Market Exposure Makes Smallholders More Competitive and Closes the Gender Gap

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PRELIMINARY DRAFT – PLEASE DO NOT CITE WITHOUT PERMISSION

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Abstract

Our investigation concentrates on the encounter of two economic and farming systems which are at the extremes along the dimension of market exposure: peasant, communal subsistence farming on the one hand and large-scale, capital-intense and profit-oriented farming by the global agricultural industry on the other hand. To this end, we conduct our investigation in Zambia – a popular destination for large-scale agricultural investors. Our investigation takes advantage of spatial differences in market exposure of rural and remote villages. Based on competition decisions of 935 adults and 401 children, we find that living in the proximity of large-scale agricultural investment sites makes smallholders more competitive. This effect is particularly strong for females and achieves closing of the gender gap in competitiveness in the villages with market exposure. A second driver of competitiveness is market integration of smallholders by selling their produce at markets. We regard our findings as highly important for the understanding of what societal arrangements influence individuals' preferences. As policy makers in developing countries are able to steer market exposure through the settlement of large-scale investments, our findings hold important policy implications.

Keywords: competitiveness; agricultural investment; endogenous preferences; field experiment; smallholders; Zambia

JEL codes: O13; O15; P11; P14; Q15

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1 Introduction

Competitiveness is a key component for success in modern market economies. Firms compete for customers, employees compete for positions and bonuses, politicians compete for voters, and students compete for university placements, grades and awards. The origins of individual competitiveness have been of great interest for economists in recent years. The literature shows that differences in competitiveness already exist among children and depend on parental backgrounds and attitudes (Almas et al., 2015; Deckers et al., 2015; Khadjavi and Nicklisch, 2015). Beyond parental influences, behavioral economic research suggests that societal arrangements influence individuals' preferences for competition, especially gender differences (Andersen et al., 2013; Buser et al., 2014; Croson and Gneezy, 2009; Niederle and Vesterlund, 2007; Gneezy et al., 2003; Gneezy et al., 2009; Leibbrandt et al., 2013; Sutter and Glätzle-Rützler, 2015).

Most changes in societal arrangements, like the extent of gender equality and market integration, happen endogenously over a long time horizon. This feature makes it hard to identify causal effects of societal arrangements on its members' preferences. For instance, Henrich et al. (2001, 2004, 2010) provide compelling evidence that market exposure correlates with pro-social behavior in small-scale societies. Likewise, Gneezy et al. (2009) and Andersen et al. (2013) provide evidence on differences in competitiveness in matrilineal and patriarchal societies. Leibbrandt et al. (2013) show how work arrangements based on natural circumstances influence competitiveness. All of the previous findings on competitiveness yield valuable insights into the emergence and endogeneity of competitiveness preferences through differences in long-term societal arrangements (Bowles, 1998).

The aim of this study is to complement findings of mostly long-term effects in the literature towards short-term effects. The reason is that such short-term effects are more likely to provide causal evidence. To this end, we take advantage of a comparatively short-term, exogenous change in a societal arrangement of rural communities in many developing countries in the last years: rapid market exposure through the arrival of large-scale agricultural investments. Following steeply increasing nominal and real world food prices from 2000 to 2015 (FAO, 2017), there have been more than 1000 large-scale agricultural investments in developing countries, mostly in land-abundant rural areas (Deininger et al., 2011; Harding et al., 2016). The associated total area is larger than 40 million hectares (an area greater than the size of Germany).

These large-scale agricultural investments are profit-oriented, capital-intense and mostly steered by international agricultural firms. In rural areas of developing countries, like our study country Zambia, they arrive next door to communities of smallholders who engage in subsistence farming. This situation mirrors the encounter of two classic antithetical paradigms of rural farming and development, where the smallholders represent a classic communal peasant economy and the agricultural firm represents the modern market economy (Timmer, 1997).

In this study we use experimental economic methods to study competitiveness, using the competition game of Gneezy et al. (2009). We measure competitiveness of randomly selected smallholders in the proximity of investment sites and compare them to similar smallholders at a distance to the investment sites. Overall, our dataset consists of 935 adults and 401 children who were randomly selected to participate in our study. Our central hypothesis is that exogenous market exposure increases competitiveness.

Our results confirm our hypothesis. Smallholders living in the proximity of large-scale agricultural investments opt into competition more frequently than those living in the same region, but not in the direct proximity of the investment sites. The results are similar and statistically significant for adults and children. Interestingly, the treatment effects in both groups are especially pronounced for female subjects – to the extent that the gender gap in competitiveness is closed in communities with market exposure – both for adults and children. Our findings suggest positive externalities from market exposure and complement our findings on social capital in a companion paper (Khadjavi et al., 2016).

2 Methods

In order to assess the impact of market exposure on competitiveness, we employed an artefactual field experiment (also often referred to as lab-in-the-field experiment). Using the incentivized competition game of Gneezy et al. (2009), we elicited participants' preferences for competitiveness. In the game we asked each participant to throw 10 tennis balls into a bucket at a 3 meter distance. Each participant had to decide between two options: Option A and Option B.

Option A meant that the participant earned 5 Zambian Kwacha (approx. $0.50 at the time of the study) for each successful throw into the bucket. That is, Option A's payment was a piece rate and independent of other participants' success.

Option B paid 15 Zambian Kwacha (approx. $1.50) for each successful throw (the threefold amount of Option A) to the participant, but only if the participant scored more tennis balls into the bucket than a randomly matched, anonymous other participant from the same village. That is, Option B's payment was a combination of a piece rate and a competition. If a participant scored fewer balls into the bucket than the other participant, then she/he received no money in the game under Option B. In case of equal scores, Option B yielded 5 Zambian Kwacha for each successful throw (just like Option A).[1]

In August and September 2015 we visited 29 randomly selected villages in Zambia's Central Province. The villages belong to two village groups: 13 *_near* villages are within a 15 kilometer radius of large-scale investment sites and 16 *_further* villages are at a 50 to 70 kilometer distance from the sites.[2] The random selection was done using village lists provided by the Zambian Central Statistical Office, Lusaka. We employed a number of measures to rule out confounds of our findings and to make causality likely. For instance, we conducted interviews with the farm owners and the Zambian Development Agency to ensure that villagers' preferences did not play a role in the settlement of the investors, keeping road access comparable, collecting and comparing nine markers for soil quality across village groups. We did not find that the proximate smallholders' competitiveness was among the selection criteria for the large scale farm acquisitions. Further, we did not find any differences between any of the nine soil measures and most observables from survey responses.[3]

Overall, 935 adult smallholders and 401 children participated in our competition game. The incentive structure for children was the same, except that they earned 1 (Option A) or 3

[1] Appendix B contains the instructions of our study.

[2] The *_near* radius was calibrated to ensure frequent and daily interaction between the *_near* villages and the large-scale investment site, while the *_further* radius was determined in a way that we have a control group which is too far away from the site to rule out interaction with the site, while remaining as close as possible and in the same district.

[3] Table A.1 in Appendix A provides an overview of the balance of independent variables across village groups. Overall, the two groups exhibit only very few differences. That is, participants in *_near* villages are younger (mean age 35 years compared to 41 years in *_further* villages), more participants in *_near* villages have ever worked on a large-scale farm (52% vs. 24%) and fewer participants in *_near* villages (71% vs. 84%) are pure self-subsistence smallholders without any monetary income. All of these differences are obvious effects from the investment sites. Our companion paper discusses and rules out a number of confounding factors in detail (Khadjavi et al., 2016).

marbles (Option B, if own_score > other_score) for each scored tennis ball. Marbles themselves are commonly used for games by children in Zambia (for instance *nsolo*). After receiving their earnings, the children were also informed that they may exchange marbles for other toys and school stationary (at exchange rates mirroring market prices).

Two advantages of the tasks are that it is easy to understand, even for illiterate participants, and that it does not require prior skills (Gneezy et al., 2009).[4] In each village there were two groups which were spatially separated. The procedure was such that each participant threw the ten tennis balls in strictly enforced privacy. Only a research assistant was presented who noted the competition decisions and the scores. After a participant made her decision and threw the tennis balls, she walked to a separate, spatially separated waiting area. These measures ensured that neither the two groups nor participants within each group could communicate about the decisions and scores. Our hypothesis is that exogenous market exposure positively affects competitiveness.

3 Results

We split this section into two parts. First, we report results of the competition game for the adults in our main study. Second, we also report results of the same game played by 5 to 15 year olds in a subset of villages.

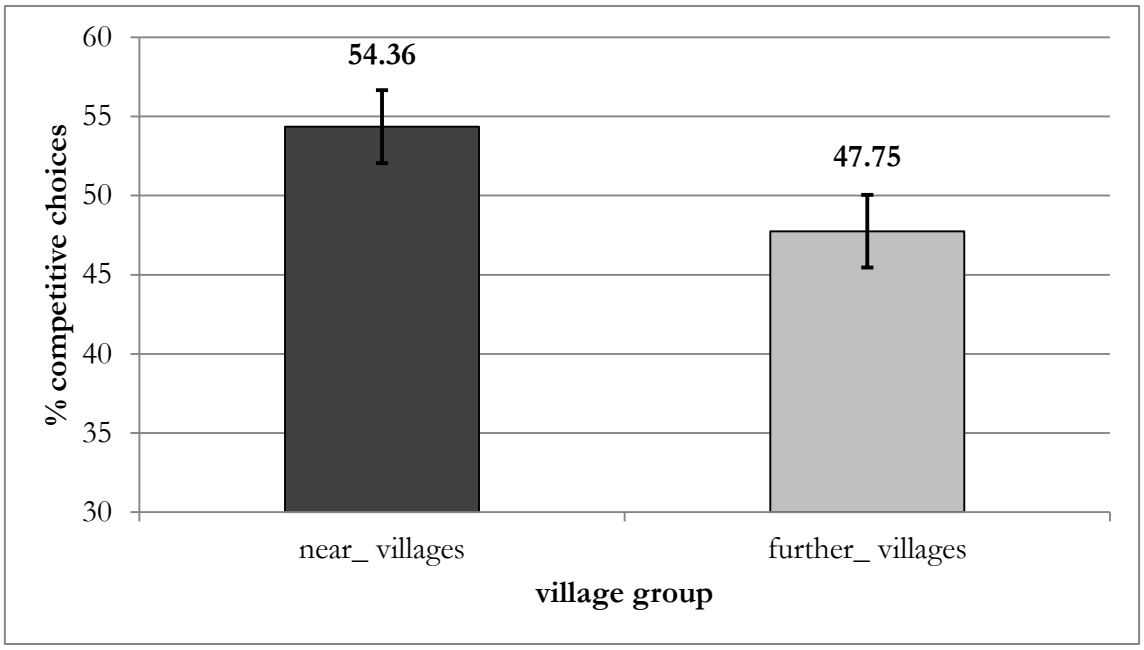
3.1 Adults

We indeed find that participants in *_near* villages are more likely to choose competition (54.36%) compared to participants in *_further* villages (47.75%). This increase of about 14% is statistically significant based on a (two-sided) chi-squared test ($p < 0.05$). Note also that the share of competitive choices in *_near* villages is greater than chance (binomial test, $p < 0.05$). Figure 1 depicts this result.[5]

[4] The game was the third and last task, after a sequential prisoner's dilemma to measure social capital and a deception game. Khadjavi et al. (2016) provide further information on the results on social capital.

[5] See Figure A.2 in Appendix A for histograms of competition game scores in our two village groups. A Kolmogorov-Smirnov test cannot reject the null hypothesis of equal distributions in the two village groups ($p > 0.2$).

Figure 1. Competitive choices of adults by village group.



This first glance at the competition decision therefore supports our main hypothesis that market exposure fosters competitiveness. Given the rich field environment of our study, we need to investigate whether this first-glance result is robust when controlling for socio-economic observables. Besides natural control variables like gender, age and occupation, we are especially interested in market integration. For this purpose we asked participants about their crops and whether they sell part of their crops on markets. Table 1 provides the results of three Logit estimates.

We find the result of greater competitiveness in *_near* villages to be robust in different estimation specifications (estimates I to III). Further, we find that smallholders who sell crops on markets are significantly more competitive than pure subsistence smallholders. Note that the village groups do not differ in the amount of smallholders who sell crops (see Table A.1 in Appendix A). No other control variable significantly correlates with competitiveness, except for two principal components of crops in estimation III[6]. Interestingly, the two channels of market integration and exposure, (1) the effect of living close to large-scale agricultural investments and (2) selling crops on markets, affect competitiveness jointly. We therefore find clear evidence that endogenous market

[6] Here we do not control for 'crop sale'. We find that 'crop sale' significantly correlates with so-called cash crops.

integration (the decision to sell crops on markets) and exogenous market exposure (the settlement of agricultural investments next door) increase competitiveness.

Table 1. Regression analysis of competitive choices of adults.

Independent Variable	**I** **Logit regression** **Dependent variable: Competitive choice (1 = yes)**	**II** **Logit regression** **Dependent variable: Competitive choice (1 = yes)**	**III** **Logit regression** **Dependent variable: Competitive choice (1 = yes)**
_near villages (dummy, 1 = yes)	0.093** (0.042)	0.094** (0.040)	0.086** (0.042)
Crop sale (dummy, 1 = yes)	0.124** (0.051)	0.122** (0.050)	
Male (dummy, 1 = yes)		0.031 (0.044)	0.029 (0.056)
Household Head (dummy, 1 = yes)		0.025 (0.045)	0.023 (0.048)
Age in years (continuous)		-0.000 (0.001)	-0.000 (0.002)
Number of ethnic groups (continuous)		-0.005 (0.007)	-0.001 (0.007)
Education in years (continuous)			0.001 (0.007)
Worked on large-scale farm (dummy, 1 =yes)			0.017 (0.041)
Migrant (dummy, 1 = yes)			-0.035 (0.040)
Assets Principal components (eigenvalues > 1)	*No*	*No*	*Yes, for all p > 0.1*
Grown crops Principal components (eigenvalues > 1)	*No*	*No*	*Yes* *(two out of three components are positively correlated with competitiveness, p < 0.05)*
Constant	-0.498** (0.194)	-0.387 (0.352)	0.011 (0.444)
Observations	842	832	805

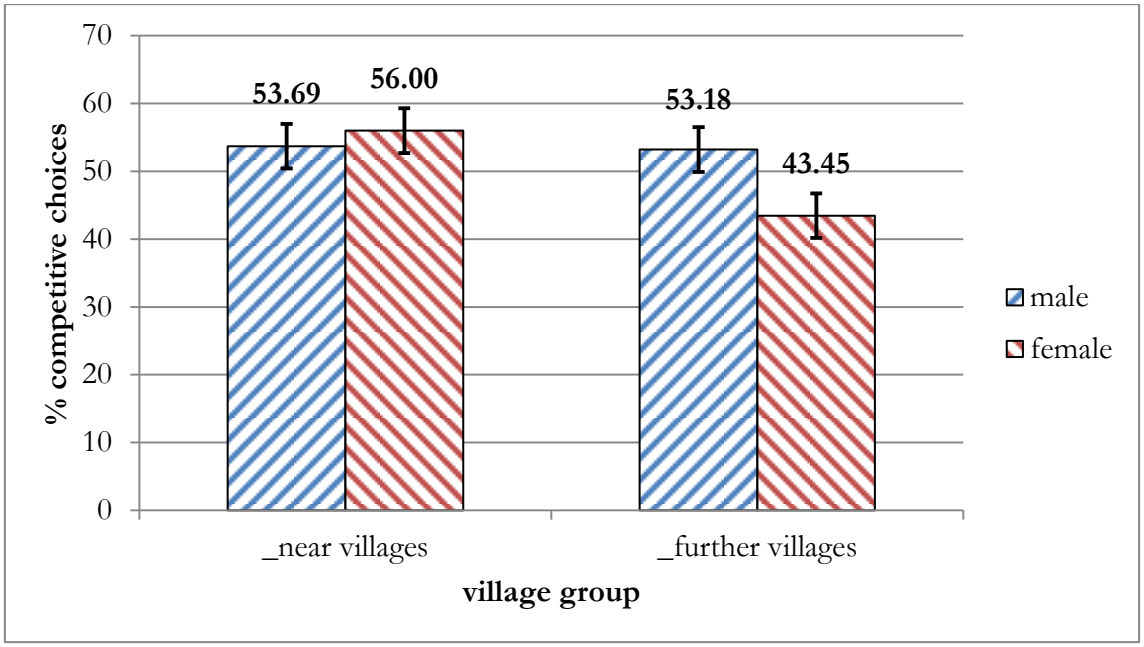
Note: The table presents marginal effects, except for the constant of the estimation. The observations from the *_further* control villages are the baseline of the estimations. The standard errors in parentheses are clustered at the village-level (29 villages) in all estimations. Statistical significance: *p < 0.10, **p < 0.05, ***p < 0.01.

Having a second look at our regression analyses in Table 1, we were surprised not to find a positive correlation between 'male' and the decision to compete. This null result differs from the established literature (Croson and Gneezy, 2009). In order to investigate this further, we compare competitiveness of females and males in the two village groups. In *_further* villages we indeed find the expected gender difference in competitiveness: 43.45% of females and 53.18% of males opt into competition. A chi-squared test rejects the null hypothesis at $p < 0.05$. Conversely, in *_near* villages 56.00% of females and 53.69 of males opt into competition. This difference is not significant ($p > 0.6$). Figure 2 depicts the results.

We therefore find evidence that our market exposure effect is driven by females whose competitiveness is increased to the level of males. We therefore find that market exposure in our rural, developing country setting balances competitiveness of females and males. This finding contributes to the quest for measures to overcome gender differences (e.g. Balafoutas and Sutter, 2012; Niederle et al., 2013).

Next we complement our analysis of adults' behavior with children's behavior. Analyzing children's behavior is interesting, as they may be more receptive to short-term changes in their environment. While adults have developed their preferences over decades, children are in the midst of their preference development.

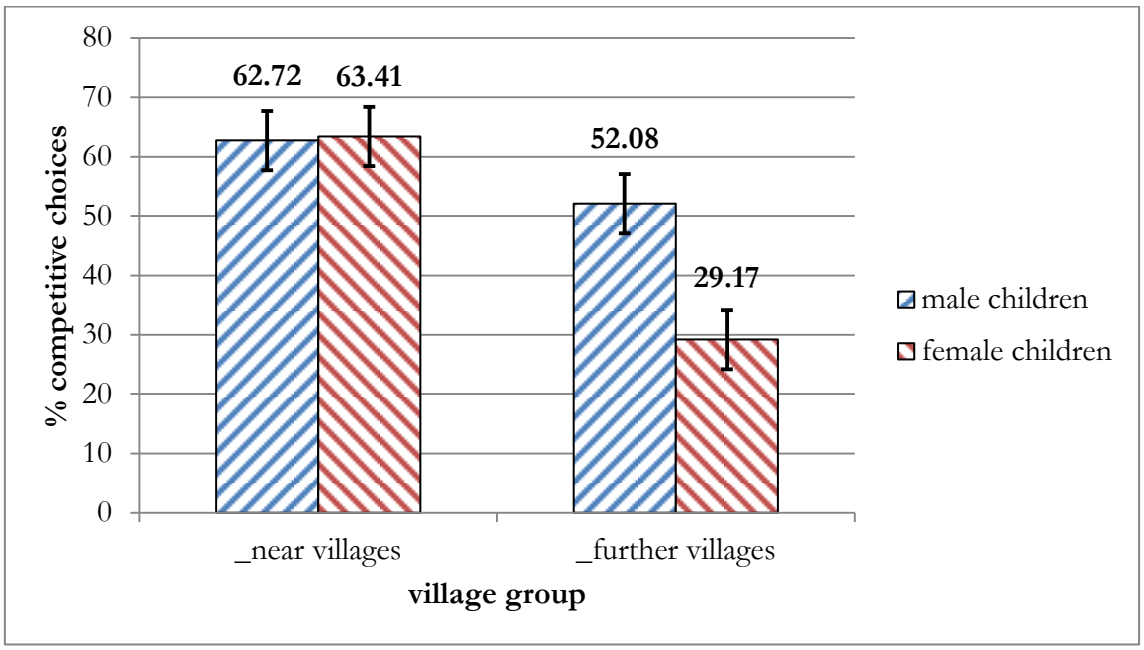
Figure 2. Competitive choices by village group and gender.



3.2 Children

We complement our analysis of adults' competitiveness with results from 401 children ages 5 to 15 years in the same two village groups. We find the same effect of market exposure for children that we find for adults: there is a significantly higher frequency of competitive choices in *_near* villages compared to *_further* villages (63.09% vs. 42.26% respectively, two-sided chi-squared test: $p < 0.000$). Examining the results of females and males separately, we find that both genders are more competitive in *_near* villages compared to *_further* villages (see Figure 3). Similar to adults, we find that the gender gap in competitiveness is wide open in *_further* villages (52.08% for males vs. 29.17% for females, chi-squared test: $p < 0.01$), but that it is completely closed in *_near* villages (62.72% for males vs. 63.41% for females, chi-squared test: $p > 0.9$).

Figure 3. Competitive choices of children by gender and village group.



Controlling for all other collected variables regarding the children (age, number of scored tennis balls in the competition game and region of data collection) in a Logit regression analysis confirms these results (see Table A.2 in Appendix A for details).

4 Conclusion

Our investigation concentrates on the encounter of two economic and farming systems which are at the extremes along the dimension of market exposure. There is peasant, communal subsistence farming of smallholders on the one hand and capital-intense profit-oriented farming by the global agricultural industry on the other hand (Timmer, 1997).

While global investors rely on formal institutions and property rights, smallholders rely on informal institutions and traditional usufruct rights. Our result is that living in the proximity of large-scale agricultural investment sites makes smallholders more competitive compared to similar smallholders who live at a distance to the investment sites. We regard this finding as highly important for agricultural policy and for the understanding of what societal arrangements may influence individuals' preferences (Bowles, 1998).

Depending on the desirability of competitiveness in society, this externality by large-scale investments may be regarded as a benefit or a cost. In our case of rural Zambia, we believe that moving smallholders' preferences towards greater competitiveness may make them more fit to compete in market arrangements and help them to produce more efficiently. The externality we identify in our research may therefore be regarded as an additional benefit of large-scale agricultural investments. If smallholders had a say about the arrival or absence of large-scale investments, a democratic vote would be informative about smallholders' preferences. In our case smallholders do not have a say about the arrival of investments. It is therefore imperative that policy makers carefully weigh the costs and benefits of market exposure.

In communities *further* away from investment sites we find the commonly observed gender gap in competitiveness (Gneezy et al., 2003; Croson and Gneezy, 2009), i.e. that males are more competitive than females. Conversely, the gender gap is completely closed in communities *near* the sites. This finding suggests that in our case market exposure not only increases competitiveness of smallholders in general, but that females' competitiveness 'catches up' with males'. A large body of literature argues that competitiveness is key to succeed in market environments and that females' lack of competitiveness explains the lower incomes and fewer females in leadership positions (Niederle and Vesterlund, 2007; Buser et al., 2014). Accordingly, balancing competitiveness of females and males through market exposure in rural setting of developing countries may be regarded as a highly valuable positive externality.

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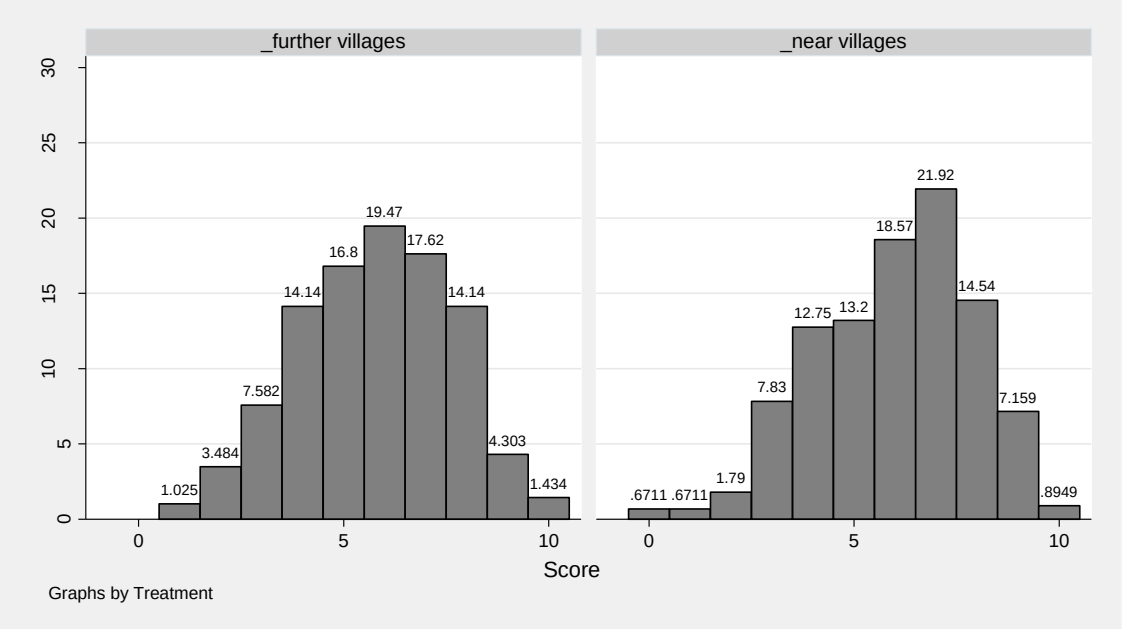
Appendix A – Additional Figures and Tables

Figure A.1. The competition game environment in the field.

Figure A.2. Histograms of competition game scores in *_near* and *_further* villages.



Note: A Kolmogorov-Smirnov test cannot reject the null hypothesis of equal distributions in the two village groups ($p > 0.2$).

Table A.1. Village Level Summary Statistics.

	_near villages		*_further* villages		
Variable	Mean	SD	Mean	SD	p-values
Male	0.54	0.15	0.47	0.12	0.13
Household head	0.46	0.09	0.50	0.13	0.32
Age (in years)	35.07	2.46	41.11	5.25	**0.00**
Ethnic groups in village	8.46	3.31	8.00	2.92	0.68
Migrant	0.53	0.20	0.60	0.18	0.51
Years of education	6.56	1.08	6.53	0.87	1.00
Literacy (with 5 is the highest level)	2.68	0.39	2.65	0.38	0.93
Asset index	0.42	0.03	0.41	0.10	0.46
Crop sale	0.83	0.39	0.87	0.35	0.81
Hectares cultivated	4.95	2.17	5.11	1.96	0.83
LSAI worker	0.52	0.26	0.24	0.19	**0.00**
Smallholder	0.71	0.17	0.84	0.10	**0.04**
Village has a public good	0.77	0.44	0.63	0.50	0.41
LSAI requested land in the village	0.18	0.41	0.15	0.38	0.86
Individuals	445		487		
Number of villages	13		16		

Note: Statistically significant p-values in bold. The p-values are based on two-sided Mann-Whitney tests on the village-level. The asset index includes information on the households' possessions of livestock holdings, radios, agricultural equipment, transportation, as well indicators of the quality of housing. The asset index was constructed using Principal Components Analysis (Filmer and Pritchett, 2001).

Table A.2. Regression Analysis of Competitive Decisions of Children.

Independent Variable	**I** **Logit regression** **Dependent variable: Competitive decision (1 = yes)**	**II** **Logit regression** **Dependent variable: Competitive decision (1 = yes)**	**III** **Logit regression** **Dependent variable: Competitive decision (1 = yes)**
_near village (dummy, 1 = yes)	0.208*** (0.049)	0.344*** (0.071)	0.347*** (0.073)
Male (dummy, 1 = yes)		0.237*** (0.078)	0.229*** (0.079)
_near village x male (interaction term)		-0.245** (0.099)	-0.247** (0.101)
Age (continuous)			0.0144 (0.009)
Own competition score (continuous)			-0.022 (0.014)
Mumbwa Region (dummy, 1 = yes)			0.005 (0.060)
Constant	-0.312** (0.156)	-0.887*** (0.259)	1.069** (0.417)
Observations	401	401	400

Note: The table presents marginal effects, except for the constant of the estimation. The observations from the *_further* control villages are the baseline of the estimations. Standard errors in parentheses, statistical significance: *p < 0.10, **p < 0.05, ***p < 0.01.

Appendix B – Instructions

Introduction

Thank you all for taking the time to come today. Today's activities may take three to four hours. Before we begin I want to make some general comments about what we are doing here today and explain the rules that we must follow.

We will ask each of you to make decisions involving money and to answer a few questions. Whatever money you earn during the activities will be yours to keep and take home. Nobody but the researchers and you will know what you decided and earned, and **money will be given in private. No other participant will learn about your decisions and earned money.** We will be supplying the money. This money was given to us by the London School of Economics, a university in Great Britain, to use for research and it is not our own personal money.

Before we proceed any further, **let me stress something that is very important**. Many of you were invited here without knowing very much about what we are planning to do today. If at any time you find that this is something that you do not wish to participate in for any reason, you are of course free to leave whether we have started the activity or not.

We will be asking you to do **three activities** with other individuals in your village today. **Your earnings from all three activities sums to your total earnings**. You will be informed about the outcomes in the three activities and your total earnings in private **at the end of all activities**.

If you have heard anything about these types of activities, you should try to forget about that because each activity can be completely different. It is important that you listen as carefully as possible.

We will run through some examples of how the activities work. **You cannot ask questions or talk while here in the group. This is very important.** Please be sure that you obey this rule, because it is possible for one person to spoil the activities for everyone. If one person talks about the activities while others can hear it, we would not be able to carry out the activities today. Do not worry if you do not completely understand the rules as we go through them here in the group. Each of you will have a chance to ask questions in private to be sure that you understand how the activities work.

Before we explain the activities we divide you into **two groups, the Green Group and the Black Group**, according to the colored cards that you have drawn from the bag a moment ago. The two groups will separate, so that green-card people and black-card people cannot see or hear each other.

After we have explained the activities, you will all wait in a group. We will call you by the number on your ticket, so please listen carefully for your number. While you are waiting you can talk about anything else you want other than the activities here today.

Activity 3 (*instructions for research assistants in parentheses*)

Activity 3 is throwing this ball into this bucket from a line. *(Show them the ball, bucket and line.)* You will have 10 tries.

We now ask you to choose one of two options according to which you will be paid in the experiment.

OPTION 1: If you choose this option, you will get 5 kwacha for each time you get the ball in the bucket in your 10 tries. So if you succeed 1 time, then you will get 5 kwacha. If you succeed 2 times, then you will get 10 kwacha. If you succeed 3 times, you will get 15 kwacha, and so on.

OPTION 2: If you choose this option, you will receive a reward only if you succeed more times than a randomly matched person who is playing in the other group (*green or black*). If you succeed more than this person, you will be paid 15 kwacha for every time you succeed. So if you succeed 1 time, then you will get 15 kwacha. If you succeed 2 times, then you will get 30 kwacha. If you succeed 3 times, you will get 45 kwacha and so on. But you will only receive a reward if you are better than the person in the other group. If you both succeed the same number of times, you will both get 5 kwacha for each success.

A successful throw is one where the tennis ball remains inside the bucket.

We now ask you to choose how you want to be paid: according to Option 1 or Option 2. Now you may play.

(Record both their ID number and their choice,

Allow the participant to toss the balls, while you record the result of each ball in the following manner: S is success, X is failure.)