Table 1 Experimental results for Full Sample

	Females			Males			F/M p-value	
	Patri	Matri	p-value	Patri	Matri	p-value	Patri	Matri
Choice 1, compete in round 3	0.41	0.45	0.369	0.51	0.47	0.419	0.016	0.528
Choice 2, submit previous perf.	0.46	0.46	0.859	0.48	0.47	1.000	0.790	0.717
Successes in round 1	5.92	6.44	0.019	6.66	6.87	0.146	0.007	0.107
Successes in round 2	7.37	7.90	0.059	8.02	8.19	0.208	0.058	0.257
Belief of rank in round 1	2.12	2.10	0.777	1.78	1.91	0.217	0.006	0.327
Belief of rank in round 2	2.31	2.40	0.149	2.04	2.05	0.437	0.025	0.004
Observations	254	250		255	240			

Notes: Fisher's exact test is used for discrete variables and Wilcoxon rank-sum test used for continuous variables. Experimental results are shown for the full sample of experimental participants. All tests are two-sided. Matrilocal and Patrilocal communities are defined following the declaration of key informants in each community.

Table 2 The Willingness to Compete, Comparing Basic Experimental Results to NV07

	Univ. of Pittsburg Students (reported in NV)	Malawi	
		Adults 18-25	Full Sample
Female	**-0.162**	**-0.140**	**-0.068**
	(0.05)	(0.079)	(0.019)
Tournament Performance	-0.009	-0.013	-0.001
	(0.42)	(0.471)	(0.927)
Improvement	0.011	0.037	0.016
	(0.44)	(0.304)	(0.355)
Submit piece rate to tournament	**0.258**	**0.387**	**0.426**
	(0.012)	(0.000)	(0.000)
Guessed Rank	**-0.12**	-0.043	-0.015
	(0.01)	(0.245)	(0.553)
Observations	77	288	998

The dependent variable is the choice to compete in round 3. P-values reported in parentheses. Improvement is measured as round 2 successes minus round 1 successes.

Table 3 Are Pre- and Early Mothers Isolated from Genetic Kin Less Competitive?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Surviving child is defined as older than							
	5		6		7		8	
Matrilocal effect	-0.037	-0.041	-0.037	-0.041	-0.037	-0.041	-0.037	-0.041
	(0.535)	(0.447)	(0.535)	(0.447)	(0.535)	(0.446)	(0.535)	(0.448)
Matri and adolescent	0.035	0.023	0.035	0.022	0.035	0.022	0.035	0.023
	(0.576)	(0.806)	(0.576)	(0.807)	(0.576)	(0.811)	(0.576)	(0.801)
Matri and 50 or older	-0.034	-0.061	-0.034	-0.060	-0.034	-0.057	-0.034	-0.059
	(0.822)	(0.680)	(0.822)	(0.684)	(0.822)	(0.698)	(0.822)	(0.690)
Patri and adolescent	-0.012	-0.004	-0.012	-0.004	-0.012	-0.005	-0.012	-0.003
	(0.850)	(0.946)	(0.850)	(0.942)	(0.850)	(0.931)	(0.850)	(0.949)
Patri and 50 or older	-0.034	0.033	-0.034	0.033	-0.034	0.036	-0.034	0.034
	(0.662)	(0.730)	(0.662)	(0.728)	(0.662)	(0.710)	(0.662)	(0.726)
Matri 15 to 49	-0.102	-0.125	-0.100	-0.117	-0.086	-0.099	-0.095	-0.097
w/ surv. child	(0.214)	(0.186)	(0.297)	(0.266)	(0.378)	(0.361)	(0.327)	(0.332)
Patri 15 to 49	-0.033	-0.063	-0.012	-0.052	0.013	-0.029	-0.012	-0.063
w surv. child	(0.355)	(0.146)	(0.706)	(0.208)	(0.654)	(0.443)	(0.697)	(0.142)
Matri 15 to 49	-0.004	0.032	-0.008	0.020	-0.018	0.005	-0.016	0.001
w/o surv. child	(0.936)	(0.554)	(0.847)	(0.687)	(0.693)	(0.926)	(0.696)	(0.982)
Patri 15 to 49	**-0.190**	**-0.212**	**-0.198**	**-0.215**	**-0.211**	**-0.227**	**-0.180**	**-0.189**
w/o surv. child	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tournament		0.002		0.002		0.003		0.003
performance		(0.827)		(0.814)		(0.754)		(0.799)
Improvement		0.012		0.012		0.012		0.011
		(0.541)		(0.540)		(0.547)		(0.563)
Submit piece		**0.442**		**0.440**		**0.439**		**0.438**
rate to tournament		(0.000)		(0.000)		(0.000)		(0.000)
Guessed rank		-0.012		-0.012		-0.012		-0.013
		(0.656)		(0.667)		(0.675)		(0.636)
Observations	936	935	936	935	936	935	936	935
Clusters	16	16	16	16	16	16	16	16
p-value of joint test that all coefficients except Patri 15 to 49 w/o surv. child are jointly equal to zero.	0.810	0.399	0.931	0.551	0.948	0.759	0.908	0.318

Notes: The dependent variable is the choice to enter and perform under competition in round 3. The coefficients are marginal effects from a probit regression with p-values from errors clustered at the village-visit level reported in parentheses. The sample includes all participants with available demographic information. Matrilocal and patrilocal communities are defined following the declaration of key informants in each community. The omitted category is men in patrilocal communities.

Table 4 The Choice to Compete across Motherhood Stages and Childrearing Environment

	(1)	(2)	(3)	(4)	(5)	(6)
Matrilocal effect	**0.165**	**0.138**	**0.143**	**0.648**	**0.652**	**0.623**
	(0.021)	(0.078)	(0.025)	(0.009)	(0.009)	(0.012)
Age and status categories						
Matri and adolescent	0.053	0.041	0.010	0.005	-0.040	-0.045
	(0.514)	(0.638)	(0.889)	(0.960)	(0.733)	(0.664)
Matri and 50 or older	-0.015	-0.027	-0.058	-0.182	-0.221	-0.226
	(0.915)	(0.854)	(0.668)	(0.321)	(0.253)	(0.212)
Patri and adolescent	**0.209**	**0.170**	**0.144**	**0.229**	**0.170**	**0.150**
	(0.005)	(0.032)	(0.098)	(0.001)	(0.019)	(0.074)
Patri and 50 or older	**0.188**	0.148	0.122	**0.277**	**0.224**	**0.197**
	(0.028)	(0.066)	(0.149)	(0.005)	(0.018)	(0.064)
Matri 15 to 49 with child over 7	-0.067	-0.040	-0.008	-0.148	-0.062	-0.087
	(0.585)	(0.766)	(0.954)	(0.277)	(0.662)	(0.557)
Patri 15 to 49 with child over 7	**0.233**	**0.323**	**0.276**	**0.242**	**0.371**	**0.291**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matri 15 to 49 with child		-0.040			**-0.134**	
		(0.587)			(0.090)	
Patri 15 to 49 with child		-0.134			-0.192	
		(0.328)			(0.130)	
Matri 15 to 49 and ever married			**-0.110**			**-0.123**
			(0.060)			(0.084)
Patri 15 to 49 and ever married			**-0.116**			**-0.138**
			(0.008)			(0.002)
Included NV controls	no	no	no	yes	yes	yes
Omitted category average*	0.297	0.412	0.419			
Observations	444	444	444	443	443	443
Clusters	16	16	16	16	16	16
P-value of the test for equality of coefficients across matri and patri						
Adolescent	0.155	0.273	0.226	**0.088**	0.129	0.146
50 and older	0.224	0.301	0.263	**0.031**	**0.045**	**0.049**
Has children over 7	**0.023**	**0.022**	**0.045**	**0.008**	**0.007**	**0.018**
Minimum Rejectable Effect Size						
Matri and adolescent	0.189	0.123	0.186	0.186	0.124	0.150
Matri and 50 or older	0.219	0.161	0.215	0.091	0.029	0.054
Matri 15 to 49 with child over 7	0.132	0.215	0.179	0.061	0.149	0.166

Notes: The dependent variable is the choice to enter and perform under competition in round 3. The coefficients are marginal effects from a probit regression with p-values from errors clustered at the village-visit level reported in parentheses. The sample includes all female participants with available demographic information. Columns 4, 5 and 6 include the standard NV controls, with coefficients shown in the appendix. Matrilocal and Patrilocal communities are defined following the declaration of key informants in each community.

*The omitted category is women between 15 and 49 in patrilocal communities without children over 7. The minimum rejectable effect size is the upper limit of the 95% confidence interval for a one-sided test and is the smallest effect size that can be rejected.

Table 5 Choice to Compete with Stricter Definition of Society

	(1)	(2)	(3)	(4)	(5)	(6)
Matrilocal effect	**0.209**	**0.222**	**0.219**	**0.699**	**0.713**	**0.698**
	(0.006)	(0.011)	(0.000)	(0.024)	(0.019)	(0.017)
Age and status categories						
Matri and adolescent	0.052	0.020	0.010	0.007	-0.067	-0.045
	(0.561)	(0.826)	(0.891)	(0.952)	(0.583)	(0.683)
Matri and 50 or older	0.097	0.065	0.055	-0.102	-0.172	-0.155
	(0.661)	(0.779)	(0.797)	(0.716)	(0.571)	(0.587)
Patri and adolescent	**0.287**	**0.272**	**0.260**	**0.286**	**0.248**	**0.249**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Patri and 50 or older	**0.234**	**0.217**	**0.204**	**0.335**	**0.299**	**0.298**
	(0.045)	(0.047)	(0.036)	(0.022)	(0.036)	(0.019)
Matri 15 to 49 with child over 7	0.056	**0.134**	0.122	-0.046	0.108	0.025
	(0.465)	(0.096)	(0.169)	(0.680)	(0.255)	(0.852)
Patri 15 to 49 with child over 7	**0.237**	**0.266**	**0.267**	**0.230**	**0.294**	**0.266**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Matri 15 to 49 with child		-0.109			**-0.218**	
		(0.174)			(0.009)	
Patri 15 to 49 with child		-0.050			-0.113	
		(0.744)			(0.376)	
Matri 15 to 49 and ever married			-0.120			-0.136
			(0.151)			(0.208)
Patri 15 to 49 and ever married			-0.068			-0.085
			(0.375)			(0.133)
Included NV Controls	no	no	no	yes	yes	yes
Omitted category average*	0.261	0.345	0.292			
Observations	310	310	310	310	310	310
Clusters	11	11	11	11	11	11
Test for equality of coefficients across matri and patri						
adolescent	**0.012**	**0.014**	**0.002**	**0.033**	**0.017**	**0.011**
50 and older	0.574	0.547	0.523	0.158	0.162	0.147
Has children over 7	**0.042**	0.224	0.157	**0.022**	**0.060**	**0.084**
Minimum Rejectable Effect Size						
Matri and adolescent	0.199	0.130	0.169	0.204	0.135	0.131
Matri and 50 or older	0.460	0.411	0.449	0.343	0.284	0.289
Matri 15 to 49 with child over 7	0.182	0.267	0.266	0.135	0.244	0.262

Notes: The dependent variable is the choice to enter and perform under competition in round 3. The coefficients are marginal effects from a probit regression with p-values from errors clustered at the village-visit level reported in parentheses. Columns 4, 5 and 6 include the standard NV controls, with coefficients shown in the appendix. The sample includes all female participants with available demographic information in villages for which key informant declaration of matrilocal and patrilocal customs matches the proportion of married women who reside in their natal community.
*The omitted category is women between 15 and 49 in patrilocal society without children over 7.
The minimum rejectable effect size is the upper limit of the 95% confidence interval for a one-sided test and is the smallest effect size that can be rejected.

Table 6 Choice to Compete by Key Inf. Declaration, Average Residency and Individual Residency

Panel A: Coefficients by Alternative Definitions of Matrilocal and Patrilocal Environments.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Matrilocal effect	**0.165**	**0.648**	0.199	**1.105**	0.019	**0.523**	**0.520**
	(0.021)	(0.009)	(0.103)	(0.062)	(0.828)	(0.023)	(0.032)
Age and status categories							
Matri and adolescent	0.053	0.005	-0.007	-0.026	**0.118**	0.108	0.005
	(0.514)	(0.960)	(0.939)	(0.827)	(0.072)	(0.164)	(0.961)
Matri and 50 or older	-0.015	-0.182	-0.056	-0.266	0.069	0.011	-0.138
	(0.915)	(0.321)	(0.782)	(0.327)	(0.581)	(0.946)	(0.443)
Patri and adolescent	**0.209**	**0.229**	**0.315**	**0.366**			
	(0.005)	(0.001)	(0.038)	(0.081)			
Patri and 50 or older	**0.188**	**0.277**	0.313	0.772	0.100	**0.253**	0.008
	(0.028)	(0.005)	(0.346)	(0.130)	(0.359)	(0.014)	(0.962)
Matri 15 to 49 with child over 7	-0.067	-0.148	-0.072	-0.170	0.066	0.023	-0.134
	(0.585)	(0.277)	(0.606)	(0.325)	(0.484)	(0.834)	(0.318)
Patri 15 to 49 with child over 7	**0.233**	**0.242**	**0.373**	**0.513**	0.107	**0.146**	-0.142
	(0.000)	(0.000)	(0.058)	(0.059)	(0.208)	(0.071)	(0.358)
Key inf. Matri Effect							**0.231**
							(0.007)
Key inf. Patri adolescent							**0.247**
							(0.064)
Key inf. Patri 50 or older							**0.353**
							(0.024)
Key inf. Patri child over 7							**0.389**
							(0.017)
Included NV controls	no	yes	no	yes	no	yes	yes
Observations	444	443	443	443	444	443	443
Clusters	16	16	16	16	16	16	16

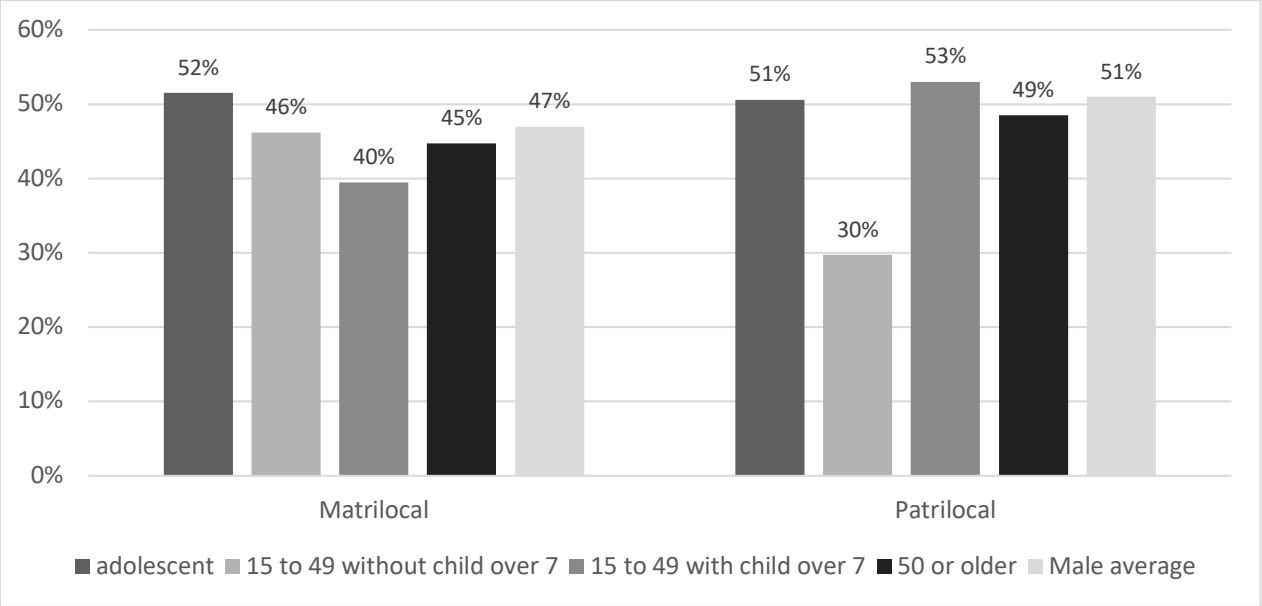
Notes: The dependent variable is the choice to enter and perform under competition in round 3. The coefficients are marginal effects from a probit regression with p-values from errors clustered at the village-visit level reported in parentheses. The sample includes all female participants with available demographic information.
Columns 1 and 2: these columns are the same as Columns 1 and 4 in Table 3 in which matrilocal and patrilocal communities are defined following the declaration of key informants in each community.
Column 3 and 4: "Patrilocal" is a continuous variable between 0.06 and 0.78, representing the proportion of married women in the community who do not live in their natal village. Patrilocal variables are interaction effects with lifecycle markers and are, therefore, marginal effects, not direct effects. The matrilocal effect is the proportion of women who do live in their natal village.

Column 5 and 6: Patrilocal environment is assigned to all women who do not live in their natal village, and the matrilocal environment is assigned to all women who do live in their natal village. Since all adolescents live in their natal village, the category of the patrilocal adolescent is omitted.
Column 7: The same specification as Column 6 with the addition of the key informant declaration of patrilocal interacted with lifecycle categories. This column shows the marginal impact of living in an environment that is different from that declared by the key informant.

Panel B: Observations by Definitions of Matrilocal (M) and Patrilocal (P) Environments

	key inf. declaration				average residency		individual residency			
	M	P	total	% M	total	% M	M	P	total	% M
Adolescent	49	36	85	58%	85	56%	85	0	85	100%
14 to 49 without child over 7	92	74	166	55%	166	60%	139	27	166	84%
15 to 49 with child over 7	54	61	115	47%	115	57%	75	40	115	65%
50 or older	34	44	78	44%	78	51%	46	32	78	59%
total	229	215	444	52%	444	59%	345	99	444	78%

Figure 1 Proportion of Women Choosing to Compete in Full Sample

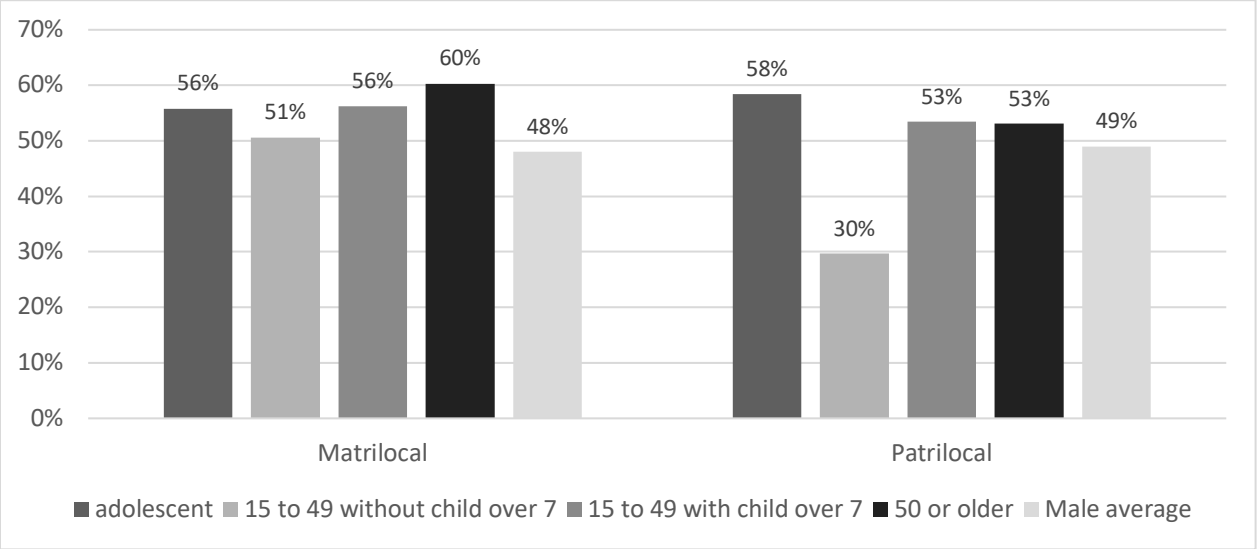


P-Values of Pairwise Comparisons within Communities

	15 to 49 w/o child over 7	adolescent	15 to 49 with child over 7	50 and older	men
			Matrilocal		
15 to 49 w/o child over 7		0.547	0.429	0.879	0.895
adolescent			0.220	0.542	0.653
15 to 49 with child over 7				0.632	0.254
50 and older					0.715
men					
			Patrilocal		
15 to 49 w/o child over 7		**0.038**	**0.007**	**0.050**	**0.001**
adolescent			0.817	0.842	0.895
15 to 49 with child over 7				0.636	0.858
50 and older					0.674
men					
			Patrilocal (columns) to Matrilocal (rows)		
15 to 49 w/o child over 7	**0.036**	0.661	0.413	0.822	0.265
adolescent	**0.017**	0.927	0.882	0.754	0.984
15 to 49 with child over 7	0.282	0.303	0.148	0.384	0.101
50 and older	0.146	0.628	0.441	0.755	0.441
men	**0.007**	0.779	0.489	0.976	0.413

Notes: The figure shows the proportion of women across four lifecycle categories and the average man within two types of communities. The sample includes all participants with available demographic information. The table shows the P-values for each pairwise comparison within and across communities. The order of categories has been changed to make it easier to see the default category of women 15 to 49 w/o child over 7.

Figure 2 The Proportion of Women Choosing to Compete in the Stricter Sample

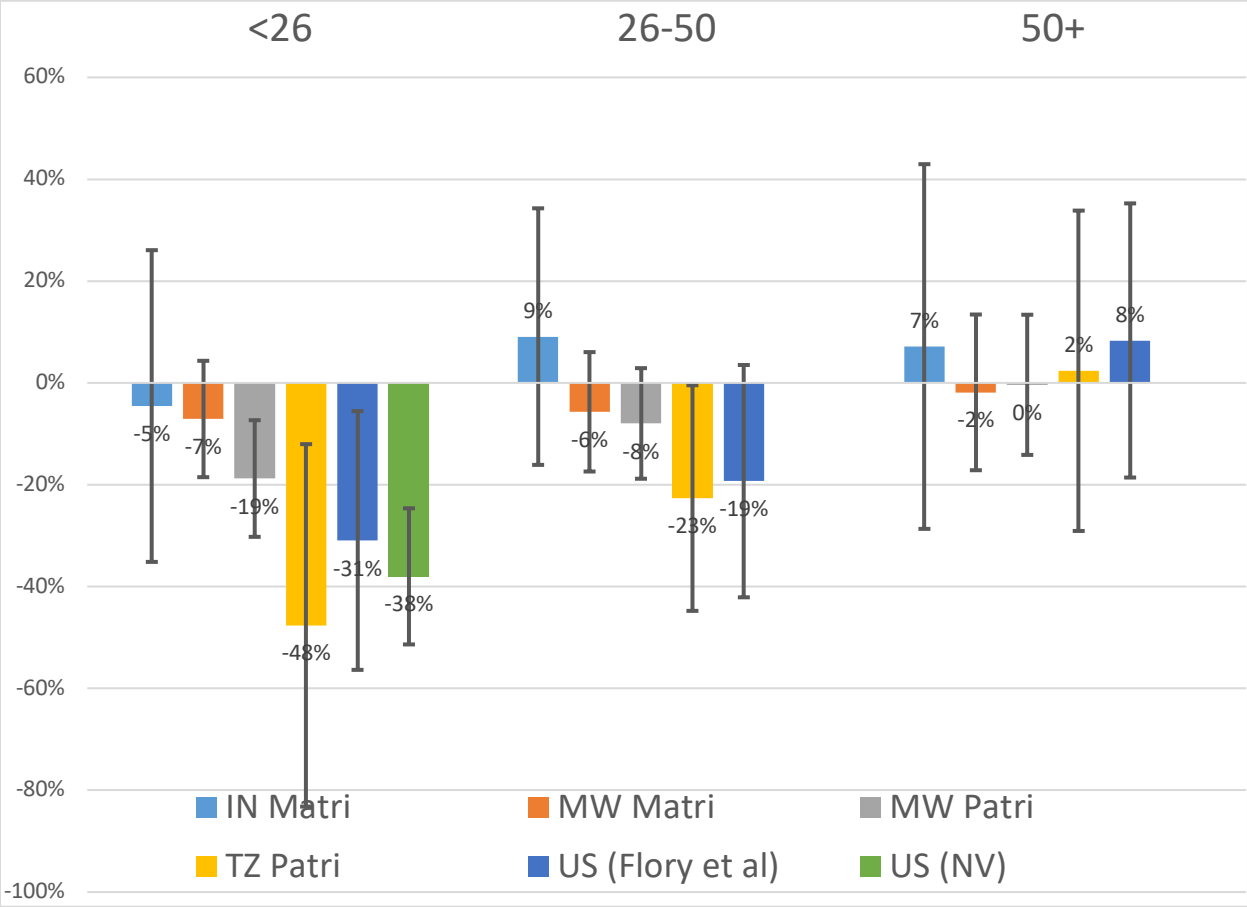


P-Values of Pairwise Comparisons within Communities

	15 to 49 w/o child over 7	adolescent	15 to 49 with child over 7	50 and older	men
			Matrilocal		
15 to 49 w/o child over 7		0.579	0.591	0.466	0.957
adolescent			0.971	0.746	0.667
15 to 49 with child over 7				0.781	0.675
50 and older					0.519
men					
			Patrilocal		
15 to 49 w/o child over 7		**0.021**	**0.034**	**0.045**	**0.005**
adolescent			0.668	0.666	0.633
15 to 49 with child over 7				0.983	0.960
50 and older					0.942
men					
			Patrilocal (columns) to Matrilocal (rows)		
15 to 49 w/o child over 7	**0.031**	0.479	0.783	0.814	0.682
adolescent	**0.012**	0.787	0.830	0.821	0.814
15 to 49 with child over 7	**0.019**	0.822	0.817	0.809	0.804
50 and older	**0.026**	0.951	0.638	0.637	0.605
men	**0.009**	0.537	0.903	0.931	0.771

Notes: The figure shows the proportion of women across four lifecycle categories and the average man within two types of communities. The sample includes all participants with available demographic information in villages for which key informant declaration of matrilocal and patrilocal customs matches the proportion of married women who reside in their natal community. The table shows the P-values for each pairwise comparison within and across communities.

Figure 3 The Gender Gap in Competitiveness by Ages and Across Multiple Types of Society



Notes: The graph examines data from communities in India and Tanzania (Gneezy et al., 2009), Malawi, a sample from the US (Flory et al., 2018) and college-aged women from the US (Niederle and Vesterlund, 2007). Except for the Niederle and Vesterlund (2007) study, we know the ages of each participant and can divide them into three separate groups: 18-25 26-50 and 50+. All participants in NV are assumed to fit in the 18-25 category. Each bar represents the within-society gender gap (each cohort compared to all men in that society) together with the 90% confidence interval.

VIII. Appendix

Robustness Tests and Additional Tables

Appendix Table 1 NV Coefficients for Tables 4 and 5

	(1)	(2)	(3)	(4)	(5)	(6)
Matrilocal effect	**0.648**	**0.652**	**0.623**	**0.699**	**0.713**	**0.698**
	(0.009)	(0.009)	(0.012)	(0.024)	(0.019)	(0.017)
Matri and adolescent	0.005	-0.040	-0.045	0.007	-0.067	-0.045
	(0.960)	(0.733)	(0.664)	(0.952)	(0.583)	(0.683)
Matri and 50 or older	-0.182	-0.221	-0.226	-0.102	-0.172	-0.155
	(0.321)	(0.253)	(0.212)	(0.716)	(0.571)	(0.587)
Patri and adolescent	**0.229**	**0.170**	**0.150**	**0.286**	**0.248**	**0.249**
	(0.001)	(0.019)	(0.074)	(0.000)	(0.000)	(0.000)
Patri and 50 or older	**0.277**	**0.224**	**0.197**	**0.335**	**0.299**	**0.298**
	(0.005)	(0.018)	(0.064)	(0.022)	(0.036)	(0.019)
Matri 15 to 49 with child over 7	-0.148	-0.062	-0.087	-0.046	0.108	0.025
	(0.277)	(0.662)	(0.557)	(0.680)	(0.255)	(0.852)
Patri 15 to 49 with child over 7	**0.242**	**0.371**	**0.291**	**0.230**	**0.294**	**0.266**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matri 15 to 49 with child		**-0.134**			**-0.218**	
		(0.090)			(0.009)	
Patri 15 to 49 with child		-0.192			-0.113	
		(0.130)			(0.376)	
Matri 15 to 49 and ever married			**-0.123**			-0.136
			(0.084)			(0.208)
Patri 15 to 49 and ever married			**-0.138**			-0.085
			(0.002)			(0.133)
Matri and tournament performance	-0.026	-0.027	-0.028	**-0.040**	**-0.042**	**-0.042**
	(0.155)	(0.161)	(0.148)	(0.049)	(0.052)	(0.053)
Matri and improvement	0.012	0.015	0.015	0.031	0.037	0.034
	(0.689)	(0.645)	(0.643)	(0.357)	(0.328)	(0.348)
Matri and submit piece rate to tournament	**0.458**	**0.465**	**0.458**	**0.469**	**0.481**	**0.470**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matri and guessed rank	**-0.063**	**-0.064**	**-0.060**	**-0.071**	**-0.069**	**-0.065**
	(0.003)	(0.005)	(0.006)	(0.004)	(0.009)	(0.013)
Patri and tournament performance	0.007	0.007	0.006	0.003	0.003	0.002
	(0.481)	(0.451)	(0.583)	(0.848)	(0.868)	(0.900)
Patri and improvement	0.014	0.016	0.015	0.024	0.024	0.025
	(0.414)	(0.365)	(0.363)	(0.407)	(0.420)	(0.377)
Patri and submit piece rate to tournament	**0.338**	**0.344**	**0.342**	**0.373**	**0.377**	**0.374**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Patri and guessed rank	**0.066**	**0.071**	**0.065**	0.046	0.047	0.046
	(0.071)	(0.055)	(0.069)	(0.381)	(0.368)	(0.380)
Observations	443	443	443	310	310	310
Clusters	16	16	16	11	11	11

Appendix Table 2 Village Classification and Marriage Customs

village	Key Inform.	Obs. Male	Obs. Female	Proportion living in natal village Male	Proportion living in natal village Female	p-value	classification 1	classification 2
1	M	21	21	0.81	0.90	0.663	M	--
2	M	7	11	0.14	0.82	0.013	M	M
3	M	16	16	0.50	0.94	0.015	M	M
4	M	12	28	0.33	0.71	0.037	M	M
5	M	21	25	0.24	0.76	0.001	M	M
6	M	18	24	0.72	0.67	0.748	M	--
7	P	19	16	0.89	0.31	0.001	P	P
8	P	18	16	0.78	0.56	0.274	P	--
9	P	8	16	0.75	0.31	0.082	P	P
10	P	18	18	1.00	0.22	0.000	P	P
11	P	29	19	0.69	0.63	0.759	P	--
12	P	24	25	0.96	0.68	0.023	P	P
Observations							446	280
Clusters							16	11

The table reports the proportion of men and women who are married and who still live in ther natal village compared and two types of classifications. The first classification takes, at face value, the declarations of key informants in the village about the customs of matrilocal and patrilocal marriage. The second definition examines, for matrilocal classification, whether it is more likely that a married woman is living in her natal village than a man and, for patrilocal classification, whether it is more likely that a married man is living in his natal village than a woman. The number of observations is the total number of married men and women interviewed in the detailed demographic survey, not the number of individuals who completed the competition experiment.

Appendix Table 3 Ethnic Groups and Marriage Customs

	Matri villages				Patri Villages			
	women		men		women		men	
Chewa	11	73%	4	50%	7	29%	2	100%
Lomwe	21	81%	24	38%	3	33%	8	75%
Manganja	11	64%	4	0%	25	56%	24	79%
Ngoni	7	86%	7	86%	7	14%	6	83%
Nyanja	19	74%	13	54%	1	0%		
Sena					41	61%	47	87%
Tumbuka			1	100%	16	38%	17	88%
Yao	51	82%	39	56%	1	0%	1	100%
missing/other	5	80%	3	33%	8	38%	11	82%
Total	125	78%	95	51%	109	48%	116	84%

The reports the number of men and women who report belonging to one of 8 ethnic groups within the collection of villages reported as being matrilocal and patrilocal. Missing includes multiple classifications, other smaller ethnic groups and no response. In addition, the table reports the proportion of married individuals who report residing in their natal village. For example, 11 women in matri villages and 7 women in patri villages are ethnically Chewa; 73% of the women who live in matrilocal villages were born in that village but only 29% of women who live in patrilocal villages were born in that village.

Appendix Table 4 Alternative Specifications for Children Surviving the Vulnerable Period

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Matrilocal effect	**0.499**	**0.571**	**0.566**	**0.589**	**0.594**	**0.598**	**0.615**	**0.620**	**0.648**	**0.565**
	(0.070)	(0.033)	(0.032)	(0.029)	(0.027)	(0.025)	(0.016)	(0.014)	(0.009)	(0.034)
Age and status categories										
Matri and adolescent	-0.037	-0.051	-0.031	-0.027	-0.021	-0.008	-0.019	-0.008	0.005	0.015
	(0.715)	(0.653)	(0.779)	(0.813)	(0.855)	(0.946)	(0.866)	(0.943)	(0.960)	(0.893)
Matri and 50 or older	-0.212	-0.230	-0.209	-0.207	-0.203	-0.190	-0.205	-0.196	-0.182	-0.171
	(0.252)	(0.234)	(0.255)	(0.265)	(0.227)	(0.289)	(0.254)	(0.284)	(0.321)	(0.358)
Patri and adolescent	0.123	**0.173**	**0.180**	**0.197**	**0.202**	**0.215**	**0.210**	**0.214**	**0.229**	**0.184**
	(0.156)	(0.010)	(0.008)	(0.004)	(0.003)	(0.004)	(0.006)	(0.003)	(0.001)	(0.006)
Patri and 50 or older	0.128	**0.187**	**0.198**	**0.221**	**0.228**	**0.244**	**0.243**	**0.250**	**0.277**	**0.216**
	(0.268)	(0.051)	(0.036)	(0.034)	(0.034)	(0.020)	(0.019)	(0.013)	(0.005)	(0.038)
Matri 15 to 49 and ever married	**-0.163**									
	(0.018)									
Patri 15 to 49 and ever married	-0.007									
	(0.902)									
Age Cutoff		0	1	2	3	4	5	6	7	8
Matri 15 to 49 with child over [#]		**-0.195**	-0.170	-0.164	-0.160	-0.147	-0.188	-0.173	-0.148	0.003
		(0.028)	(0.113)	(0.130)	(0.192)	(0.264)	(0.114)	(0.181)	(0.277)	(0.736)
Patri 15 to 49 with child over [#]		0.076	0.092	0.128	**0.143**	**0.172**	**0.172**	**0.195**	**0.242**	**0.010**
		(0.386)	(0.317)	(0.103)	(0.082)	(0.058)	(0.011)	(0.001)	(0.000)	(0.614)
Observations	443	443	443	443	443	443	443	443	443	443
Clusters	16	16	16	16	16	16	16	16	16	16
P-value of the test for equality of the coefficients across matri and patri										
Adolescent	0.233	**0.091**	0.108	**0.095**	**0.094**	0.101	**0.088**	**0.087**	**0.088**	0.185
50 and older	0.123	**0.059**	**0.055**	**0.049**	**0.034**	**0.040**	**0.035**	**0.037**	**0.031**	**0.075**
marriage, child and child age	**0.071**	**0.028**	**0.063**	**0.030**	**0.042**	**0.048**	**0.009**	**0.011**	**0.008**	**0.031**

Notes: The dependent variable is the choice to compete in Round 3. The regressions show the model from Column 4 of Table 4, with NV coefficients included as controls. The main results from Table 3 (women who have a child over the age of 7) is shown in Column 9 and replaced with ever married and child ages from 0 to 8 in the other columns.

Appendix Table 5 Alternative Specifications with Age

	(1)	(2)	(3)	(4)	(5)	(6)
Matrilocal effect	0.135	**0.600**	**0.295**	**0.653**	**0.885**	**0.761**
	(0.334)	(0.040)	(0.099)	(0.065)	(0.022)	(0.030)
Age and status categories						
Matri and adolescent	0.018	-0.045	-0.098	-0.073	-0.127	-0.199
	(0.816)	(0.603)	(0.500)	(0.544)	(0.351)	(0.307)
Matri and 50 or older	0.185	0.226	-0.160	0.207	0.242	-0.342
	(0.433)	(0.381)	(0.406)	(0.384)	(0.312)	(0.183)
Patri and adolescent	**0.162**	**0.250**	0.193	**0.167**	**0.258**	**0.192**
	(0.068)	(0.029)	(0.175)	(0.035)	(0.007)	(0.142)
Patri and 50 or older	**0.403**	**0.397**	0.171	**0.505**	**0.502**	**0.238**
	(0.027)	(0.006)	(0.190)	(0.022)	(0.007)	(0.088)
Matri 15 to 49 with child over 7	0.002	0.079	0.046	-0.014	0.058	0.006
	(0.985)	(0.685)	(0.817)	(0.927)	(0.788)	(0.978)
Patri 15 to 49 with child over 7	**0.298**	**0.215**	**0.242**	**0.317**	**0.230**	**0.260**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Matri Age	-0.005	-0.018		-0.010	-0.022	
	(0.273)	(0.286)		(0.107)	(0.211)	
Patri Age	-0.006	0.015		-0.008	0.014	
	(0.166)	(0.166)		(0.143)	(0.210)	
Matri Age^2		0.000			0.000	
		(0.410)			(0.475)	
Patri Age^2		**-0.000**			**-0.000**	
		(0.020)			(0.011)	
Matri Age 15 to 49			-0.008			-0.011
			(0.320)			(0.179)
Patri Age 15 to 49			-0.001			-0.002
			(0.863)			(0.746)
Included NV controls	no	no	no	yes	yes	yes
Observations	444	444	444	443	443	443
Clusters	16	16	16	16	16	16
P-value of the test for equality of coefficients across matri and patri						
Adolescent	0.224	**0.040**	0.154	**0.098**	**0.022**	**0.100**
50 and older	0.415	0.510	0.159	0.278	0.296	**0.057**
Has children over 7	**0.025**	0.497	0.342	**0.044**	0.437	0.245

Notes: The dependent variable is the choice to enter and perform under competition in round 3. The coefficients are marginal effects from a probit regression with p-values from errors clustered at the village-visit level reported in parentheses. The sample includes all female participants with available demographic information.

Appendix Table 6 Male Competitiveness across Similar Life Stages

	(1)	(2)	(3)	(4)
Matrilocal effect	-0.124	-0.115	-0.131	-0.138
	(0.184)	(0.758)	(0.288)	(0.633)
Age and status categories				
Matri and adolescent	0.079	0.223	0.098	0.167
	(0.290)	(0.123)	(0.304)	(0.273)
Matri and 50 or older	0.052	0.114	0.090	-0.060
	(0.547)	(0.346)	(0.380)	(0.685)
Patri and adolescent	-0.073	-0.067	-0.061	-0.035
	(0.283)	(0.595)	(0.499)	(0.728)
Patri and 50 or older	**-0.117**	-0.189	**-0.150**	**-0.322**
	(0.082)	(0.254)	(0.022)	(0.000)
Matri 15 to 49 with child over 7	-0.035	-0.018	-0.100	**-0.155**
	(0.521)	(0.818)	(0.239)	(0.002)
Patri 15 to 49 with child over 7	-0.088	-0.106	**-0.234**	**-0.326**
	(0.557)	(0.543)	(0.046)	(0.000)
Included NV controls	no	yes	no	yes
Observations	420	420	296	296
Clusters	16	16	11	11
P-value of the test for equality of coefficients across matri and patri				
Adolescent	0.133	0.128	0.226	0.268
50 and older	0.121	0.140	**0.046**	**0.056**
Has children over 7	0.739	0.643	0.324	**0.067**

Notes: The dependent variable is the choice to compete in round 3. The coefficients are marginal effects from a probit regression. The sample includes all male participants from matrilocal and patrilocal society. P-values are in parentheses. For columns 1 and 2, matrilocal and patrilocal communities are defined following the declaration of key informants in each community. For columns 3 and 4, the sample includes all female participants with available demographic information in villages for which key informant declaration of matrilocal and patrilocal customs matches the proportion of married women who reside in their natal community.

Appendix Table 7 Alternative Cluster Specifications

	(1)	(2)	(3)	(4)
Matrilocal effect	**0.165**	**0.159**	**0.648**	**0.619**
	(0.036)	(0.046)	(0.004)	(0.030)
Age and Status Categories				
Matri and adolescent	0.053	0.054	0.005	0.005
	(0.543)	(0.631)	(0.954)	(0.999)
Matri and 50 or older	-0.015	-0.015	-0.182	-0.153
	(0.878)	(0.941)	(0.135)	(0.461)
Patri and adolescent	**0.209**	**0.203**	**0.229**	**0.196**
	(0.040)	(0.047)	(0.032)	(0.055)
Patri and 50 or older	**0.188**	**0.180**	**0.277**	**0.240**
	(0.051)	(0.065)	(0.017)	(0.019)
Matri ages 15 to 49 with child over 7	-0.067	-0.068	-0.148	-0.123
	(0.425)	(0.633)	(0.116)	(0.393)
Patri ages 15 to 49 with child over 7	**0.233**	**0.227**	**0.242**	**0.208**
	(0.008)	(0.013)	(0.012)	(0.031)
NV Controls				
Matri and tournament performance			-0.026	-0.021
			(0.120)	(0.247)
Matri and improvement			0.012	0.010
			(0.692)	(0.805)
Matri and submit piece rate to tournament			**0.458**	**0.446**
			(0.000)	(0.003)
Matri and guessed rank			**-0.063**	**-0.051**
			(0.076)	(0.073)
Patri and tournament performance			0.007	0.006
			(0.648)	(0.481)
Patri and improvement			0.014	0.012
			(0.635)	(0.427)
Patri and submit piece rate to tournament			**0.338**	**0.319**
			(0.000)	(0.003)
Patri and guessed rank			**0.066**	0.057
			(0.071)	(0.169)
Constant		**0.297**		**-0.045**
		(0.030)		(0.002)
Observations	444	444	443	443
Clusters	0	16	0	16

Columns 1 through 4 show the same model and specification as Columns 1 and 4 ofTable 4. Columns 1 and 3 show regression results without clustering and columns 2 and 4 show regression results using Wild Bootstrapped Clustering.

Appendix Table 8 The Choice to Submit Previous Performance to Tournament Incentives

	(1)	(2)
Matrilocal effect	-0.031	0.026
	(0.694)	(0.791)
Age and status categories		
Matri and adolescent	0.109	0.094
	(0.160)	(0.253)
Matri and 50 or older	**0.185**	0.084
	(0.063)	(0.630)
Patri and adolescent	0.012	0.110
	(0.881)	(0.147)
Patri and 50 or older	-0.070	0.009
	(0.409)	(0.959)
Matri 15 to 49 with child over 7	0.080	0.126
	(0.290)	(0.196)
Patri 15 to 49 with child over 7	**0.141**	0.150
	(0.027)	(0.147)
Observations	444	310
Clusters	16	11
Omitted category average*	0.432	0.432
P-value of the test for equality of coefficients across matri and patri		
Adolescent	0.387	0.887
50 and older	**0.051**	0.233
Has children over 7	0.534	0.868

Notes: The dependent variable is the choice to submit round 1 performance to tournament incentives in round 4. The coefficients are marginal effects from a probit regression with the female interaction terms shown as the difference from the male coefficient. P-values are in parentheses.
The sample includes all female participants with available demographic information. For Column 1, matrilocal and patrilocal communities are defined following the declaration of key informants in each community. For Column 2, the sample includes all female participants with available demographic information in villages for which key informant declaration of matrilocal and patrilocal customs matches the proportion of married women who reside in their natal community.

Experimental protocol and Instructions

The real effort task that we use was specifically designed to involve a simple cognitive exercise with very low education requirements to participate – arranging shapes in a row from smallest to largest. Each participant has a set of 6 blocks, shown in the figure below. Each side of a given block has one of 6 shapes. The task is to arrange all six blocks such that a given shape (e.g., star) appears facing up, and to align the 6 versions of that shape (e.g., all 6 stars) in order from smallest to largest (i.e., the bottom row shown in the figure). Upon completing one shape, the participant moves to the next shape. All participants work with identical blocks and face the same order of shapes to complete.

Figure 4 The real effort task, incomplete (top) and complete (bottom)

All sessions were conducted in a room large enough to hold all participants, similar in size to standard experimental labs in the US. Since many adults are illiterate in rural Malawi, a script reader read the instructions aloud; the script-reader was the only person who spoke to the participants in the session. Facilitators demonstrated how to perform the task, kept track of participants' number of successes in each round, and recorded participants' choices. Each session lasted about an hour, and included on average, 16 participants equally balanced between men and

women. Multiple sessions were completed in each village, with participants who had completed the experiment isolated from participants who had not yet begun the experiment. As in NV, participants are told that they will be paid for one of the four rounds, selected at random.

Instructions

These instructions were translated into Chichewa for use in Malawi, where X was 50 kwacha and used in English in the US. Amounts for the US: X = $1, Y = $0.50. Amounts for Malawi: X = 50 kwacha (approximately $.33), Y = 20 kwacha (approximately $.13). The show-up fee was divided into two payments of $5 and two payments of 80 kwacha (approximately $0.52)

Welcome

In the study today, we will ask you to complete a simple task in four different rounds. None of these rounds will take more than 5 minutes. Because we are not simply asking you questions, but asking you to perform a task, we will pay you for your work. You will receive {amount} at the beginning and at the end you will receive {amount} for having completed the four rounds. In addition, you can earn more money based on your performance in one of the four rounds.

To participate in this study, you must be at least 18 years old and you must agree to participate in the study, or you must have the permission of your parent or guardian.

We will now give you some information about the study today. In each round, we will ask you to do something that can earn you money. When you are done here, you go to the cashier, he will put four cards into a bag, and you will pick one of these cards from the bag without seeing the cards. These are the four cards; this one is for the first round; this one is for the second round; this one is for the third round and this one is for the fourth round [*speaker places cards in bag*]. You will be allowed to pick one just as this man is going to show you right now. He cannot see which card he will pick, but we are not choosing the card. You will receive money according to how well you have done for the round that you pick from the bag without seeing. We will explain to you exactly how you can earn money in each round. Some people will only earn the show-up fee today. Others will earn more. But everyone who begins will earn {*amount*} and everyone who finishes will earn {*amount*} again.

This is the payment desk [*speaker points*]. When you are finished with the tasks, please go here to answer some questions that we will ask, and after that, please come here to receive your payment.

Explanation and practice round

Welcome to this study. Now your helper will give you the {*amount*} that we promised to give to you at the beginning of the study. Today we will ask you to perform tasks and make decisions. If you listen carefully, you can earn a large amount of money. So, pay close attention to the instructions, and ask questions if you do not understand, because it may affect how much money you earn.

Please do not talk with one another at any time during this study. I am happy to answer any questions you have at any time. But please direct your questions only to me. The person sitting in front of you is here to help show you the task, and to record the decisions that you make. They are not allowed to help you make decisions; please do not ask them for help with the decisions we ask you to make.

You see the blocks that are in front of you. Please look at them and see the shapes and colors on each of the blocks. Take one of the blocks and show your helper each of the shapes on the block as he points to it on the paper in front of you. Every shape shown on the paper is shown on each of the blocks. The task we will ask you to perform today is to arrange the shapes in order from smallest to largest. The person helping you will now demonstrate for you how to complete the task. First, your helper will show you how to find all of the circles. When all of the circles are facing up, he or she will put them in order from the smallest circle to the largest circle. The circles are now finished, and they are finished correctly. The task is complete.

We will now ask *you* to practice doing the task one time. Your helper will now turn your card to the next shape, which is a square. We want you to perform the task for the squares. When you think you are finished, look at your helper for confirmation. If you have completed the task correctly, your helper will nod his head. If you are incorrect, he will shake his head, and you must continue until the squares are arranged from smallest to largest.

The way you are paid for this task will change each round. So, pay close attention to these rules each round and be sure you understand them, because they will affect how much money you can earn in that round. For each round, we will explain the rules, before we ask you to begin. Please do not begin until we tell you to.

We will ask you to perform this task as many times as you can within 3 minutes. As soon as you finish arranging the blocks for one shape, look to your helper and he or she will indicate to you whether you may move to the next shape. If he nods his head, then turn the paper in front of you to show the next shape and then begin the next shape. If your facilitator shakes his head this means you have not correctly completed the task and you need to keep trying. You have 3 minutes to complete as many shapes as possible. The number of tasks that you complete is recorded on the paper, but we will never tell anyone else how you have done.

Does anyone have any questions about how to perform the task?

Round One: Individual Performance.

We will now begin round one. Before we begin, we will explain how you will be paid for the tasks this round: If Round 1 is the task that you draw from the bag at the end, then you get $\{X\}$ for each shape you successfully complete. For example, if you complete one set of shapes you receive $\{X\}$; if you complete two sets of shapes you receive $\{2X\}$; if you complete three sets of shapes you receive $\{3X\}$; if you complete four sets of shapes you receive $\{4X\}$, and so on for as many shapes as you complete. We call this **individual performance**. This is represented by the single person standing alone in the picture in front of you.

Please do not talk during the task or after you have finished. This is very important. If you have any questions, please raise your hand and ask me now. Once we begin, you cannot ask any questions. Do you have any questions before we begin?

Are the facilitators ready? *[When ready:]* Okay, go. *[When time is up:]* Okay, everyone please stop now.

Round Two: Compared Performance.

Now we will move to the second round. For this round, the task is exactly the same. However, the way you are paid is now different. In this round, your payment depends on your performance compared to a group of other participants. Each group consists of four people. The three other members of your group come from other participants. Your group members may be in this room right now, but they may not be. You will never know the names of the other people in your group and they will never know your name. The person sitting next to you is <u>not</u> in your group. Do you have any questions about who is in your group? If you have a question, please raise your hand and ask me now.

We will now explain how your payment is determined in this round. If round 2 is the task that you draw from the bag at the end, then your earnings depend on your number of successes compared to the three other people in your group. If you complete the most shapes in 3 minutes out of anyone in your group, you receive {*4X*} for each set you complete. But if someone else in your group completes the most shapes, you receive nothing.

One times {*4X*} is {*4X*}. Two times {*4X*} is {*8X*}. Three times {*4X*} is {*12X*}. Four times {*4X*} is {*16X*}. And so on. We call this **compared performance.** This is represented by the group of 4 people standing together in the picture in front of you. You will not know how you did in the compared performance until the end of today's activity when you receive your earnings.

Please do not talk during the task or after you have finished. This is very important. If you have any questions, please raise your hand, and ask me now. Once we begin, you cannot ask any questions. Do you have any questions before we begin?

Are the facilitators ready? *[When ready:]* Okay, go. *[When time is up:]* Okay, everyone please stop now.

Round Three: Choice of Payment Scheme Before Doing Task.

Now we will move to the third round. The task in this round is exactly the same, but now you can choose which way you want to be paid. If round 3 is the one that you draw from the bag, then your earnings for this task are determined as follows. If you choose **individual performance**, you receive {*X*} per success and you will not be compared to anyone else.

If you choose **compared performance** your payment for this round is similar to the payment in round two. The only difference is that your performance in this round is compared to the performance of the other three members of your group <u>for round 2</u>, the one we just finished, instead of being compared to their performance this round. If you complete the task more times than the other people in your group did for round 2, then you will receive four times the payment from the individual performance, which is {*4X*} per success. You will receive no earnings for this round if you choose compared performance and you do not complete more sets of shapes than the other people in your group did for round 2.

Notice that this round is a little different than last round because nothing you do in this round can affect the earnings of other people in your group, and nothing that other people in your group do this round can affect your earnings from this round.

You will not know how you did in the compared performance until the end of today's activity, when you receive your earnings. Do you have any questions? If you have any questions, please ask me now.

Please do not talk as you are making your decision. If you would like to choose individual performance, please point to the picture of one person. If you would like to choose compared performance, please point to the picture of the group.

Please do not talk during the task or after you have finished. Are the facilitators ready? *[When ready:]* Okay, go. *[When time is up:]* Okay, everyone please stop now.

Round Four: Choose Scheme for Past Performance

For this new round, you do not have to do any tasks. Instead, you may be paid one more time for how you did in the first round of the experiment. Now we are going to ask you how you would like to be paid for the tasks that you completed in the first round. You can choose to be paid for your individual performance or compared performance.

If the fourth round is the one selected for payment, then your earnings for this round are determined like this. If you choose *individual performance,* you receive {*X*} per success you had in round 1. If you choose *compared performance,* your performance will be compared to the performance of the other three members of your group in the first round. If you completed the task more times in round 1 than they did in round 1, then you receive four times the earnings of the individual performance choice, which is {*4X*} per success. If you choose compared performance and you did not complete the task more times than others did in round 1 you will receive no earnings for this round. Do you have any questions? If you have any questions, please ask me now.

Please do not talk as you are making your decision. Now your helper will show you how many times you successfully completed the sets of shapes in the first round. Now your helper will show you a picture. If you would like to choose individual performance, please point to the picture of the one person. If you would like to choose compared performance, please point to the picture of the group.

Belief-Assessment Questions:

We will now ask you how you think you performed in the tasks, compared to the 3 other people in the group we assigned you to, for the first two rounds. You will earn *{Y}* for each correct guess. Please look at the picture of the four people. The highest person completed the

most sets of shapes in your group; he is first in the group. The next person completed the second-most sets of shapes in your group; he is second. The next person completed the third-most sets of shapes; he is third. The final person completed the least sets of shapes in your group; he is fourth.

We will first ask you how you think you performed in Round 1, the ***individual performance***. If you are correct, you will be paid an additional *{Y}* when we pay you your earnings. Before we ask you, do you have any questions? If you have any questions, please ask me now.

Please do not talk as you are making your decision. Now please, silently, show your helper how you think you performed in Round 1, the ***individual performance,*** compared to the other people in your group, by pointing to the position in the picture. Do you think you were the best? Do you think you were the second-best? Do you think you were third best? Or, do you think you were last?

We will now ask you how you think you performed in Round 2, the ***compared performance***. If you are correct, you will be paid an additional *{Y}* when we pay you your earnings.

Please do not talk as you are making your decision. Now please silently show your helper how you think you performed in Round 2, the ***compared performance,*** compared to the other people in your group, by pointing to the position in the picture. Do you think you were the best? Do you think you were the second-best? Do you think you were third best? Or, do you think you were last?

Thank you very much for your participation today. You can go now. Please go to there to answer some questions for our study.