Essays in Development Economics

Inauguraldissertation
zur Erlangung des akademischen Grades eines Doktors der
Wirtschaftswissenschaften der Universität Mannheim

vorgelegt von
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November 2012

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Tag der Verteidigung: 18. Dezember 2012

ACKNOWLEDGEMENTS

I would like to acknowledge Getinet Haile who was co-author on Chapter II: "School Meals and Educational Outcomes in Rural Ethiopia", Niels Kemper who was co-author on Chapter IV: "The Impact of Financial Literacy Training on Risk Management, Over-indebtedness and Vulnerability", as well as Markus Frölich who was co-author on both aforementioned chapters.

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CHAPTER I

Introduction

This dissertation consists of four essays on development economics. The first two essays study educational challenges in rural Ethiopia. In Chapter II, the first essay explores a school meals program in Ethiopia. In food-insecure parts of poor countries, where school enrollment is low, school meals can provide a strong incentive to poor households to send their children to school. School meals appear to be attractive as they may not only increase school participation and reduce dropout but may also improve learning and cognitive development. Chapter III investigates the role of poor eyesight, which is a considerable burden in developing countries. As refractive errors are rarely corrected through eyeglasses, particularly in rural parts of poor countries, children loose educational opportunities if eyesight problems lead to low grade attainment and prevent better learning outcomes. Chapter IV uses data on four financial literacy training programs, which were implemented in three countries (Cambodia, the Philippines and Vietnam), to examine whether financial literacy training can improve microfinance clients' risk management in order to avoid over-indebtedness and reduce vulnerability. Chapter V investigates the role of parental migration on children's school participation using data from Moldova. While migration, through remittances, has the potential to contribute to children's education by

making more resources available, parental migration may be detrimental as it implies parental absence. Thus, it is not clear a priori whether parental migration has a net positive or negative impact on educational outcomes of children who are left behind.

CHAPTER II

School Meals and Educational Outcomes in Rural Ethiopia

2.1 Introduction

Pervasive undernutrition remains a serious obstacle to children's physical and cognitive development in many developing countries. Hunger diminishes children's ability to concentrate and to retain what they learn at school. School meals attempt to improve poor and credit-constrained households' investments in education by subsidizing the cost of schooling and by reducing short-term hunger and improving nutrition. In 2008, the United Nations World Food Programme (WFP) provided school meals to around 22 million children in 70 countries (Bundy et al., 2009). In poor countries, where school enrollment is low, school meals can provide a strong incentive to poor households to send their children to school and to keep them there.[1] School meals appear to be attractive as they may not only increase school participation and reduce dropout but may also improve learning and cognitive development.

The educational benefits of school meals programs depend on the modality, targeting and implementation of the program. The two basic modalities constitute (i)

[1]Other interventions to attract children to school that have been found to increase school enrollment and attendance include deworming (Miguel and Kremer, 2004), provision of additional teachers (Duflo et al., 2008) and conditional cash transfers (Behrman et al., 2009).

providing school meals on-site or (ii) take-home rations, both of which may be combined with micronutrient supplementation (Adelman et al., 2008b). While on-site meals (breakfast, lunch or snacks) are usually provided to all students, take-home rations are often given only to girls conditional on school attendance exceeding some threshold. School meals may also involve local (community or household) contributions. These contributions may be in kind, such as firewood and water, or in cash to cover cooks' remunerations. In most developing countries, school meals programs target areas with high food insecurity, low enrollment or high gender disparity. If the program is less well implemented, food distribution might be subject to disruption and may divert class and teacher time away from learning.

This paper investigates the impact of a school meals program, its modalities and implementation on learning achievement, concentration/attention span, cognitive development, and children's activities using data from chronically food-insecure districts in rural Ethiopia. It contributes to the literature in a number of ways. Whereas many studies have provided evidence on the impact of school meals, much less is known about the role played by modalities and the implementation of school meals programs. Nevertheless, children are often involved in the acquisition of the material contributions (such as firewood) their households are required/expected to make available as part of the preparation of school meals. This has a potentially detrimental effect on the learning achievement of children. The paper examines the effect of school meals on children's activities. In addition, it also investigates the effect of school meals, the modalities and implementation on learning achievement and cognitive development of children. Finally, the paper also contributes to the literature by highlighting the role of school meals on children's concentration/attention span – an outcome that has not been explored in the literature. In particular, the

paper investigates whether children on school meals are able to concentrate better due to the alleviation of short-term hunger during school hours. Considering likely variations in the effects of school meals across the gender and age of children, the paper also conducts gender and age based sub-group analyses.

The paper's main finding are that (i) supplementing on-site meals with take-home rations positively affects concentration, reading, writing and arithmetic skills, and (ii) serving food at the end of classes adversely affects outcomes relative to serving food at the beginning of classes. However, the timing of food appears to only affect the girls. Further, children are found to benefit more if households contribute to the program.

2.2 The school meals program in Ethiopia

The Government of Ethiopia has adopted an Education and Training Policy in 1994 with a view to achieving universal primary education by the year 2015.[2] To attain this goal, the Government of Ethiopia has so far been implementing three phases of multi-year Education Sector Development Programmes. One of their main components has been the school meals program, which the Government of Ethiopia undertakes in partnership with the United Nations World Food Programme (WFP).

Education Sector Development Programme III has expanded school meals to further schools in food insecure and vulnerable areas in Ethiopia. In particular, the program targets pastoralist areas and chronically food deficit highland woredas (districts) in the country. The main objectives of the school meals program in Ethiopia are to: attract children to school in chronically food insecure areas, increase enrollment, stabilize attendance and reduce dropout. The program also pays special

[2]Most of the discussion in this section is drawn from the 2007 Country Status Report of the Standardized School Feeding Survey (WFP, 2008).

attention to increasing girls' enrollment in program areas with a view to bringing about gender parity in school enrollment.

WFP sponsored school meals started in Ethiopia in 1994 with an initial pilot project in war-affected zones in Tigray region. The program has so far provided school meals in six regions of the country (Afar, Amhara, Oromia, SNNPR, Somali and Tigray). In 2008, WFP provided food for 915 schools with 482,000 children benefiting from school meals. The per child ration consists of 150 gm of corn-soya blend (CSB), 6 gm of fortified vegetable oil and 3 gm of iodised salt, provided as a cooked meal on every school day. Chronically food insecure districts in the six regions with lower enrollment and higher gender disparity have been the target of the program.

In 2002, the World Food Programme launched the Girls' Initiative in food insecure areas in Afar and Somali regions, and pastoralist areas of Oromia and SNNPR regions. The initiative has the objective of encouraging girls' education and narrowing the gender gap. It provides 8 liters of vegetable oil per semester conditional on 80 percent girl's attendance in pastoralist and semi pastoralist areas, in addition to on-site school meals. In 2008, 68,000 girls received take-home rations.

In about 300 communities, WFP's school meals program is supported by Children in Local Development (CHILD), a community-led planning tool initiated by WFP and the Ministry of Education. CHILD is primarily intended to increase the sustainability and impact of school meals; and mainly involves capacity building for government partners and beneficiary communities. It also assists communities to plan for a child-friendly school environment in order to improve the learning atmosphere.

School meals involve local contribution, which is usually in kind, with the exception of cooks' remuneration. Communities may contribute labor e.g. to build canteens and storage rooms. Additionally, parents may contribute firewood and water to support the preparation of meals or cash to cover payments for cooks.

2.3 Review of the literature

School meals subsidize the cost of school attendance by providing food with the potential of improving learning and nutrition. If beneficiary households respond to school meals by reducing their food expenditures, more resources will be available, which may increase expenditures on education or change children's activities. In the short-run, school meals are expected to alleviate hunger in the classroom and help the child to concentrate better and learn more. In the long-run, improved nutrition is expected to increase children's physiological capacity for learning and to reduce morbidity by strengthening the immune system, thereby reducing missed school days due to sickness. The impact of on-site school meals on learning is expected to operate through an increase in school attendance and through improvement in learning efficiency while in school, as in the absence of hunger children are able to concentrate better and as (micronutrient-fortified) school meals may also improve cognitive function (Adelman et al., 2008b).

A number of studies found school meals to raise enrollment and attendance (Ahmed, 2004; Dreze and Goyal, 2003; Kazianga et al., 2009; Tan et al., 1999; Vermeersch and Kremer, 2005). However, effects on learning achievement and cognitive development are less clear. Filmer and Schady (2009) argue that students may not learn much due to overcrowding as a consequence of school meals attracting new students, who are often poorer. Poor marginal students may do worse in terms of

learning if schools cater to elites (Duflo et al., 2008). If poor, credit-constrained households send their most promising children to school first, then the marginal students will have less favourable characteristics, e.g. in terms of ability (Card, 1999). On-site school meals may adversely affect the effectiveness of the educational process, e.g. by food distribution interfering with teaching time. In some cases the total amount of hours devoted to teaching is found to decrease by 15 percent (Vermeersch and Kremer, 2005). The environment in which school meals take place also plays an important role. If a program increases enrollment and attendance, with teaching quality being low or teachers' absenteeism high, it is unlikely to induce better learning achievement. For example, Vermeersch and Kremer (2005) found no impact of school meals on cognitive skills; better test scores were primarily associated with greater teachers' experience. Adelman et al. (2008a) found positive effects of school meals and take-home rations in Northern Uganda on math and on literacy only for older children; no impact was found on cognitive skills as measured by the Raven's test. Kazianga et al. (2009) found that school meals increase enrollment but fail to improve attendance and academic performance.

A body of literature investigates the impact of school meals on (short-term) cognitive development, focussing on the specific micronutrient content of school meals. Although the empirical evidence is mixed, there appears to be a consensus on the importance of animal source food. For example, Whaley et al. (2003) explore the effect of three different diets (meat, milk, and energy), suggesting that animal source food has greater impact on cognitive function. Similarly, Gewa et al. (2009) investigate the effect of different school meals comprised of exclusively vegetarian meals, milk, or supplemented with meat; results show that the meat variant is relatively more important in terms of improving cognitive function among school-age children.

However, most of these studies are conducted in a laboratory setting, which limits their external validity.

2.4 Data

The data used in this paper come from a survey conducted in 2010 by the World Food Programme Country Office Ethiopia in partnership with the University of Mannheim involving school catchment areas in food-insecure woredas (districts) in the four major regions of Ethiopia (Amhara, Oromia, SNNPR and Tigray). Employing a two-stage sampling design, the survey sampled 200 school catchment areas in the four regions of the country stratified by highland and pastoral areas.[3] The survey covered three types of school catchment areas – program school, non-program school and phased-out program school catchment areas. The first-stage sampling was conducted using program woredas as the sampling frame for non-program school catchment areas. This type of program/non-program school catchment area matching procedure was chosen in order to attain comparable control school catchment areas. The second-stage sampling entailed sampling of ten children aged 7 to 13 years per school catchment area who were either enrolled in school or not at the time of the survey.[4] This design feature of the survey allows for a richer analysis than surveys that are based on the school only. It allows to investigate relationships within the school service area, circumventing selection problems associated with children enrolled in school based on unobserved characteristics. Only students enrolled in grades 2 to 4 were included.

We dropped schools where food had not been distributed yet at the time of the survey (3 schools). The fact that these schools were still without food although the

[3] In Tigray and Amhara WFP's school meals are operational in highland areas only.
[4] For a more detailed description of the survey design see Haile et al. (2011).

school year had already started cannot be attributed to pure chance. Rather, these schools might be different along characteristics that are unobserved. In addition, as we are interested in current school meals on current outcomes, children in schools where food had not been distributed yet would be at a disadvantage. Furthermore, this paper excludes phased out program schools from the sample used for the analysis, as the focus of this paper is investigating the effect of current school meals on learning achievement. Table 2.1 shows the distribution of schools across regions and livelihood (highland vs. pastoralist) in the sample.

Table 2.1: Distribution of schools, by region and livelihood

	Program	Non-program	Total
Amhara highland	14	17	31
Oromia highland	14	14	28
Oromia pastoralist	12	13	25
Tigray highland	14	16	30
SNNPR highland	10	12	22
SNNPR pastoralist	5	5	10
Subtotal highland	52	59	111
Subtotal pastoralist	17	18	35
Total	69	77	146

To measure scholastic performance, we tested children on their reading, writing and arithmetic skills.[5] Children were tested regardless of whether they were enrolled in school. For reading, children were asked to read pre-prepared letters, words and sentences. In the writing test, children were asked to write down pre-prepared sentences that the interviewer read aloud. Children were also tested on their arithmetic skills using up to three different arithmetic questions. In all three cases, two different versions of the tests were administered depending on the age of the children involved

[5]We adapted our tests on reading, writing and arithmetic skills from the Young Lives project, a longitudinal study conducted in four countries, core-funded by the UK Department for International Development (DFID).

– one set for children between the ages of 7 and 10 years and a more difficult set for children between the ages of 11 and 13 years.

To test children's cognitive development we use the Raven's Standard Progressive Matrices (SPM) test. The major benefit of this test is that no formal schooling is required to solve the questions. The test is a measure of problem solving ability and consists of selecting bits with different shape and design to complete matrices. We asked the first 25 questions of the Raven's test, including problem sets A and B.

To test children's concentration and attention we use a modified version of the *d2* Test of Attention (Brickenkamp and Zillmer, 1998). In its original form, the test consists of crossing out symbols – the letter d with 2 strokes above or below – while leaving out all other symbols, i.e. any d with more or less than 2 strokes and the letter q irrespective of the number of strokes. We modified the original test by replacing the d's and q's with 6's and 9's as the Latin alphabet is not used in all our sample regions. The score we use for measuring performance in terms of speed and accuracy is composed of the total number of symbols covered minus the number of wrongly crossed-out symbols and the number of wrongly left out symbols.[6] Children were asked to cover 8 rows of symbols, each row comprising 47 symbols for which they were given 20 seconds (per row).

Table 2.2 reports child, household and school characteristics in program and non-program school service areas. The children's mean age is close to ten years with 68 percent of children aged 10 years or less (10 years is the cutoff above which children were given a more difficult set of tests). Slightly more boys than girls are included in our sample. If children were enrolled, their mean grade was grade 3. Around 20

[6]We also use an alternative measure consisting of the number of correctly crossed-out symbols minus the number of falsely crossed-out symbols called Concentration Performance score. However, changes in results are only minor.

Table 2.2: Summary statistics (means) of selected characteristics of children, households, and schools

Variable Names	Non-program	Program	p-value
Child characteristics			
Age	9.91	9.96	.66
Children aged ≤ 10	.68	.68	.9
Male	.52	.56	.19
Grade	3	2.98	.64
Enrolled	.8	.79	.45
HH characteristics			
Number of children	3.85	4.08	.01
Total expenditures (log)	5.82	5.82	.93
Neither parent attended school	.58	.68	0
Male headed household	.83	.89	0
Livestock index	3.08	3.89	.01
School characteristics			
School equipment index	2.13	2.43	0
Highland	.76	.75	.61

Notes: The p-value stems from a means comparing t-test.

percent of children were not enrolled in school at the time of the survey. Households in program school service areas have slightly more children on average, have a higher share of either parents without education and are more often headed by a male household head. They also have a higher livestock index.[7] Children residing in program school catchment areas have access to better school facilities as measured by our school equipment index. This index is defined as the sum (range 0-4) of whether sanitation facilities are available, school buildings are in a good condition, the school compound is fenced and classrooms have glass windows.

Table 2.3 presents characteristics of the modality and the implementation of the program. Around a quarter of schools have the additional school meals program component – take-home rations consisting of vegetable oil that households receive

[7]The livestock index is a weighted index using tropical livestock units (TLU) as weights as follows: cattle are weighted by 0.7 TLU, donkeys or horses are weighted by 0.3 TLU, goats or sheep are weighted by 0.15 TLU and poultry are weighted by 0.05 TLU.

each semester conditional on 80 percent girls' attendance. Almost 50 percent of the schools have the additional CHILD (Children in Local Development) component that involves capacity building for government partners and beneficiary communities to assist communities to plan for a child-friendly school environment in order to improve the learning environment. Schools usually establish food management committees as part of the program to oversee delivery, storage and distribution of food. In 59 percent of cases the food management committee has been trained to enable members to more effectively assume their responsibilities. Training may also be provided to the cooks. In 43 percent of cases cooks have been trained. 88 percent of schools reported that they experienced disruptions in the distribution of food. Almost equally important as reasons for the disruptions are lack of food[8] and lack of water. In 16 percent of cases schools reported that cooks' absenteeism was the main reason for the disruption of food distribution. In terms of the timing of school meals, in the majority of schools food is distributed half-way through the school day. Most schools use a traditional three-stone fire place for cooking, only 15 percent of schools use an improved stove. The majority of schools consider their storage facilities to be adequate and safe. In 25 percent of schools students use a special eating place within the school compound. The mean program duration is 8.43 years in the sample.

Table 2.4 reports households' contribution to the program. 6 percent of beneficiary households are member of a food management committee. Their most important contribution to school meals is firewood, followed by cash and water contribution. Only 2 percent of beneficiary households report no contribution at all.

[8]Lack of food occurs mainly because of late delivery to the school. In Ethiopia, WFP procures food and the delivery of food non-locally.

Table 2.3: Summary statistics of school meals program modality and implementation

Variable Names	Mean
Modality	
Take-home rations	.26
Children in Local Development (CHILD)	.48
When distributed	
Beginning of day	.34
Half-way through	.62
End of day	.04
Implementation	
Food management committee trained	.59
Cooks trained	.43
Disruption in food distribution (yes=1)	.88
Reasons for days w/o food	
No food	.25
No water	.28
No fuel	.03
Cooks were absent	.16
Other reason	.28
Facilities	
Three-stone fire place	.85
Improved stove	.15
Storage facility adequate/safe	.87
Special eating place in school	.25
Program duration (years)	8.43
Number of observations (schools)	69

Table 2.4: Summary statistics of households' involvement and contribution

Variable Names	Mean
Households' involvement	
Member of food management committee	.06
Households' contribution	
No contribution	.02
Cash	.35
Firewood	.49
Labor	.03
Water	.09
Firewood, labor, or water	.61
Number of observations (households)	688

2.5 Empirical specification

This study is interested in identifying the impact of school meals, its implementation and the role of modalities on cognitive skills, concentration/attention span, reading, writing, arithmetics and children's activities. These outcomes are correlated with school, teacher, household or child characteristics, many of which are not observed.

The estimable regression model is the following linear model:

$$y_{is} = \mathbf{X}'_{is}\alpha + \mathbf{D}'_{s}\delta + \epsilon_{is}. \tag{2.1}$$

We estimate the effects of school meals, the modalities and the implementation on child i's outcome y_{is} in school service area s using ordinary least squares. $\mathbf{D}_s$ is a vector including program status which may also include the modality and characteristics of implementation, $\mathbf{X}_{is}$ is a vector of child, household, and school service area characteristics, and ϵ_{is} denotes the error term.

Alternatively, we also use a random-effects model based on generalized least squares to account for the error structure::

$$y_{is} = \mathbf{X}'_{is}\alpha + \mathbf{D}'_{s}\delta + \eta_s + \mu_{is}, \tag{2.2}$$

with $\mathbf{D}_s$ and $\mathbf{X}_{is}$ defined as before, and η_s are unobserved school service area effects assumed to be random and to follow a probability distribution known up to some finite set of parameters and μ_{is} denotes the error term.

We control for household and individual characteristics to account for possible correlation between school meals (modalities and implementation) and the error term. For example, we do not observe children's nutrition – a variable that is likely to be correlated with school meals. However, we do observe household and individual

characteristics that *inter alia* determine how well a child is able to cope with shocks to food availability. Furthermore, controlling for wealth is mandated as wealthy households are more likely to invest more in both health and education relative to poor households.

Our variables controlling for household composition include the sex of the household head and the number of children. Additional household-level control variables include a dummy variable for whether at least one parent has some education, the log of total household expenditures and asset holdings.[9] Later, we use the asset index to categorize households into low and high asset households using median asset ownership as the cutoff point. Variables controlling for child characteristics include the age and the sex of the child.

We control for school characteristics by using a school equipment index.[10] We also use region dummies and a dummy that controls for areas dominated by pastoralism.

In sum, the vector $\mathbf{X}_{is}$ includes the following variables: the child's age, a dummy for the child being aged between 7 and 10 years,[11] the child's sex, a dichotomous variable whether the head of household is male, the number of children in the household, a dichotomous variable whether both parents are uneducated, the logarithm of total household expenditures, the school equipment index, a dichotomous variable

[9] Asset holdings are measured using an index of livestock that is a weighted index using tropical livestock units (TLU) as weights as follows: cattle are weighted by 0.7 TLU, donkeys or horses are weighted by 0.3 TLU, goats or sheep are weighted by 0.15 TLU and poultry are weighted by 0.05 TLU.

[10] As explain above, this index is defined as the sum (range 0-4) of whether sanitation facilities are available, school buildings are in a good condition, the school compound is fenced and classrooms have glass windows.

[11] In the regressions, we control for whether a child is aged between 7 and 10 years because the survey administered different tests for younger and older children – except for the Raven's test and the concentration test which were administered irrespective of age –, as in small samples, the distribution of younger children might be unequal across program status.

whether the district of the school catchment area is characterized by pastoralism, and controls for the region (Amhara, Oromia, SNNPR and Tigray).

We use two different samples: (i) for estimating the effects of the modalities and the implementation we use a sample that only includes program school catchment areas and (ii) for estimating the effects of school meals we use a sample that includes both program and non-program (control) school catchment areas. In case (i), the vector $\mathbf{D}_s$ includes the full set of modality and implementation variables: whether CHILD is implemented, take-home rations are distributed, the food management committee is trained, the cooks are trained, the school had at least one day of food not being distributed, whether food is served half-way through classes, whether food is served at the end of classes (serving food at the beginning of classes is the reference category), the duration of the program, whether households contribute to the program with cash, and whether households contribute with material (defined as labor, water or firewood contributions), the reference category being no contribution. These modality and implementation variables are included simultaneously in the estimations. In case (ii), the vector $\mathbf{D}_s$ includes a binary variable indicating whether school meals are provided and the interaction of this variable with a binary variable indicating whether take-home rations are provided.

We estimate the impact of (the modalities and the implementation of) school meals on all eligible individuals, i.e. all school-age children in a school catchment area, because the program was offered at the school catchment area level with take-up being incomplete, as not all eligible children are enrolled in schools where school meals are offered. Hence, we estimate the average intent to treat effect (AIT) that provides a lower bound of magnitude for the average treatment on the treated effect

(ATT), if eligible compliers benefit more than non-compliers from the intervention.[12] To estimate the AIT of the school meals program, we use school-age children in non-program school catchment areas as the counterfactual. To estimate the AIT of the modalities and the implementation of the program, we restrict the sample to school-age children in program school catchment areas, controlling for all other modality and implementation characteristics as well as household, child and school catchment area characteristics.

2.6 Results

To examine the effect of the modalities and the type of implementation of school meals as well as the effect of the provision of school meals, we use ordinary least squares and the random-effects model. Because the random-effects model gives very similar results, we only present results using the ordinary least squares estimator.

2.6.1 The impact of the modalities and the implementation of the school meals program

Tables 2.5-2.8 report the impact of the modalities and the implementation of the school meals program, separately for boys and girls and by age group.

Cognitive skills

Table 2.5 explores the impact of the modalities and the implementation on boys' outcomes. We do not detect impact on cognitive skills as measured by the Raven's test.

Table 2.6 explores the impact of the modalities and the implementation for girls. The CHILD component appears to be favourable in terms of cognitive skills as we find

[12] See also Kazianga et al. (2009).

a positive effect of about 1.2 points (s.e.= 0.57).[13] We also find cooks who are trained to have a positive effect. In terms of the timing of the food distribution, serving food half-way or at the end of the school day appears to be less favourable than serving food at the beginning of the school day (which is the reference category). We also find a longer program duration to improve cognitive skills for girls, an additional year increases the Raven's test score by 0.16 points (s.e.= 0.077).

Tables 2.7 and 2.8 present results for younger and older children, respectively. We find cooks' training to positively affect cognitive skills for younger children and training of the food management committee to positively affect cognitive skills for older children. We do not detect impact of the remaining modality and implementation variables on cognitive skills.

[13]In the sample of program school catchment area girls, the score has a mean of 12.8 and a standard deviation of 3.5. See Table 2.12 in the Appendix.

Table 2.5: Impact of school meals program's modalities and implementation, boys

	(1) Raven's test	(2) Concentration	(3) Reads word	(4) Reads sentence	(5) Writes	(6) Math
CHILD	-0.348	-22.919	-0.080	-0.093	-0.014	-0.030
	(0.583)	(23.405)	(0.081)	(0.072)	(0.080)	(0.073)
Take-home rations	-0.483	15.364	0.549***	0.819***	0.429***	0.323***
	(1.067)	(18.853)	(0.116)	(0.121)	(0.133)	(0.111)
Food management committee trained	0.676	-12.987	-0.012	-0.109	-0.025	-0.062
	(0.596)	(13.227)	(0.061)	(0.071)	(0.077)	(0.061)
Cooks trained	0.942	19.406	0.007	0.080	0.117	0.081
	(0.617)	(12.836)	(0.063)	(0.069)	(0.075)	(0.056)
Disruption in food distribution	0.289		-0.047	0.029	-0.045	0.002
	(0.847)		(0.095)	(0.085)	(0.095)	(0.110)
Served at half-way	-0.282	9.702	-0.005	-0.037	-0.024	0.010
	(0.581)	(14.980)	(0.088)	(0.067)	(0.093)	(0.070)
Served at end	-0.504	8.884	0.017	-0.045	-0.239	-0.160
	(0.950)	(20.817)	(0.145)	(0.175)	(0.234)	(0.133)
School meals program duration	0.023	6.936***	-0.008	-0.002	0.000	-0.007
	(0.080)	(1.531)	(0.009)	(0.009)	(0.010)	(0.010)
Cash contribution	-0.834	-2.295	0.097	-0.042	0.024	0.308*
	(1.410)	(25.120)	(0.247)	(0.228)	(0.260)	(0.178)
Material contribution	-2.039	10.121	0.031	-0.107	0.015	0.297*
	(1.353)	(25.759)	(0.253)	(0.227)	(0.249)	(0.175)
Observations	298	140	300	300	300	299

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
In the regression on concentration, the coefficient and standard error of the disruption variable are omitted because of collinearity. All regressions use child, household and regional controls.
Due to time constraints, we conducted the concentration test only in a subset of school service areas.

Table 2.6: Impact of school meals program's modalities and implementation, girls

	(1) Raven's test	(2) Concentration	(3) Reads word	(4) Reads sentence	(5) Writes	(6) Math
CHILD	1.201**	15.600	0.036	0.099*	0.133	0.023
	(0.571)	(23.549)	(0.064)	(0.058)	(0.091)	(0.081)
Take-home rations	0.461	82.526***	0.063	0.317***	0.351**	-0.044
	(1.037)	(23.805)	(0.138)	(0.089)	(0.161)	(0.125)
Food management committee trained	0.178	3.670	-0.025	-0.043	0.029	-0.049
	(0.518)	(17.250)	(0.078)	(0.064)	(0.076)	(0.065)
Cooks trained	1.119**	17.035	0.080	-0.028	0.000	0.074
	(0.547)	(15.192)	(0.079)	(0.063)	(0.078)	(0.064)
Disruption in food distribution	1.270*		-0.105	-0.093	-0.119	-0.163*
	(0.737)		(0.103)	(0.095)	(0.122)	(0.096)
Served at half-way	-1.495**	19.045	-0.042	-0.048	-0.094	-0.104
	(0.621)	(25.263)	(0.066)	(0.052)	(0.075)	(0.087)
Served at end	-2.402**	-35.143	-0.217***	-0.237***	-0.065	-0.297**
	(0.906)	(30.283)	(0.079)	(0.085)	(0.189)	(0.139)
School meals program duration	0.157**	3.787	-0.003	0.007	-0.008	0.010
	(0.077)	(2.781)	(0.009)	(0.008)	(0.010)	(0.011)
Cash contribution	0.268	6.203	0.160	-0.039	0.206*	0.060
	(0.985)	(20.178)	(0.105)	(0.114)	(0.111)	(0.131)
Material contribution	-1.084	3.728	0.148	-0.116	0.248**	0.001
	(0.892)	(19.206)	(0.107)	(0.107)	(0.106)	(0.144)
Observations	239	105	253	253	253	253

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
In the regression on concentration, the coefficient and standard error of the disruption variable are omitted because of collinearity. All regressions use child, household and regional controls.
Due to time constraints, we conducted the concentration test only in a subset of school service areas.

Table 2.7: Impact of school meals program's modalities and implementation, children aged 7-10 years

	(1) Raven's test	(2) Concentration	(3) Reads word	(4) Reads sentence	(5) Writes	(6) Math
CHILD	0.210	-16.209	-0.082	-0.065	-0.074	-0.056
	(0.508)	(22.347)	(0.059)	(0.042)	(0.060)	(0.083)
Take-home rations	0.024	58.727***	0.062	0.295***	0.289***	0.069
	(1.047)	(18.282)	(0.115)	(0.096)	(0.096)	(0.125)
Food management committee trained	-0.011	-9.041	-0.073	-0.103	-0.033	-0.109*
	(0.531)	(13.408)	(0.059)	(0.063)	(0.061)	(0.062)
Cooks trained	1.219**	15.101	0.041	0.035	0.017	0.108*
	(0.558)	(12.605)	(0.066)	(0.069)	(0.063)	(0.064)
Disruption in food distribution	0.589		-0.009	0.043	-0.105	-0.115
	(0.743)		(0.078)	(0.076)	(0.089)	(0.109)
Served at half-way	-0.588	14.297	-0.026	-0.056	-0.059	-0.086
	(0.518)	(13.386)	(0.067)	(0.048)	(0.059)	(0.077)
Served at end	-0.971	0.114	-0.035	-0.042	-0.126	-0.283
	(1.019)	(23.995)	(0.127)	(0.129)	(0.167)	(0.180)
School meals program duration	0.108	5.710***	0.001	0.010	-0.002	0.004
	(0.074)	(1.885)	(0.007)	(0.006)	(0.007)	(0.009)
Cash contribution	0.466	16.361	0.228**	0.060	0.179	0.187
	(1.109)	(16.462)	(0.098)	(0.101)	(0.142)	(0.159)
Material contribution	-1.177	24.429*	0.144	-0.063	0.198	0.085
	(1.121)	(14.022)	(0.100)	(0.096)	(0.143)	(0.159)
Observations	368	160	391	391	392	392

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
In the regression on concentration, the coefficient and standard error of the disruption variable are omitted because of collinearity. All regressions use child, household and regional controls.
Due to time constraints, we conducted the concentration test only in a subset of school service areas.

Table 2.8: Impact of school meals program's modalities and implementation, children aged 11-13 years

	(1) Raven's test	(2) Concentration	(3) Reads word	(4) Reads sentence	(5) Writes	(6) Math
CHILD	0.526	-13.749	0.155	0.161	0.308***	-0.067
	(0.843)	(18.919)	(0.108)	(0.122)	(0.077)	(0.080)
Take-home rations	-0.617	108.315*	0.547***	0.781***	0.528***	-0.073
	(1.276)	(53.454)	(0.171)	(0.176)	(0.157)	(0.130)
Food management committee trained	1.334**	-8.762	0.134	0.023	0.089	0.197**
	(0.665)	(23.573)	(0.103)	(0.097)	(0.089)	(0.075)
Cooks trained	0.546	39.732	0.055	0.015	0.103	0.012
	(0.616)	(26.584)	(0.095)	(0.088)	(0.084)	(0.081)
Disruption in food distribution	0.860		-0.214*	-0.212	-0.149	-0.072
	(0.918)		(0.123)	(0.131)	(0.101)	(0.131)
Served at half-way	-1.115	23.007	0.012	0.036	-0.113	0.090
	(0.838)	(24.716)	(0.115)	(0.105)	(0.086)	(0.082)
Served at end	-1.329	20.223	-0.068	-0.154	-0.159	0.098
	(1.288)	(33.300)	(0.138)	(0.162)	(0.131)	(0.114)
School meals program duration	0.051	9.513	-0.020	-0.023	-0.015	-0.005
	(0.122)	(6.529)	(0.015)	(0.017)	(0.014)	(0.011)
Cash contribution	-0.089	-52.411**	-0.036	-0.209	0.035	0.290***
	(1.054)	(21.094)	(0.193)	(0.219)	(0.177)	(0.081)
Material contribution	-0.455	-25.620	0.046	-0.120	0.143	0.301***
	(0.842)	(22.316)	(0.197)	(0.217)	(0.172)	(0.093)
Observations	161	84	160	160	161	160

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
In the regression on concentration, the coefficient and standard error of the disruption variable are omitted because of collinearity. All regressions use child, household and regional controls.
Due to time constraints, we conducted the concentration test only in a subset of school service areas.

Concentration

We find a longer program duration to improve concentration for boys, an additional year increases the concentration score by 6.9 points (s.e.= 1.5).[14] We detect no impact of the remaining modality and implementation variables for boys.

We find take-home rations to improve girls' concentration by 82.5 points (s.e.= 23.8), or by about 1.5 standard deviations. This effect is particularly large in terms of economic significance. Remember that take-home rations are conditional on girls' attendance, supplementing on-site school meals in pastoralist and semi pastoralist areas. They are aimed at improving girls' attendance in areas that have lower girls' school attendance rates. We detect no impact of the remaining modality and implementation variables for girls.

We also find take-home rations to improve concentration for younger and older children (see Tables 2.7 and 2.8). Although take-home rations are conditional on girls' attendance, all children within a household may well be benefiting from take-home rations as, due to the value transfer to the household, children's attendance may improve as well as their nutritional status. We also find a longer program duration to improve cognitive skills for younger children.

Material contributions appear to increase concentration for younger children. We include firewood, water and labor in the materials category. Cash is usually contributed towards the cooks' remuneration. The reference category is no contribution at all. On the other hand, cash contributions appear to adversely affect concentration for older children. We should be cautious interpreting these findings, as we suspect estimates on household contributions to suffer from endogeneity bias, possibly much

[14] In the sample of program school catchment area boys, the score has a mean of 136.7 and a standard deviation of 56.6. See Table 2.12 in the Appendix.

more than the other modality variables. Conditional on the school meals program being in place, an implementation variable such as whether cooks are trained might be more or less random and thus uncorrelated with the error term, at least when controlling for other characteristics. On the other hand, households might arguably have more flexibility to avoid contributions, which may depend on unobservable characteristics. Of course, household contributions may also improve the availability of resources that are complementary to the distribution of food, thereby reinforcing any beneficial effect of school meals.

We interpret the results on take-home rations as weak evidence that not only targeted girls benefit, but possibly all children within a household receiving take-home rations.

Reading

We find take-home rations to improve reading skills for boys, both in terms of being able to read a word and a sentence. Again, this finding is remarkable as take-home rations are conditional on girls' attendance. As explained above, boys may also be benefiting from take-home rations as, due to the value transfer to the household, boys's attendance may improve as well as their nutritional status.

We find that girls are 10 percentage points (s.e.= 5.8%), or a quarter of a standard deviation, more likely to be able to read a sentence if the CHILD component is in place. Again, we find take-home rations to have a particularly large effect as we find girls to be 31.7 percentage points (s.e.= 8.9%) more likely to be able to read a sentence. Serving food at the end of classes, as opposed to earlier in the day, is found to negatively affect reading skills, both in terms of being able to read a word and a sentence.

We find take-home rations to improve reading skills for younger and older children. In addition, disruption in the distribution of food is found to negatively affect reading skills for older children. Contributing cash appears to positively affect reading for younger children.

Writing

We find take-home rations to positively affect writing for boys. We do not detect impact on the remaining modality and implementation variables.

Take-home rations appear to have a large effect on writing for the girls, as we find girls to be 35.1 percentage points (s.e.= 16.1%) more likely to be able to write, an improvement by about 0.7 standard deviations. Any contribution (material or cash), as opposed to no contribution at all, appears to improve writing skills for girls.

Take-home rations are also found to positively affect writing for younger and older children, while we find the CHILD component to improve writing for older children.

Arithmetic skills

We find take-home rations to improve arithmetic skills for boys. Making any kind of contribution (cash or material), as opposed to no contribution, is also found to improve arithmetic skills for boys.

We find a disruption in the distribution of food to have an adverse effect on girls' arithmetic skills. The timing of serving food also appears to be important for girls, as we find food being served at the end of the school day having a less favourable effect as opposed to food being served at the beginning of the school day. We do not detect impact of take-home rations on girls' arithmetic skills.

A food management committee that is trained appears to improve arithmetic skills for older children, but not for the younger children as we even find a negative

effect, which is puzzling. We find any kind of contribution (cash or material) to improve arithmetic skills for older children.

In sum, we find that supplementing on-site meals with take-home rations positively affects concentration, reading, writing and arithmetic skills; we do not detect impact on cognitive skills. We also find that training communities on how to improve the school environment has a favourable impact on learning achievement and cognitive development. Our results suggest that school meals are most effective if they are served at the beginning of classes or half-way through; however, the timing of serving food appears to be only important for girls. Moreover, we find household's material contribution to be beneficial, relative to no such contributions, with respect to children's learning achievement and concentration.

2.6.2 The impact of the school meals program

Tables 2.9-2.11 present results on the impact of school meals, separately for boys, girls, and age groups, and also by asset holdings. To examine the effect of the program itself, we use a binary school meals variable and a sample that includes children from program school service areas as well as children from non-program school service areas.[15] In addition, as we found take-home rations to play an important role as a variable of modality in Section 2.6.1, we are now interested in estimating interaction effects with on-site school meals within a larger sample that also includes non-program school service areas.

[15]As explained above, we choose not to condition on children's enrollment status, effectively estimating an average intent to treat effect (AIT).

Cognitive skills, concentration and learning achievement

Table 2.9 presents the effect of school meals on cognitive skills, concentration, and reading, writing and arithmetic skills, based on subsamples partitioned by the child's sex and age group.

We find no impact of school meals on cognitive skills as measured by the Raven's test, a finding similar to that of Vermeersch and Kremer (2005) and Adelman et al. (2008a). Neither do we find an effect on concentration, reading or arithmetic skills.

On the other hand, if school meals are supplemented by take-home rations, we find the program to have a negative effect on writing for younger children. As this is the only effect we find on learning achievement, this result may well be due to chance, given the large number of outcomes included in the analysis (see Table 2.9).

Overall, in contrast to the results on providing take-home rations in addition to school meals presented in Section 2.6.1, we do not find any interaction effects. One explanation for this result is that the problem of endogeneity may be more severe in a sample that includes both program and non-program school service areas, masking the impact of take-home rations.

Table 2.9: Impact of school meals on cognitive skills, concentration and learning achievement

	(1) Raven's test	(2) Concentration	(3) Reads word	(4) Reads sentence	(5) Writes	(6) Math
Boys						
School meals	-0.155	-12.510	-0.031	-0.014	-0.001	-0.048
	(0.397)	(8.440)	(0.045)	(0.044)	(0.040)	(0.039)
School meals x Take-home rations	-0.737	-8.651	0.048	0.032	-0.068	-0.016
	(0.775)	(17.676)	(0.086)	(0.089)	(0.095)	(0.086)
Observations	689	300	725	725	725	723
Girls						
School meals	0.224	-10.901	-0.037	-0.036	-0.032	-0.007
	(0.435)	(9.639)	(0.044)	(0.041)	(0.049)	(0.047)
School meals x Take-home rations	-0.835	-10.626	-0.044	-0.052	-0.149	-0.106
	(0.765)	(23.535)	(0.079)	(0.077)	(0.100)	(0.081)
Observations	588	264	635	635	635	635
Aged 7-10 years						
School meals	-0.209	-11.729	-0.026	-0.032	0.002	-0.001
	(0.409)	(8.148)	(0.039)	(0.039)	(0.035)	(0.040)
School meals x Take-home rations	-0.869	6.391	-0.033	0.011	-0.185**	-0.121
	(0.701)	(12.155)	(0.072)	(0.063)	(0.079)	(0.081)
Observations	853	354	927	927	928	927
Aged 11-13 years						
School meals	0.354	-14.218	-0.062	-0.024	-0.048	-0.075
	(0.439)	(10.582)	(0.056)	(0.052)	(0.055)	(0.047)
School meals x Take-home rations	-0.323	-26.029	0.096	-0.055	0.048	0.089
	(0.728)	(21.140)	(0.118)	(0.135)	(0.106)	(0.089)
Observations	412	209	429	429	432	431

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses. All regressions use child, household and regional controls. Due to time constraints, we conducted the concentration test only in a subset of school service areas.

Table 2.10: Impact of school meals on children's activities

	(1) Family business	(2) Domestic tasks	(3) Caring for others	(4) Paid work
Boys				
School meals	0.287	0.404**	-0.067	-0.084
	(0.268)	(0.161)	(0.102)	(0.088)
School meals x Take-home rations	0.732	-0.526**	-0.135	-0.196
	(0.446)	(0.212)	(0.280)	(0.142)
Observations	766	766	765	765
Girls				
School meals	-0.023	0.040	0.189	0.096
	(0.216)	(0.178)	(0.155)	(0.111)
School meals x Take-home rations	0.252	0.162	-0.389	-0.109
	(0.400)	(0.265)	(0.310)	(0.123)
Observations	656	655	655	656
Aged 7-10 years				
School meals	0.152	0.210	0.058	-0.076*
	(0.216)	(0.158)	(0.116)	(0.044)
School meals x Take-home rations	0.412	-0.095	-0.287	0.028
	(0.389)	(0.205)	(0.274)	(0.058)
Observations	961	960	959	960
Aged 11-13 years				
School meals	0.078	0.328*	0.084	0.166
	(0.267)	(0.194)	(0.124)	(0.188)
School meals x Take-home rations	0.829*	0.473	-0.194	-0.574*
	(0.432)	(0.325)	(0.288)	(0.307)
Observations	451	451	451	451

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses.
All regressions use child, household and regional controls.

Children's activities

Table 2.10 presents results on the impact of school meals on children's activities.

If the program is supplemented by take-home rations, we find school meals to increase time spent on the family business for older children; they spend an additional 0.83 hours per day (s.e.= 0.432) in program school service areas

We find school meals to increase boys' time spent on domestic tasks. On the other hand, the interaction between school meals and take-home rations has a negative effect. We also find an increase in time spent on domestic tasks for older children; they spend an additional 0.33 hours per day (s.e.= 0.194) in program school service areas. Although the program is expected to increase participation in school, through enhanced nutrition and improved physical capacity children may be increasingly involved in other activities such as collecting firewood, possibly as part of household contributions to the program.

We find a reduction in time spent on activities related to paid work for younger children and, if the program is supplemented by take-home rations, also for older children. This is consistent with the program changing children's activities as a result of the value transfer of the school meals program, in particular take-home rations, rendering a household's reliance on paid child labor less important.

We do not detect impact of school meals on time spent on caring for others.

Table 2.11 reports results from further analysis that examines the impact of school meals on children's activities. We partition the sample according to household asset holdings, using median asset holdings as the cutoff point for classifying households into low and high-asset households.

The positive effect on domestic tasks for boys noted earlier appears to be driven by boys and younger children from low-asset households. Further, the negative effect

Table 2.11: Impact of school meals on children's activities, by asset holdings

	(1) Family business	(2) Domestic tasks	(3) Caring for others	(4) Paid work
Low-asset				
Boys				
School meals	0.510	0.654***	0.006	-0.071
	(0.422)	(0.220)	(0.150)	(0.163)
School meals x THR	0.368	-0.629	-0.588	-0.149
	(0.756)	(0.386)	(0.359)	(0.237)
Observations	360	360	360	360
Girls				
School meals	0.132	-0.065	0.275	0.212
	(0.320)	(0.264)	(0.224)	(0.180)
School meals x THR	-0.510	0.737*	-0.853**	-0.228
	(0.374)	(0.381)	(0.399)	(0.198)
Observations	336	336	336	336
Aged 7-10 years				
School meals	0.239	0.388*	0.109	-0.106*
	(0.295)	(0.212)	(0.161)	(0.063)
School meals x THR	-0.221	0.256	-0.802**	0.057
	(0.424)	(0.321)	(0.314)	(0.087)
Observations	498	498	498	498
Aged 11-13 years				
School meals	0.308	0.211	0.322*	0.505
	(0.467)	(0.280)	(0.194)	(0.365)
School meals x THR	-0.036	-0.499	-0.339	-0.909
	(0.636)	(0.474)	(0.388)	(0.618)
Observations	193	193	193	193
High-asset				
Boys				
School meals	-0.054	0.171	-0.080	-0.026
	(0.313)	(0.206)	(0.123)	(0.075)
School meals x THR	0.681	-0.302	0.271	-0.157
	(0.526)	(0.280)	(0.391)	(0.105)
Observations	406	406	405	405
Girls				
School meals	-0.124	0.213	0.083	-0.055
	(0.275)	(0.193)	(0.186)	(0.113)
School meals x THR	0.720	-0.529	0.216	0.074
	(0.578)	(0.379)	(0.412)	(0.132)
Observations	320	319	319	320
Aged 7-10 years				
School meals	-0.007	0.089	0.022	-0.041
	(0.269)	(0.177)	(0.143)	(0.052)
School meals x THR	0.461	-0.365	0.350	0.029
	(0.544)	(0.266)	(0.364)	(0.050)
Observations	463	462	461	462
Aged 11-13 years				
School meals	-0.180	0.384	-0.068	-0.019
	(0.311)	(0.260)	(0.160)	(0.125)
School meals x THR	1.053*	-0.642	-0.041	-0.196
	(0.535)	(0.398)	(0.355)	(0.216)
Observations	258	258	258	258

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses.
All regressions use child, household and regional controls. THR: Take-home rations.

on time spent on paid work for younger children noted earlier appears to stem from younger children in low-asset households. For older children, we find a positive effect of schools meals on the amount of time they spend caring for others. On the other hand, we find girls and younger children from low-asset households to spend less time on activities related to caring for others if school meals are supplemented by take-home rations.

In high-asset households, we find school meals to increase time spent on the family business for older children if school meals are supplemented by take-home rations. This result is consistent with opportunity costs of children's time being larger in households with larger livestock holdings and the program having a favourable effect on physical capacity through enhanced nutrition. We do not detect impact on the other children's activities in high-asset households.

In sum, we find some evidence of a shift from market-related activities to domestic activities which are potentially more compatible with school attendance. For older children from high-asset households, we also find some evidence of spending more time on the family business if the program provides take-home rations in addition to school meals.

2.7 Conclusion

The effectiveness of school meal programs depends on how well these programs are designed in terms of modality as well as how well they are implemented. However, little is known about the role of school meals program modalities and the manner of implementation on generating learning achievement and enhancing cognitive development.

This paper investigated the role of the Ethiopian school meals program, its modalities and implementation on learning achievement, cognitive development and concentration/attention span in rural areas of the country. We found that supplementing on-site meals with take-home rations positively affects concentration, reading, writing and arithmetic skills; we did not detect impact on cognitive skills. We also found that training communities on how to improve the school environment has a favourable impact on reading, writing and cognitive development. Our results suggest that school meals are more effective if they are served at the beginning of classes or half-way through; however, the timing of serving food appears to be only important for girls. Moreover, we found household's material contribution to be beneficial, relative to no such contributions, with respect to children's learning achievement and concentration.

On the impact of the school meals program, we found no evidence that the school meals program improves learning achievement, cognitive development or concentration. However, our findings suggest an increase in the time spent on domestic tasks and a decline in the time children spend on paid labor. This is consistent with the program changing children's activities as a result of the value transfer of the school meals program, in particular take-home rations, rendering a household's reliance on paid child labor less important.

Our findings show that a school meals program's modalities and its implementation play an important role in terms of program effectiveness, even though this paper could not provide evidence on the program's cost-effectiveness. While we acknowledge the limitations of our data, this paper provided some evidence on issues related to modality and implementation that influence the extent to which a school meals program can improve educational outcomes of some of the world's poorest children.

Appendix

Table 2.12: Summary statistics of outcomes, by program status

	Program		Non-program	
Variable Names	Mean	Std. dev.	Mean	Std. dev.
Both sexes				
Raven's test	12.61	3.44	12.88	3.62
Concentration	137.42	55.49	152.54	57.87
Reads word	0.38	0.49	0.44	0.50
Reads sentence	0.25	0.43	0.31	0.46
Writes	0.60	0.49	0.66	0.47
Math	0.44	0.50	0.49	0.50
Family business (hours/day)	2.78	2.65	2.40	2.55
Domestic tasks (hours/day)	2.22	1.73	2.10	1.69
Caring for others (hours/day)	0.86	1.49	0.89	1.49
Paid work (hours/day)	0.13	0.86	0.19	1.11
Girls				
Raven's test	12.79	3.45	12.90	3.62
Concentration	138.31	54.19	151.84	57.19
Reads word	0.32	0.47	0.40	0.49
Reads sentence	0.20	0.40	0.29	0.45
Writes	0.55	0.50	0.65	0.48
Math	0.42	0.49	0.48	0.50
Family business (hours/day)	1.99	2.34	1.77	2.21
Domestic tasks (hours/day)	2.44	1.77	2.44	1.78
Caring for others (hours/day)	1.22	1.73	1.11	1.62
Paid work (hours/day)	0.15	0.94	0.12	0.93
Boys				
Raven's test	12.47	3.43	12.87	3.62
Concentration	136.74	56.63	153.24	58.72
Reads word	0.44	0.50	0.47	0.50
Reads sentence	0.30	0.46	0.33	0.47
Writes	0.64	0.48	0.66	0.47
Math	0.45	0.50	0.50	0.50
Family business (hours/day)	3.42	2.71	2.97	2.70
Domestic tasks (hours/day)	2.05	1.67	1.79	1.54
Caring for others (hours/day)	0.57	1.19	0.68	1.33
Paid work (hours/day)	0.11	0.78	0.26	1.25

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CHAPTER III

Poor Eyesight and Educational Outcomes in Ethiopia

3.1 Introduction

Poor health is recognized to be a major obstacle to the progress of developing countries. Yet, little is known about the mechanisms linking health and development. Poor eyesight, being one of the major health problems, is a considerable burden in developing countries. Silver et al. (2009) estimate that 9 percent of school age children have vision problems that could be corrected by eyeglasses. However, very few children in developing countries wear eyeglasses. Children loose educational opportunities if eyesight problems lead to low grade attainment and prevent better learning outcomes.

Few studies have examined the role of vision impairment on educational outcomes in developing countries. Gomes-Neto et al. (1997) find that poor vision increases dropout, hinders grade promotion and decreases performance in achievement tests. In a randomized controlled trial, Glewwe et al. (2012) investigate the role of providing eyeglasses to visually impaired students and find that for students who accepted eyeglasses average test scores increased by 0.12 to 0.22 standard deviations, equivalent to 0.33-0.5 years of additional schooling. Hannum and Zhang (2008), using

propensity score matching to address selectivity of wearing eyeglasses, find that students who wear glasses perform better on literacy and math tests, though not on language tests, and are less likely to fail a class.

Myopia (nearsightedness), the most common refractive error, is influenced by both environmental and genetic factors. Parents who have myopia tend to have children with myopia. Environmental factors have been found to play a role, e.g. a higher prevalence of myopia in urban areas has been documented in a number of studies. One possible explanation for these different rates of prevalence could be that children in urban areas spend more time reading and writing outside the school compared to children in rural areas (Saw et al., 2001). On the other hand, outdoor activities tend to decrease the prevalence of myopia. However, the roles of environmental influences and genetic predisposition to myopia remain uncertain (Mutti et al., 2002). For example, parents may pass on their inclination to reading to their children rather than myopia itself.

While I expect uncorrected refractive errors to be detrimental to educational attainment, e.g. due to difficulties of reading from the blackboard, the effect of poor vision on educational attainment is difficult to isolate. In studies in Asia, the correlation of prevalence of myopia and educational attainment has been found to be positive (Au Eong et al., 1993; Tay et al., 1992), with educational attainment being positively associated with household socioeconomic status. Angle and Wissmann (1980) argue that vision can be affected by near-work activities, such as reading, which are likely to be correlated with schooling outcomes. Students who study more tend to have their eyesight deteriorate faster.

This paper investigates the role of poor vision on educational outcomes using data from high-poverty districts in rural Ethiopia. I explore the effect of poor eyesight on dropout, grade repetition, learning achievement and cognitive development.

This paper contributes to the literature by investigating the role of poor eyesight across gender. Whereas other studies have looked at the impact of poor eyesight of children, the gender dimension of poor eyesight on educational outcomes in developing countries has not been explored in the literature. In particular, the paper investigates whether visually impaired girls are more likely to drop out from school. If households view net returns to education to be lower for girls than for boys, then girls will be more at risk of dropping out. In particular, when, possibly due to poor eyesight, school performance is low, girls' net returns to continued schooling will be more likely perceived to be negative, resulting in withdrawal from school. Psacharopoulos and Patrinos (2004) find that returns to primary education are much higher for boys than for girls.[1]

In Ethiopia, primary education lasts 8 years and is split into grades 1-4 (primary first cycle) and grades 5-8 (primary second cycle). Secondary education is also divided into two cycles. Grades 9-10 provide general secondary education and, upon completion, students are streamed either into grades 11-12 as preparation for university, or into technical and vocational education and training (TVET). This paper focuses on the first cycle of primary education.

In many Sub-Saharan African countries, girls are much less likely to attend school and to complete basic education. The largest female gender gaps tend to occur in

[1]However, at secondary education level girls have higher returns to education than boys (Psacharopoulos and Patrinos, 2004). The focus of this study is on primary education. There is substantial empirical evidence that the economic returns are high in developing countries. In a study on Indonesia, Duflo (2001) finds returns to primary education to range between 6.8 to 10.6 percent, which is smaller than what Psacharopoulos and Patrinos (2004) find for developing countries.

countries with low income and small overall participation in education (World Bank, 2012). In Ethiopia, there has been considerable improvement in primary education net enrollment rates in the past decade. In the academic year 2010/11, in primary education boys' net enrollment rate is reported at 87 percent, the corresponding figure for girls is 83.5 percent.[2] In the first cycle (grades 1-4), net enrollment rates are reported at 94 percent and 89.4 percent for boys and girls, respectively. In the second cycle (grades 5-8), girls' net enrollment rate is slightly larger than the corresponding figure for boys, though at a much lower level at 47.9 and 46.6 percent for girls and boys, respectively (Ministry of Education, 2011).

There is growing interest in the relationship between health and educational outcomes. A positive correlation between health and education has been firmly established in the literature. However, the causal relationship between health and education remains uncertain (Eide and Showalter, 2011). First, health may causally affect education. Children with stronger health may obtain more education (Behrman and Rosenzweig, 2004). Second, education may causally affect health, resulting in declining morbidity and mortality (Lleras-Muney, 2005). Third, there may exist a third omitted factor affecting both health and education, such as time preferences.

I begin with a conceptual discussion of the impact of poor eyesight and school performance on school attainment. Section 3.3 describes the data. Section 3.4 presents the empirical specification and the results. Section 3.5 concludes.

[2]According to national education statistics, the gender gap has also narrowed considerably. In 2006/07, boys' net enrollment rate is reported at 82.6 percent, the corresponding figure for girls is 75.5 percent (Ministry of Education, 2011).

3.2 Conceptual framework

Schooling decisions can be characterized by parental decisions that are based on net marginal returns to schooling. We can think of children that are enrolled having positive net marginal returns to schooling while net marginal returns are negative for those that are not enrolled. Moreover, at the time of enrollment, some children start with relatively high positive net marginal returns while others start with (positive) net marginal returns that are just at the margin and, furthermore, net marginal returns are such that they are increasing with school performance.

When a child's school performance is revealed to be low, as a consequence of poor vision among other things, perceived net marginal returns may become negative, which is more likely so for children whose net marginal returns were just at the margin at the time of enrollment. Depending on perceived marginal returns to schooling parents will then decide about the child's continued education; parents will keep the child in school if net marginal returns are perceived to be still positive, or else withdraw the child from school.

Low school performance, as a consequence of poor vision among others, increases the likelihood of non-promotion which in turn increases the likelihood of dropout and repetition. If a child is not promoted to the next grade, parents may allow the child to repeat a grade or withdraw the child from school, depending on the perceived net marginal returns to education. Grade repetition may lead to lower dropout in the future if it enhances subsequent learning achievement which in turn increases net marginal returns to education. However, grade repetition may also be a precursor to dropout. Retained students are taken out of their social group which may be detrimental to their motivation; they might be mocked by their old

and new peers and struggle harder to be socially accepted because they are older. Thus, whether poor eyesight operating through grade repetition leads to more or less subsequent dropout is not clear from a conceptual point of view. Nevertheless, as poor vision increases the probability of non-promotion to the next grade, I expect visually impaired children to be more likely to repeat at grade.

The model suggests that parents respond to poor performance at school differently based on the 'type' of the child. Households may have beliefs about net marginal returns being different for boys and girls. If net marginal returns to education for girls are perceived to be lower than for boys, then, on average, at the time of enrollment girls will start with perceived net returns that are lower than boys' returns. If performance at school is revealed to be poor, girls will be at higher risk of dropping out because girls' perceived net marginal returns to education will be more likely to be negative.

Hence, in this paper I formulate the following testable hypotheses:

(i) Poor vision leads to higher probability of dropout.

(ii) Poor vision leads to higher probability of repeating a grade.

(iii) As a consequence of poor vision, girls are more at risk of dropping out than boys.

3.3 Data and descriptive analysis

The data used in this paper come from a survey conducted in 2010 by the United Nations World Food Programme (WFP) Country Office Ethiopia and the University of Mannheim involving school catchment areas in food-insecure woredas (districts)

in the four major regions of Ethiopia (Amhara, Oromia, SNNPR and Tigray).[3] Employing a two-stage sampling design, the survey sampled 200 school catchment areas in the four regions of the country stratified by highland and pastoral areas (see Table 3.1).[4] The second-stage sampling entailed sampling of ten children aged 7 to 13 years per school catchment area who were either enrolled in school or not at the time of the survey. This design feature of the survey allows for a richer analysis than surveys that are based on the school only. It allows to investigate relationships within the school service area, circumventing selection problems associated with children enrolled in school based on unobserved characteristics. Only students enrolled in grades 2 to 4 were included. The survey provides information on health, education, learning, and child and household characteristics for close to 2000 children.

Table 3.1: Distribution of school catchment areas

	Program	Non-Program	Phase-out	All
Amhara highland	14	17	16	47
Oromia highland	14	14	12	40
Oromia pastoralist	12	13	7	32
Tigray highland	14	16	9	39
SNNPR highland	10	12	0	22
SNNPR pastoralist	5	5	0	10
Subtotal highland	52	59	37	148
Subtotal pastoralist	17	18	7	42
Total	69	77	44	190

In this paper, the analysis is conducted separately for the highland and the pastoralist areas of Ethiopia. The rationale to use these subsamples rather than the

[3]The original purpose of the survey was to study the impact of WFP's school feeding program on attendance and learning achievement including attention span and cognitive development. See Chapter II in this dissertation and Haile et al. (2011).

[4]In Tigray and Amhara, WFP's school feeding is operational in highland areas only. Overall, the survey aimed to achieve the inclusion of one-third feeding schools (program schools), one-third schools that had been phased out from the program and one-third non-program schools. In SNNPR phase-out schools were not included, resulting in one-half program and one-half non-program sampled school catchment areas in that region.

whole sample is based on the argument that highland and pastoralist areas are rather dissimilar in terms of education. In particular, pastoralist areas generally exhibit lower enrollment rates and higher gender disparity, with some improvement in the recent past.[5] Since the study uses a measure of dropout that depends on past school enrollment, school service areas with lower enrollment will by construction have a lower dropout prevalence. Furthermore, this study is based on a sample which includes current and former school feeding service areas. Feeding schools in pastoral school service areas provide take-home rations conditional on girls' attendance in addition to on-site school meals. Highland feeding schools do not offer such take-home rations. Since this study examines the effect of poor eyesight along gender lines, pooling highland and pastoral school catchment areas is not advisable. The study is interested in the effect of poor eyesight on educational outcomes conditional on children being enrolled in school, except for dropout for which I use current and former students in the analysis.

To measure scholastic performance, I use test scores on children's reading, writing and arithmetic skills.[6] Children were tested regardless whether they were enrolled in school. For reading, children were asked to read pre-prepared letters, words and sentences. In the writing test, children were asked to write down pre-prepared sentences that the interviewer read aloud. Children were also tested on their arithmetic skills using up to three different arithmetic questions. In all three cases, two different versions of the tests were administered depending on the age of the children involved – one set for children between the ages of 7 and 10 years and a more difficult set for children between the ages of 11 and 13 years.

[5]See also Ministry of Education (2011).

[6]The survey adapted tests on reading, writing and arithmetic skills from the Young Lives project, a longitudinal study conducted in four countries (Peru, Ethiopia, India and Vietnam).

To measure children's cognitive skills, I use the Raven's Standard Progressive Matrices (SPM) test. The major benefit of this test is that no formal schooling is required to solve the questions. The test is a measure of problem solving ability and consists of selecting bits with different shape and design to complete matrices. The survey administered the first 25 questions of the Raven's test, including problem sets A and B.

To measure children's eyesight, I use the Landolt C vision test. Landolt C is a symbol that consists of a ring with a gap, thus looking similar to the letter C. The gap could be on the left, right, bottom, or top of the ring. A table with 12 rows of gradually smaller symbols was placed in front of the child. The child was then asked to indicate the position of the gap. The first row corresponds to 10 percent of normal eyesight coded as 0.1, the second row to 20 percent of normal eyesight coded as 0.2 and so on. If the child could read the 10th row, this corresponds to normal eyesight coded as 1.0. If the child could read beyond the 10th row, this corresponds to 150 percent (11th row coded as 1.5) and 200 percent (12th row coded as 2.0) of normal eyesight, respectively. The test was conducted separately for the left and the right eye and, if the child wore glasses, separately with and without glasses.

I define poor eyesight as visual acuity score below 0.9 or, alternatively, 0.8 in one or both eyes.[7] Table 3.2 shows poor eyesight by age and student status. The share of children with poor eyesight defined by a visual acuity score below 0.9 is 28 percent and 16 percent if poor eyesight is defined by visual acuity below 0.8 in one or both eyes. Virtually no children wore glasses.

[7]The visual acuity cutoff point 0.9 is in accordance with Glewwe et al. (2012) who chose their cutoff point based on acceptance of offered eyeglasses. In their study, acceptance was poor among children with a visual acuity score of 0.9. However, a majority of children with a visual acuity score of less than 0.9 accepted the glasses.

Table 3.2: Poor eyesight by enrollment status and age

	Acuity < 0.8	Acuity < 0.9	N
Current and former students			
7 years	0.14	0.31	49
8 years	0.17	0.31	252
9 years	0.16	0.27	283
10 years	0.14	0.26	455
11 years	0.20	0.28	148
12 years	0.18	0.30	210
13 years	0.17	0.22	184
All	0.16	0.27	1591
Non-students			
7 years	0.20	0.37	75
8 years	0.16	0.26	73
9 years	0.16	0.28	32
10 years	0.16	0.34	38
11 years	0.07	0.29	14
12 years	0.00	0.17	24
13 years	0.17	0.22	23
All	0.16	0.30	285
All children			
7 years	0.18	0.35	124
8 years	0.17	0.30	325
9 years	0.16	0.27	315
10 years	0.14	0.27	493
11 years	0.19	0.28	162
12 years	0.16	0.28	234
13 years	0.17	0.22	207
All	0.16	0.28	1876

Angle and Wissmann (1980) argue that vision can be affected by individuals' activities, in particular how much time they spent doing 'near-work'. Near-work activities, such as reading, are likely to be correlated with schooling outcomes potentially making inference on the relationship between eyesight and schooling outcomes spurious. Students' vision may suffer from reverse causality as children who study more will have their eyesight deteriorate faster. Refractive development is a dynamic process. During infancy and early childhood, the variability of refractive error decreases progressively. Before start-of-school age, most children are functionally emmetropic. Thereafter, the distribution of refractive error gradually shifts to more myopia with increasing age, the incidence of myopia reaching its peak at around 9-12 years of age (Wojciechowski, 2011). However, it remains uncertain to which extent near-work activities contribute to the shift towards more myopia with increasing age.

Table 3.2 is also informative about the relationship between poor eyesight and age by enrollment status. For current and former students, the correlation between poor vision and age is positive and insignificant ($r = 0.01$, $p = 0.59$) if poor eyesight is defined by a visual acuity of less than 0.8 in one or both eyes. For never enrolled children, the correlation is also positive and insignificant ($r = 0.01$, $p = 0.9$). If poor eyesight is defined by a visual acuity of less than 0.9 in one or both eyes, for current and former students, the correlation between poor vision and age is negative and insignificant ($r = -0.03$, $p = 0.21$). For never enrolled children, the correlation is also negative and insignificant ($r = -0.02$, $p = 0.68$). In sum, I do not find evidence for a correlation between poor vision and age for current and former students.[8]

Additionally, Table 3.3 presents correlations between age and vision controlling for confounding factors. Vision is scaled from 0.1 to 1.0 with values capped at 1.0.

[8]Neither do I find evidence for a correlation between poor vision and age if I restrict the sample to currently enrolled students.

Table 3.3: Dependent variable: Vision

	Current and former students			Never-enrolled students		
	All	Highland	Pastoral	All	Highland	Pastoral
Child age	0.001	0.000	0.004	-0.004	-0.007	0.009
	(0.003)	(0.003)	(0.007)	(0.007)	(0.009)	(0.012)
Child sex male	-0.006	0.002	-0.032	-0.024	-0.034	-0.000
	(0.008)	(0.009)	(0.020)	(0.026)	(0.030)	(0.053)
One parent went to school	0.004	-0.009	0.055**	-0.007	0.005	-0.045
	(0.010)	(0.011)	(0.022)	(0.036)	(0.040)	(0.075)
Both parents went to school	0.024*	0.010	0.066**	0.007	0.057	-0.100
	(0.012)	(0.014)	(0.028)	(0.063)	(0.080)	(0.097)
Male headed household	-0.014	-0.001	-0.054**	-0.050	-0.057	-0.113
	(0.012)	(0.013)	(0.024)	(0.043)	(0.058)	(0.085)
Wealth index[1]	0.088**	0.080	0.119	0.013	-0.052	0.108
	(0.044)	(0.050)	(0.080)	(0.118)	(0.160)	(0.154)
Livestock index[1]	0.092	0.149	0.080	-0.134	0.675	-1.095
	(0.142)	(0.158)	(0.288)	(0.505)	(0.519)	(1.132)
Number of children in hh	0.000	0.001	-0.004	0.006	0.007	0.003
	(0.003)	(0.003)	(0.008)	(0.007)	(0.009)	(0.016)
School fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.010	0.009	0.052	0.021	0.047	0.113
N	1410	1095	315	263	185	78

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
[1] The wealth index and livestock index are defined on page 53 f.

The first three columns use current and former students while the last three columns use never enrolled children. Results presented in Table 3.3 confirm the findings from the simple correlations. I do not find evidence for a correlation between age and eyesight.

Tables 3.4 and 3.5 present means of outcome variables by visual impairment status in highland and pastoralist areas, respectively. Dropout is a dummy variable that is one if a currently non-enrolled child attended school in the past and zero if the child is currently enrolled. Grade repetition is also a dummy variable indicating whether a student repeated a grade in the past, conditional on being a student. I use this variable to investigate the likelihood of repeating a grade conditional on being enrolled. Unfortunately, I am not able to investigate grade repetition among current *and* former students as for the former students I lack the information of whether they

Table 3.4: Summary statistics (means) of outcome variables in highland sample by visual impairment

	< 0.8	≥ 0.8	p-value	< 0.9	≥ 0.9	p-value
Both sexes						
Never enrolled	0.10	0.14	0.09	0.13	0.14	0.85
Dropout	0.10	0.06	0.04	0.09	0.06	0.14
Grade repetition	0.12	0.11	0.69	0.09	0.11	0.39
Cognitive test	13.29	13.23	0.83	13.45	13.17	0.24
Reading	0.45	0.45	1.00	0.45	0.45	0.86
Writing	0.64	0.67	0.44	0.60	0.68	0.01
Math	0.36	0.50	0.00	0.41	0.51	0.00
Girls						
Never enrolled	0.09	0.12	0.41	0.12	0.12	0.90
Dropout	0.10	0.05	0.08	0.07	0.05	0.46
Grade repetition	0.11	0.12	0.68	0.10	0.13	0.39
Cognitive test	13.38	13.37	0.98	13.75	13.26	0.18
Reading	0.47	0.40	0.22	0.41	0.41	0.96
Writing	0.61	0.67	0.25	0.60	0.68	0.08
Math	0.36	0.50	0.01	0.38	0.51	0.01
Boys						
Never enrolled	0.10	0.16	0.14	0.15	0.15	0.85
Dropout	0.11	0.07	0.19	0.10	0.07	0.21
Grade repetition	0.13	0.09	0.32	0.09	0.10	0.76
Cognitive test	13.21	13.12	0.81	13.22	13.10	0.69
Reading	0.43	0.49	0.28	0.49	0.48	0.86
Writing	0.66	0.66	0.97	0.60	0.68	0.04
Math	0.36	0.51	0.01	0.43	0.50	0.09

The p-value stems from a t-test of means comparison.

repeated a grade. As argued in Section 3.2, grade repetition and dropout are likely to be interdependent. If grade repetition eventually leads to dropout, then grade repetition will be systematically underestimated as these children are only recorded as dropouts but not as repeaters.

In highland areas, Table 3.4 shows a higher incidence of children with poor eyesight experiencing dropout than with normal eyesight. Children with poor eyesight are less often never-enrolled compared to children with normal eyesight. Cognitive skills are measured on a scale between 0 and 25, indicating how many questions

Table 3.5: Summary statistics (means) of outcome variables in pastoral sample by visual impairment

	< 0.8	≥ 0.8	p-value	< 0.9	≥ 0.9	p-value
Both sexes						
Never enrolled	0.25	0.19	0.19	0.23	0.19	0.34
Dropout	0.01	0.03	0.16	0.01	0.04	0.08
Grade repetition	0.08	0.13	0.24	0.11	0.13	0.63
Cognitive test	11.24	11.40	0.63	11.41	11.32	0.75
Reading	0.38	0.39	0.91	0.38	0.39	0.79
Writing	0.51	0.55	0.52	0.51	0.57	0.27
Math	0.52	0.39	0.01	0.52	0.35	0.00
Girls						
Never enrolled	0.25	0.18	0.32	0.23	0.18	0.40
Dropout	0.00	0.03	0.18	0.00	0.04	0.06
Grade repetition	0.10	0.16	0.34	0.15	0.14	0.83
Cognitive test	11.13	11.46	0.47	11.38	11.37	0.99
Reading	0.35	0.31	0.57	0.36	0.30	0.41
Writing	0.42	0.54	0.14	0.43	0.56	0.10
Math	0.58	0.37	0.01	0.54	0.35	0.01
Boys						
Never enrolled	0.25	0.19	0.41	0.22	0.20	0.62
Dropout	0.02	0.03	0.50	0.02	0.04	0.52
Grade repetition	0.07	0.10	0.51	0.07	0.11	0.35
Cognitive test	11.34	11.35	0.99	11.44	11.26	0.68
Reading	0.40	0.46	0.46	0.39	0.48	0.21
Writing	0.60	0.56	0.63	0.57	0.57	1.00
Math	0.47	0.40	0.33	0.49	0.35	0.05

The p-value stems from a t-test of means comparison.

were correctly answered. Visually impaired children (using a cutoff acuity of 0.9) in highland areas have a mean score of 13.45.[9] Finally, reading, writing and math are dummy variables indicating whether a child could read a word, write a simple sentence and do basic calculations, respectively. Table 3.4 shows that visually impaired children perform worse in math and writing compared to children with normal eyesight.

In pastoralist areas, Table 3.5 shows that dropout is generally small among children with poor eyesight, while the share of never-enrolled children is high. Performance in math is superior among children with poor eyesight. As discussed above, several studies find a positive correlation between visual impairment and learning achievement, children who spent more time on near-work activities may have their eyesight deteriorate faster, which is one explanation why visually impaired children may perform better in math.

Comparing Tables 3.4 and 3.5, dropout and never-enrolled status follow different patterns across the two livelihood areas. In highland areas, dropout is larger among children with poor eyesight and they are less often never-enrolled than children with normal eyesight. In pastoralist areas, I find smaller dropout among children with poor eyesight and they are more often never-enrolled than children with normal eyesight.

Table 3.6 presents simple comparisons of means of covariates used in the analysis by visual impairment. The wealth index is defined following Woldehanna et al. (2008). In particular, the wealth index is defined as an unweighted average of services and consumer durables. Services include availability of a pit toilet, whether the household uses a certain type of fuel (kerosene, paraffin or gas) for cooking, as

[9]In pastoralist areas, children with a visual acuity of less than 0.9 have a mean sore of 11.41. Generally, children in pastoralist areas score lower than in the highland areas (see Table 3.5).

Table 3.6: Summary statistics (means) of control variables by visual impairment

	< 0.8	≥ 0.8	p-value	< 0.9	≥ 0.9	p-value
Highland						
Child characteristics						
Male	0.51	0.56	0.24	0.57	0.54	0.43
Chronic illness	0.10	0.04	0.00	0.07	0.04	0.04
Age	10.16	10.01	0.27	9.99	10.04	0.67
Young child (age ≤ 10)	0.59	0.67	0.04	0.64	0.66	0.51
Household characteristics						
Number of children	3.63	3.77	0.26	3.84	3.73	0.26
Neither parent attended school	0.59	0.60	0.85	0.58	0.60	0.50
Male headed household	0.80	0.84	0.20	0.84	0.83	0.78
Wealth index	0.25	0.27	0.06	0.26	0.27	0.09
Livestock index	2.31	2.76	0.12	2.43	2.78	0.14
Food shortage occurs often	0.31	0.22	0.01	0.26	0.23	0.14
Pastoral						
Child characteristics						
Male	0.54	0.51	0.63	0.54	0.50	0.41
Chronic illness	0.07	0.06	0.65	0.06	0.07	0.62
Age	9.78	9.77	0.97	9.65	9.87	0.21
Young child (age ≤ 10)	0.75	0.71	0.51	0.77	0.69	0.06
Household characteristics						
Number of children	4.43	4.34	0.61	4.37	4.35	0.90
Neither parent attended school	0.68	0.64	0.44	0.71	0.61	0.02
Male headed household	0.90	0.87	0.32	0.91	0.85	0.06
Wealth index	0.29	0.33	0.01	0.30	0.34	0.01
Livestock index	4.31	5.83	0.12	4.57	6.06	0.09
Food shortage occurs often	0.32	0.35	0.67	0.32	0.36	0.41

The p-value stems from a t-test of means comparison.

opposed to firewood or cow dung, and whether water is piped into own dwelling, plot or yard. Consumer durables include radio, bicycle, cell phone, modern bed, chair and table. I define the livestock index as the weighted average over cattle, donkeys/horses, goats/sheeps and poultry using tropical livestock units as weights.

In highland areas, children with poor eyesight, defined by visual acuity of less than 0.8 in at least on eye, suffer more often from a chronic illness than children with normal eyesight. Visually impaired children live in households with a smaller

livestock index. In addition, children with poor eyesight (visual acuity < 0.8) live more often in households with self-reported food shortages occurring frequently than children with normal eyesight. In pastoralist areas, children with poor eyesight live in households with a smaller wealth index than children with normal eyesight. In addition, the fraction of neither parent having attended school is larger among children with poor eyesight (visual acuity < 0.9) than among children with normal eyesight. Children with poor eyesight (visual acuity < 0.9) live in households with a smaller livestock index.

Comparing highland and pastoralist children in terms of household characteristics (see Table 3.14 in the Appendix), pastoralist children's households have more children, a larger fraction with neither parent having attended school, are more often headed by a male household member, have a larger wealth and livestock index, and report more often to have food shortages occurring frequently.

3.4 Empirical specification and results

3.4.1 Empirical specification

This paper is interested in identifying the effect of poor vision on schooling outcomes. However, health is correlated with family and individual characteristics many of which are not observed by the econometrician. The reduced form regression to be estimated is:

$$y_{is} = \mathbf{X}'_{is}\delta + \beta PV_{is} + \eta_s + \epsilon_{is}, \tag{3.1}$$

I estimate the effect of individual i's poor vision PV_{is} who lives in school catchment area s on her outcome y_{is} using the fixed-effects model. $\mathbf{X}_{is}$ is an individual and household specific vector of controls, η_s is a school fixed effect and ϵ_{is} is the error term.

I control for household and individual characteristics to account for possible correlation between eyesight and the error term. For example, I do not observe individual (mal)nutrition – a variable that is likely to be correlated with eyesight. However, I do observe household and individual characteristics that *inter alia* determine how well an individual is able to cope with shocks to food availability. Furthermore, controlling for wealth is mandated as wealthy households are more likely to invest more in both health and education relative to poor households.

In the learning achievement related regressions, I control for whether a child is aged between 7 and 10 years (a dummy variable) because the survey administered different tests for younger and older children, except for the Raven's test which was administered irrespective of age. In small samples the distribution of younger children might be unequal across visual impairment status.

The data at hand allow me to control for chronic diseases that the child might have. This is relevant because chronic conditions might be correlated with poor eyesight.[10]

In all regressions, I use school fixed effects which allow me to focus on within school catchment area variation. Furthermore, I use robust standard errors corrected for school catchment area cluster effects. Estimations for binary dependent variables are based on the linear probability model.

While I acknowledge that the non-experimental and cross-sectional nature of the data does not allow me to rule out correlation between visual impairment and the error term, the strength of these data is their broad geographical coverage within Ethiopia, as the data cover high-poverty districts of the four major regions of the

[10]However, this measure might actually include poor vision as households may perceive poor vision as a chronic condition. I therefore reran all regressions without this control variable. Changes in results are only minor.

country. Other studies, e.g. Glewwe et al. (2012), attain stronger internal validity but are more local in scale. The results obtained in this study provide some noteworthy correlations that have not been looked at so far and may form the basis of future studies.

3.4.2 Results

I first present results with respect to educational attainment and then proceed to results on the effect of poor eyesight on cognitive development and learning achievement.

Educational attainment

Table 3.7 presents results on dropout for girls and boys by livelihood area. Columns 1 and 2 show results for highland areas, while columns 3 and 4 show results for pastoralist areas.

In highland areas, I find poor eyesight to have a positive effect on dropout for girls. This effect is substantial. When their vision is poor, girls are 6.1 percentage points (s.e.= 3.2%) more likely to drop out. For comparison, Gomes-Neto et al. (1997) report an 8.6 percentage points higher probability of dropout. On the other hand, boys do not appear to have a higher probability of dropout when their eyesight is poor.

In pastoralist areas, the effect of poor eyesight on dropout appears to be negative for girls, as I find girls to be 7.9 percentage points (s.e.= 3.2%) less likely to drop out. It is worth noting that the results on dropout presented in this paper constitute a lower bound for the effect of poor eyesight. As I expect the correlation between poor eyesight and study time to be positive and the correlation between study time

Table 3.7: Dependent variable: Dropout (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	0.061*	0.047	-0.079**	0.004
	(0.032)	(0.029)	(0.032)	(0.035)
Child has chronic illness	0.109	-0.108***	0.077	0.127
	(0.077)	(0.034)	(0.084)	(0.109)
Child age	0.010	0.035***	0.010	0.004
	(0.008)	(0.010)	(0.007)	(0.009)
Food shortage often	0.060**	0.044	0.029	0.014
	(0.029)	(0.028)	(0.021)	(0.035)
Neither parent went to school	0.027	0.011	0.047	-0.036
	(0.025)	(0.029)	(0.056)	(0.030)
Male headed household	-0.078*	0.011	-0.080	-0.056
	(0.042)	(0.040)	(0.058)	(0.068)
Wealth index	-0.163	-0.046	0.014	-0.135
	(0.102)	(0.088)	(0.155)	(0.119)
Livestock index	0.008	0.002	-0.000	-0.000
	(0.005)	(0.003)	(0.001)	(0.002)
Number of children in hh	-0.014*	-0.000	-0.002	0.033*
	(0.008)	(0.010)	(0.008)	(0.017)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.097	0.059	0.156	0.104
N	552	637	156	161

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

and dropout to be negative, the estimates of the effect of poor eyesight on dropout will be biased downward, implying that the 'true' effect is more positive.

Table 3.8 shows results on never-enrollment. From a conceptual point of view, it is not clear whether parents are more likely to enroll a child that has normal eyesight as opposed to a child with poor eyesight. According to the conceptual framework outlined in Section 3.2, parents base their educational decisions on the marginal returns to education net of of marginal costs. Consequently, parents may perceive a child with poor eyesight to have lower opportunity costs as she may be considered to be unfit for certain tasks, such a herding. On the other hand, parents may expect a visually impaired child to do less well in school and therefore perceive the marginal benefits to be lower.

Table 3.8: Dependent variable: Never enrolled (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.026	-0.025	-0.037	-0.091
	(0.035)	(0.037)	(0.074)	(0.064)
Child has chronic illness	-0.009	0.064	-0.112	0.035
	(0.049)	(0.075)	(0.106)	(0.143)
Child age	-0.033***	-0.045***	-0.073***	-0.092***
	(0.010)	(0.010)	(0.024)	(0.018)
Food shortage often	-0.030	0.051*	-0.122*	0.060
	(0.029)	(0.030)	(0.064)	(0.078)
Neither parent went to school	0.089***	0.014	0.245***	0.173**
	(0.028)	(0.027)	(0.068)	(0.085)
Male headed household	-0.007	0.060	-0.014	-0.074
	(0.043)	(0.043)	(0.101)	(0.136)
Wealth index	-0.186	-0.268**	-0.428	-0.380
	(0.115)	(0.110)	(0.266)	(0.262)
Livestock index	0.002	0.002	-0.000	0.009**
	(0.003)	(0.004)	(0.002)	(0.004)
Number of children in hh	0.017	-0.010	0.006	0.039**
	(0.012)	(0.010)	(0.020)	(0.017)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.059	0.067	0.187	0.244
N	622	749	195	198

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

In Table 3.8, I do not find an effect of poor eyesight on a child being never-enrolled. One explanation is that lower perceived opportunity costs and marginal benefits may balance out on average. The findings on the other covariates are in line with expectations. The negative coefficient on the child's age suggests that children are less likely to be never-enrolled with increasing age, which is consistent with the general fact that many children enter school at an age that is larger than the official school entry age. Children with lower educational household background are more likely to be never-enrolled and children from wealthier households are less likely to be never-enrolled.

Table 3.9 presents results on grade repetition. Estimates on grade repetition are conditional on being enrolled, i.e. based on a sample of current students. I do not find an effect of poor eyesight on grade repetition. It should be noted that

Table 3.9: Dependent variable: Repeated grade (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.026	-0.019	0.020	-0.008
	(0.039)	(0.029)	(0.065)	(0.078)
Child has chronic illness	0.046	0.022	0.118	0.168*
	(0.137)	(0.076)	(0.104)	(0.088)
Child age	0.054***	0.027***	-0.000	0.018
	(0.012)	(0.009)	(0.020)	(0.019)
Food shortage often	0.012	0.059	0.085	0.099
	(0.041)	(0.044)	(0.081)	(0.078)
Neither parent went to school	-0.093***	-0.042	-0.139*	-0.029
	(0.035)	(0.031)	(0.078)	(0.051)
Male headed household	-0.007	0.019	-0.181	0.027
	(0.061)	(0.038)	(0.117)	(0.058)
Wealth index	-0.013	-0.226*	-0.255	0.268
	(0.124)	(0.124)	(0.259)	(0.182)
Livestock index	-0.005	0.000	0.004	-0.003
	(0.010)	(0.003)	(0.003)	(0.006)
Number of children in hh	-0.002	0.021**	0.037	-0.012
	(0.009)	(0.010)	(0.029)	(0.013)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.081	0.056	0.111	0.091
N	513	576	151	156

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

selection bias is expected to play a more important role, changing the pool of students potentially based on unobservables, in a sample that is restricted to current students. As mentioned above, I am not able to investigate grade repetition among current *and* former students as for the former students I lack the information of whether they repeated a grade.

Overall, the results are suggestive that girls face a higher likelihood of dropout when their eyesight is poor as opposed to boys who may continue their education despite poor eyesight. These findings are consistent with a theory about households making schooling decisions on perceived net marginal returns to education as was argued in Section 3.2. Neither girls nor boys appear to be more likely to repeat a grade when their eyesight is poor.

Cognitive development and learning achievement

Results on cognitive development and learning achievement presented in Tables 3.10 to 3.13 are based on regressions using the sample of currently enrolled children.

Table 3.10 shows positive impact on cognitive skills, though only for highland boys I find this effect to be statistically significant at the 10% level. As mentioned above, enrollment, through time spent on near-work activities, may contribute to poor eyesight. The resulting bias will be positive, if the correlation between poor eyesight and enrollment[11] is positive and there is a positive correlation between enrollment and cognitive development. While generally the effect of poor eyesight is expected to be negative, e.g. due to difficulties of reading from the blackboard, because cognitive skills are a more general concept, the ability of reading from the blackboard may be considered to be less crucial for cognitive skills than e.g. for reading skills.

Turning to reading skills, Table 3.11 presents results on whether children are able to read a word – a simple word for children aged 7-10 and a more difficult one for children aged 11-13.[12] Although the coefficient on poor eyesight is negative – except for pastoralist girls –, it is never statistically significant.

Table 3.12 shows results on writing. I find the effect of poor eyesight to be negative for girls and boys in highland and pastoralist areas, though not statistically significant. As Table 3.7 showed a positive effect of poor eyesight on girl's dropout in highland areas, the two findings combined tentatively suggest that worse school performance leads to larger dropout. Ideally, I would include learning achievement,

[11]Enrollment can be used as a proxy for near-work activities, in particular study time.

[12]Because the two test variants may be unbalanced across visual impairment status, the regressions include a dummy that is one if the child was between 7 and 10 years old (it is zero if the child was between 11 and 13 years old).

Table 3.10: Dependent variable: Cognitive skills (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	0.605	0.663*	0.109	0.715
	(0.400)	(0.357)	(0.462)	(0.629)
Child has chronic illness	0.840	-0.411	0.352	-1.498*
	(0.957)	(0.878)	(1.012)	(0.874)
Child age	0.239**	0.149	0.262*	0.196
	(0.104)	(0.102)	(0.155)	(0.181)
Food shortage often	-0.578	0.063	-0.141	0.640
	(0.382)	(0.438)	(0.422)	(0.727)
Neither parent went to school	-0.466	-0.750**	0.055	-0.740
	(0.418)	(0.361)	(0.573)	(0.574)
Male headed household	0.023	-0.440	0.545	-0.680
	(0.510)	(0.506)	(0.754)	(1.099)
Wealth index	-1.286	-0.835	1.712	2.218
	(1.521)	(1.291)	(2.477)	(2.047)
Livestock index	-0.011	0.068	-0.003	0.104**
	(0.082)	(0.058)	(0.011)	(0.043)
Number of children in hh	-0.023	0.091	-0.217	-0.216
	(0.111)	(0.107)	(0.132)	(0.144)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.032	0.028	0.072	0.106
N	496	551	143	149

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

such as writing, in the dropout regressions. However, as learning achievement itself is an outcome of poor eyesight, it is not feasible to condition on learning achievement in a regression of poor eyesight on dropout. Hence, I am not able to test the hypothesis that worse learning achievement, as a consequence of poor eyesight, increases the probability of dropout. However, the two findings combined are consistent with a theory outlined in Section 3.2.

Table 3.13 presents results on arithmetic skills. I do not detect impact of poor eyesight.

3.4.3 Robustness check

I reran all regressions using poor eyesight defined as visual acuity below 0.8 in at least one eye. Results are shown in Tables 3.15-3.21 in the Appendix.

Table 3.11: Dependent variable: Reading (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.049	-0.049	0.123	-0.042
	(0.065)	(0.052)	(0.112)	(0.105)
Child has chronic illness	-0.093	-0.092	-0.071	-0.257
	(0.106)	(0.096)	(0.156)	(0.303)
Child age	0.080***	0.066***	-0.004	0.097
	(0.021)	(0.021)	(0.067)	(0.075)
Young child (age $\leq$ 10)	0.255***	0.007	-0.188	0.174
	(0.076)	(0.073)	(0.211)	(0.231)
Food shortage often	0.024	-0.043	-0.041	0.008
	(0.044)	(0.053)	(0.094)	(0.115)
Neither parent went to school	-0.018	-0.025	-0.041	-0.305***
	(0.048)	(0.038)	(0.156)	(0.106)
Male headed household	-0.025	0.018	-0.053	-0.081
	(0.053)	(0.059)	(0.175)	(0.154)
Wealth index	-0.002	0.129	0.385	0.844**
	(0.181)	(0.180)	(0.465)	(0.407)
Livestock index	0.001	-0.009	-0.003	0.018**
	(0.015)	(0.008)	(0.004)	(0.008)
Number of children in hh	0.006	-0.019	0.009	-0.032
	(0.017)	(0.015)	(0.039)	(0.028)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.041	0.071	0.044	0.180
N	509	573	149	151

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.12: Dependent variable: Writing (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.079	-0.032	-0.051	-0.118
	(0.048)	(0.040)	(0.118)	(0.097)
Child has chronic illness	0.019	-0.076	0.066	-0.217
	(0.032)	(0.096)	(0.154)	(0.187)
Child age	0.046**	0.046**	-0.058	-0.064
	(0.021)	(0.021)	(0.065)	(0.048)
Young child (age $\leq$ 10)	0.196***	0.145**	-0.375*	-0.198
	(0.075)	(0.072)	(0.221)	(0.171)
Food shortage often	0.038	0.082*	0.070	-0.018
	(0.044)	(0.048)	(0.103)	(0.112)
Neither parent went to school	-0.070	-0.015	0.066	-0.008
	(0.043)	(0.040)	(0.113)	(0.098)
Male headed household	-0.076	-0.077	-0.147	0.328*
	(0.056)	(0.049)	(0.149)	(0.182)
Wealth index	0.127	0.163	-0.085	0.170
	(0.161)	(0.156)	(0.409)	(0.372)
Livestock index	-0.003	-0.003	0.009	0.018***
	(0.009)	(0.008)	(0.006)	(0.005)
Number of children in hh	0.010	-0.017	-0.002	-0.033
	(0.015)	(0.016)	(0.036)	(0.032)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.046	0.035	0.096	0.132
N	509	573	149	151

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.13: Dependent variable: Math (cutoff acuity: 0.9)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.046	-0.011	0.120	0.079
	(0.056)	(0.059)	(0.096)	(0.103)
Child has chronic illness	0.080	0.041	-0.307**	-0.262
	(0.101)	(0.120)	(0.137)	(0.209)
Child age	0.080***	0.048*	-0.029	0.075
	(0.023)	(0.027)	(0.051)	(0.061)
Young child (age $\leq$ 10)	0.699***	0.462***	0.213	0.753***
	(0.082)	(0.093)	(0.188)	(0.162)
Food shortage often	-0.059	-0.129**	0.138	-0.059
	(0.056)	(0.060)	(0.086)	(0.119)
Neither parent went to school	0.014	-0.018	0.048	-0.140
	(0.052)	(0.057)	(0.108)	(0.101)
Male headed household	-0.125**	-0.101	0.011	0.287***
	(0.058)	(0.072)	(0.111)	(0.106)
Wealth index	0.039	0.134	0.049	0.218
	(0.218)	(0.176)	(0.345)	(0.351)
Livestock index	-0.001	-0.003	-0.001	0.009
	(0.012)	(0.007)	(0.004)	(0.007)
Number of children in hh	0.003	0.002	-0.038	-0.047
	(0.016)	(0.017)	(0.031)	(0.033)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.251	0.103	0.153	0.346
N	509	570	149	151

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.15 presents results on dropout. The effect of poor eyesight is now larger in magnitude for highland girls and less negative for girls in pastoralist areas. When their vision is poor, I find girls in highland areas to be 8 percentage points (s.e.= 4%) more likely to drop out. The stronger effect in terms of magnitude is as expected, since worse eyesight should result in larger dropout. I do not detect impact for boys. Table 3.16 shows results on never-enrollment. I do not detect impact of poor eyesight on a child being never enrolled. According to Table 3.17, poor eyesight is negatively related to grade repetition for pastoralist girls who appear to be 12.4 percentage points (s.e.= 5.7%) less likely to repeat a grade. Table 3.18 shows positive effect on cognitive skills for boys and girls in highland areas, suggesting that visually impaired highland boys score 1 point (s.e.= 0.43) and girls score 0.85 points (s.e.= 0.51) higher. The score has a mean of 13.21 and 13.38 (see Table 3.4) and a standard deviation of 4.1 and 3.9 (not shown) among visually impaired highland boys and girls, respectively. Table 3.19 suggests that poor eyesight adversely affects boys' reading skills in highland areas. They are 13.9 percentage points (s.e.= 6%) less likely to be able to read a word. Table 3.20 shows results on writing. I find girls in highland areas to be 8.9 percentage points (s.e.= 4.9%) less likely to be able to write. Results presented in Table 3.21 suggest that highland boys' math skills are adversely affected by poor eyesight. Visually impaired highland boys are 14.5 percentage points (s.e.= 6.8%) less likely to be able to solve a simple arithmetic problem.

Overall, the results from the regressions using poor eyesight defined as visual acuity below 0.8 in one or both eyes confirm the previous results which suggest that girls face a higher likelihood of dropout when eyesight is poor. There is some evidence that boys are kept in school, despite performance being lower due to poor eyesight, as I still do not find an effect of poor vision on dropout, while learning

achievement appears to be adversely affected. Moreover, results suggest that poor vision has an adverse effect on writing for girls. The negative impact on reading, writing and math is consistent with poor vision being more harmful with respect to learning achievement that is relatively more 'vision-intensive'.

3.5 Conclusion

Eyesight problems, which are mostly uncorrected, are prevalent among children in developing countries. However, little is known about the impact of poor vision on educational outcomes. Children loose educational opportunities if vision problems result in low grade attainment and poor academic achievement.

This paper explored the role of poor vision on educational outcomes in rural Ethiopia. I found that around 28 percent of children have poor eyesight. Of these children, virtually no child wears eyeglasses. Results showed that poor vision increases school dropout among girls. This effect is substantial. Girls that suffer from poor eyesight have, depending on the definition of poor eyesight, a 6.1 or 8 percentage points higher probability of school dropout. Results also showed that learning achievement is adversely affected by poor eyesight. The evidence is consistent with a theory in which parents make educational decisions based on net marginal returns to schooling.

This analysis is important for public policy. The evidence presented in this paper lends some support to potentially large benefits if vision were to be corrected through properly fitted eyeglasses, particularly with respect to girls' educational attainment. As low-cost eyeglasses are available, the cost-benefit ratio appears to be favourable relative to other more costly interventions that may generate similar benefits.

Appendix

Table 3.14: Summary statistics (means) of household characteristics by livelihood

	Pastoral	Highland	p-value
Number of children	4.37	3.75	0
Neither parent attended school	.66	.6	.03
Male headed household	.88	.83	.01
Wealth index	.32	.27	0
Livestock index	5.42	2.69	0
Food shortage occurs often	.34	.24	0

The p-value stems from a t-test of means comparison.

Table 3.15: Dependent variable: Dropout (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	0.080**	0.061	-0.067**	-0.002
	(0.040)	(0.041)	(0.028)	(0.031)
Child has chronic illness	0.105	-0.108***	0.093	0.128
	(0.077)	(0.035)	(0.088)	(0.108)
Child age	0.011	0.034***	0.012	0.004
	(0.008)	(0.010)	(0.008)	(0.009)
Food shortage often	0.059**	0.045	0.029	0.014
	(0.028)	(0.028)	(0.020)	(0.035)
Neither parent went to school	0.028	0.010	0.027	-0.034
	(0.024)	(0.029)	(0.053)	(0.025)
Male headed household	-0.072*	0.009	-0.092	-0.055
	(0.041)	(0.041)	(0.065)	(0.064)
Wealth index	-0.176*	-0.043	-0.015	-0.135
	(0.101)	(0.087)	(0.150)	(0.118)
Livestock index	0.008	0.002	0.000	-0.000
	(0.005)	(0.003)	(0.001)	(0.002)
Number of children in hh	-0.014*	-0.000	-0.000	0.033*
	(0.008)	(0.010)	(0.008)	(0.017)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.099	0.059	0.143	0.104
N	552	637	156	161

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.16: Dependent variable: Never enrolled (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.023	-0.050	0.010	0.005
	(0.034)	(0.040)	(0.085)	(0.057)
Child has chronic illness	-0.007	0.067	-0.105	0.033
	(0.049)	(0.076)	(0.106)	(0.142)
Child age	-0.033***	-0.045***	-0.071***	-0.087***
	(0.010)	(0.010)	(0.023)	(0.018)
Food shortage often	-0.029	0.050*	-0.118*	0.053
	(0.029)	(0.029)	(0.065)	(0.077)
Neither parent went to school	0.089***	0.015	0.235***	0.149*
	(0.028)	(0.027)	(0.062)	(0.084)
Male headed household	-0.008	0.061	-0.030	-0.096
	(0.042)	(0.043)	(0.097)	(0.135)
Wealth index	-0.181	-0.270**	-0.417	-0.370
	(0.115)	(0.110)	(0.272)	(0.260)
Livestock index	0.002	0.002	0.000	0.008**
	(0.003)	(0.004)	(0.002)	(0.004)
Number of children in hh	0.017	-0.010	0.006	0.044**
	(0.012)	(0.010)	(0.020)	(0.017)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.059	0.068	0.186	0.233
N	622	749	195	198

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.17: Dependent variable: Repeated grade (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.053	-0.005	-0.124**	-0.044
	(0.056)	(0.044)	(0.057)	(0.061)
Child has chronic illness	0.046	0.019	0.114	0.171*
	(0.136)	(0.076)	(0.099)	(0.088)
Child age	0.054***	0.027***	-0.006	0.019
	(0.011)	(0.009)	(0.019)	(0.017)
Food shortage often	0.013	0.058	0.079	0.099
	(0.041)	(0.044)	(0.075)	(0.078)
Neither parent went to school	-0.094***	-0.041	-0.113	-0.025
	(0.035)	(0.031)	(0.079)	(0.062)
Male headed household	-0.009	0.019	-0.147	0.030
	(0.061)	(0.038)	(0.117)	(0.054)
Wealth index	-0.007	-0.226*	-0.280	0.270
	(0.125)	(0.124)	(0.248)	(0.181)
Livestock index	-0.005	0.000	0.003	-0.004
	(0.010)	(0.003)	(0.003)	(0.006)
Number of children in hh	-0.002	0.021**	0.036	-0.013
	(0.009)	(0.010)	(0.029)	(0.013)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.083	0.056	0.132	0.096
N	513	576	151	156

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.18: Dependent variable: Cognitive skills (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	0.846*	0.998**	0.200	0.154
	(0.511)	(0.432)	(0.463)	(0.657)
Child has chronic illness	0.805	-0.402	0.324	-1.527*
	(0.965)	(0.866)	(1.017)	(0.844)
Child age	0.244**	0.133	0.263*	0.156
	(0.105)	(0.102)	(0.154)	(0.175)
Food shortage often	-0.590	0.072	-0.135	0.658
	(0.377)	(0.441)	(0.415)	(0.697)
Neither parent went to school	-0.457	-0.764**	0.072	-0.526
	(0.415)	(0.360)	(0.612)	(0.575)
Male headed household	0.071	-0.459	0.536	-0.523
	(0.512)	(0.502)	(0.725)	(1.139)
Wealth index	-1.450	-0.840	1.771	2.079
	(1.531)	(1.291)	(2.491)	(2.123)
Livestock index	-0.011	0.064	-0.003	0.109**
	(0.083)	(0.058)	(0.012)	(0.045)
Number of children in hh	-0.023	0.095	-0.217	-0.234
	(0.111)	(0.107)	(0.134)	(0.143)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.034	0.031	0.073	0.094
N	496	551	143	149

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.19: Dependent variable: Reading (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	0.045	-0.139**	0.035	-0.080
	(0.073)	(0.060)	(0.101)	(0.131)
Child has chronic illness	-0.089	-0.079	-0.090	-0.250
	(0.096)	(0.098)	(0.153)	(0.310)
Child age	0.080***	0.065***	-0.004	0.095
	(0.022)	(0.020)	(0.068)	(0.076)
Young child (age $\leq$ 10)	0.257***	-0.004	-0.165	0.160
	(0.075)	(0.071)	(0.219)	(0.239)
Food shortage often	0.020	-0.043	-0.042	0.006
	(0.044)	(0.052)	(0.096)	(0.116)
Neither parent went to school	-0.015	-0.022	0.002	-0.303***
	(0.047)	(0.038)	(0.141)	(0.103)
Male headed household	-0.027	0.023	-0.019	-0.082
	(0.053)	(0.058)	(0.168)	(0.154)
Wealth index	0.008	0.125	0.416	0.845**
	(0.182)	(0.178)	(0.482)	(0.402)
Livestock index	0.002	-0.009	-0.004	0.018**
	(0.015)	(0.007)	(0.004)	(0.008)
Number of children in hh	0.004	-0.020	0.006	-0.034
	(0.017)	(0.015)	(0.038)	(0.028)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.040	0.080	0.034	0.184
N	509	573	149	151

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.20: Dependent variable: Writing (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.089*	0.004	-0.082	-0.007
	(0.053)	(0.049)	(0.137)	(0.107)
Child has chronic illness	0.025	-0.083	0.075	-0.227
	(0.033)	(0.093)	(0.158)	(0.194)
Child age	0.044**	0.047**	-0.060	-0.052
	(0.021)	(0.021)	(0.065)	(0.048)
Young child (age $\leq$ 10)	0.193**	0.148**	-0.385*	-0.179
	(0.075)	(0.073)	(0.216)	(0.172)
Food shortage often	0.039	0.080*	0.067	-0.025
	(0.043)	(0.048)	(0.103)	(0.115)
Neither parent went to school	-0.071	-0.014	0.059	-0.054
	(0.043)	(0.040)	(0.112)	(0.091)
Male headed household	-0.081	-0.077	-0.146	0.297
	(0.056)	(0.050)	(0.149)	(0.187)
Wealth index	0.143	0.163	-0.115	0.192
	(0.161)	(0.158)	(0.401)	(0.382)
Livestock index	-0.004	-0.003	0.009	0.017***
	(0.009)	(0.008)	(0.006)	(0.005)
Number of children in hh	0.010	-0.017	-0.001	-0.029
	(0.015)	(0.016)	(0.036)	(0.032)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.045	0.033	0.099	0.120
N	509	573	149	151

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Table 3.21: Dependent variable: Math (cutoff acuity: 0.8)

	Highland		Pastoral	
	Girls	Boys	Girls	Boys
Poor eyesight	-0.031	-0.145**	0.106	0.028
	(0.067)	(0.068)	(0.100)	(0.101)
Child has chronic illness	0.084	0.063	-0.327**	-0.259
	(0.101)	(0.119)	(0.142)	(0.209)
Child age	0.079***	0.045*	-0.026	0.069
	(0.023)	(0.027)	(0.052)	(0.060)
Young child (age $\leq$ 10)	0.698***	0.446***	0.236	0.746***
	(0.082)	(0.093)	(0.191)	(0.163)
Food shortage often	-0.060	-0.126**	0.141	-0.055
	(0.055)	(0.059)	(0.086)	(0.119)
Neither parent went to school	0.014	-0.016	0.080	-0.115
	(0.052)	(0.058)	(0.102)	(0.091)
Male headed household	-0.128**	-0.096	0.028	0.305***
	(0.058)	(0.072)	(0.114)	(0.105)
Wealth index	0.049	0.130	0.096	0.205
	(0.216)	(0.176)	(0.348)	(0.346)
Livestock index	-0.001	-0.003	-0.002	0.010
	(0.012)	(0.007)	(0.004)	(0.007)
Number of children in hh	0.003	-0.001	-0.041	-0.049
	(0.017)	(0.017)	(0.032)	(0.032)
School fixed effects	Yes	Yes	Yes	Yes
R^2	0.250	0.112	0.150	0.342
N	509	570	149	151

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

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CHAPTER IV

The Impact of Financial Literacy Training on Risk Management, Over-indebtedness and Vulnerability

4.1 Introduction

Microfinance has been growing rapidly in recent years which has allowed more poor people to benefit from microfinance services, especially micro-credit. Yet many clients are at risk or have already become over-indebted. Development practitioners claim that loan recipients default on their loan obligations due to incapacity to manage the businesses they started and inability of businesses to earn enough profit, hence leading to business failure.

Financial literacy levels are considered to be low among households in developing countries. Financial education addresses this weakness by teaching people how to save more, spend carefully, borrow prudently, and manage their debt with discipline. The provision of financial education aims to prevent or reduce risk, in particular over-indebtedness of microfinance clients.

From the perspective of a microfinance institution, it is hoped that better skilled clients, aware of their needs, will help to adapt or modify a microfinance institution's products to make them more appropriate for its clients. Insurance and savings prod-

ucts can then be better tailored to the client's actual needs. Introducing financial literacy or entrepreneurship training, by helping to reduce business failure and increasing income and profits, may also help to avoid repayment problems. Thus, as clients are able to better manage their loans and financial flows more generally, the quality of a microfinance institution's loan portfolio improves.

Few studies have examined the role of financial education on microfinance institutions' or poor borrowers' outcomes in developing countries. Drexler et al. (2010) compare two training programs in terms of content implemented in the Dominican Republic. They find that financial literacy training based on 'rules of thumbs' is superior to more principles-based training. In India and Indonesia, Cole et al. (2011) investigate the relative importance of financial literacy and monetary incentives for the demand of financial services. While failing to find an overall effect, financial literacy education has a modest effect on the likelihood of opening a bank account for uneducated and financially illiterate households. On the other hand, monetary incentives have a much larger effect on the likelihood of opening a bank account.

A much larger number of studies investigates the role of financial literacy in *developed countries*. Lusardi and Mitchel (2007) find that households with low levels of financial literacy tend not to plan for retirement; Lusardi and Tufano (2008) find that these households borrow at higher interest rates. Participation in the stock market is also found to be lower among households with low levels of financial literacy (van Rooji et al., 2007). In a randomized experiment, Duflo and Saez (2003) find that even among highly educated staff at a United States university, encouraging individuals to attend an information fair has a strong effect on enrollment in retirement plans.

More recently, a number of impact evaluations have examined the role of business training for micro and small enterprises. These studies are based on the idea that poor management is a major constraint in developing countries.[1] In a study conducted in Peru, Karlan and Valdivia (2011) find positive impact of business training on business knowledge, practices and revenues. The microfinance institution also benefited through higher repayment and client retention rates. Bruhn and Zia (2012) find a business and financial training for young entrepreneurs in Bosnia to improve business practices, but not firm survival. de Mel et al. (2012) evaluate the International Labour Organization's Start and Improve Your Business (SIYB) program.[2] They find the program to improve business practices and to increase profitability. However, the latter effect is confined to business start-ups, as opposed to existing businesses. Klinger and Schündeln (2011), who investigate a business training that is based on a business plan competition, find the training to positively influence business start-up as well as expansion of an existing business. Mano et al. (2012) provide evidence for a business training, conducted in an industrial cluster in Ghana, to improve business practices. Among these studies, there appears to be a consensus that training participants improve business practices. On the other hand, empirical evidence on business survival and profitability is much less clear.

In this paper, the training interventions under investigation differ with respect to the modality as to how they deliver financial education. First, financial literacy training is integrated into regular meetings between clients and credit officers. Appropriately trained credit officers spend more time to explain and process applications of their clients and financially advice them during the loan cycle. Second,

[1]For an overview of recent impact evaluations on business training see McKenzie and Woodruff (2012).

[2]In the Philippines, the present paper explores the International Labour Organization's Generate Your Business (GYB) and Start Your Business (SYB) programs.

financial education is delivered through extra training sessions. Training courses are organized during evenings, weekends or holidays as to accommodate client and staff schedule. A further modality refers to the voluntariness of the training. Microfinance institutions offer the training on a voluntary basis, encouraging clients to attend, or make the training mandatory during group meetings or for new clients and those applying for a re-loan. None of the training interventions charged a fee for participation.

This paper contributes to the literature by comparing four financial training programs which were implemented in three countries (Cambodia, the Philippines and Vietnam). While one intervention teaches business skills, the other three interventions focus on more general financial literacy. In all four training interventions, the majority of participants are self-employed. We expect the training to improve financial attitudes, translating into sound financial behavior. Through enhanced risk management strategies, broadly defined as improved financial behavior including asset building, the training aims to help participants to avoid over-indebtedness and to reduce their vulnerability. We use household survey data collected in several rounds: one baseline survey and two to four follow-up surveys. We also use administrative data obtained from the microfinance institutions' management information systems.

The paper's main findings are that financial training somewhat improves financial attitude. Although we find evidence for the training to improve financial behavior, we also find a worsening in several financial behavior indicators. We find evidence for the training to positively affect the building of assets. Results also suggest that financial education improves loan repayment despite evidence for increased borrowing. We find a negative treatment effect on the ability to cover planned or unforeseen expenses. However, as a result of the training, clients might be better aware as to whether they

are able to cover their planned or unforeseen expenses. We find little evidence on the use of improved coping mechanisms in response to shocks.

4.2 The ILO Microfinance for Decent Work action research

4.2.1 Introduction

Microfinance is generally considered to generate positive effects on incomes of the self-employed. However, much less is known about its impact on other aspects of labor for the working poor, e.g., child labor, safe working conditions, and wages and incomes that are sufficiently high; to allow setting money aside as protection against risk and to reduce vulnerabilities.

The Microfinance for Decent Work (MF4DW) action research aims at building knowledge about the impact of microfinance on clients' livelihoods. Launched by the International Labour Organization (ILO) Social Finance Programme in 2008, the MF4DW action research started by identifying specific work-related challenges among microfinance clients and how to address them, implementing innovations with 16 microfinance institutions (MFIs) from 14 countries in Asia, Africa and South America. The MF4DW action research, scheduled to conclude in 2012, set out to apply an experimental research design to measure the impact of these innovations.

At the outset of the MF4DW action research, each participating MFI conducted a diagnostic survey among 200 of its clients to determine their most pressing work-related challenges. The analysis was guided by ILO's vision of decent work for all and its goal to promote opportunities for women and men to obtain decent and productive work, in conditions of freedom, equity, security and human dignity. Within this framework, the diagnostic determined child labor, working conditions, formal-

isation, job creation and productive employment, risk management, and women's empowerment, as key challenges for microfinance clients to obtain decent work.

Informed by the diagnostic results, each MFI developed an innovation to address the work-related challenge that most affected its clients and started implementing the innovations from 2009 onwards. The innovations included new or upgraded

- financial services (loan, savings, insurance, leasing),
- non-financial services (training, awareness campaign), or
- mechanisms for delivering services (organisational restructuring).

This paper presents the results of financial education that addresses microfinance clients' challenges in terms of risk management, conducted by one MFI in Vietnam, one MFI in the Philippines and two MFIs in Cambodia.[3] The financial education programs differ with respect to content and as to how the training was delivered.

Financial education intends to generate social and economic impact on client households. We expect the training to improve financial attitudes, translating into sound financial behavior. Through enhanced risk management strategies, broadly defined as improved financial behavior including asset building, the training aims to help participants to avoid over-indebtedness and to reduce their vulnerability.

4.2.2 Financial education with an emphasis on microinsurance

The Vietnamese MFI implemented financial education with an emphasis on microinsurance. It is one of the largest MFIs in Vietnam; it has 17 branches and operates in 10 provinces in the North and Center of the country. As of December

[3]For each financial education intervention, we first drafted a report jointly with staff from the International Labour Organization. As the MF4DW action research has not been concluded yet, we do not refer by name to the four microfinance institutions involved in financial education.

2011, it serves over 70,000 women. The MFI provides a range of financial services such as group and individual loans, savings products, insurance and training, mostly in rural areas of Vietnam. It conducted the MF4DW action research in two provinces: Hanoi province and Nam Dinh province. The MFI's branches in these two provinces were selected as they tend to have comparable characteristics. They are both in rural areas and were created in 1999, their clients are engaged in similar economic activities, the average loan amount, the dropout and repayment rates are rather close. Me Linh 7 branch (Hanoi province) forms the target group while Y Yen 8 branch (Nam Dinh province) forms the control group.

The diagnostic showed that clients' understanding of risk management and of the role of different financial products, in particular the MFI's microinsurance product, in managing risks is still low. As a result, clients' strategies to cope with risk are not optimal and unforeseen shocks can have negative impact on their livelihoods. In an earlier attempt to improve the situation of its clients, the MFI had introduced a credit life insurance product as well as health and death benefits to its clients (including spouse and children). However, given the limited benefits and low awareness among clients, the product was not able to sufficiently cover health and death related expenses and thus mitigate financial pressure. In an effort to better address the needs of its clients and offer meaningful benefits, the MFI upgraded its microfinance product in early 2009.

To support the introduction of the upgraded microinsurance product, and to address the low awareness among its clients about the use of insurance and other risk management strategies, the MFI introduced an integrated client training on risk management and microinsurance. The training aims to equip clients with skills and knowledge on risk management to make informed and sound financial decisions

about spending, borrowing, saving, and using insurance. The curriculum covered five topics:

1. Introduction to risk management
2. Saving
3. Concept of insurance
4. Insurance terms and types of common insurance
5. Use of the insurance product offered by the MFI

The MFI's target branch staff delivered 59 two half-day training courses to 1567 clients of the target branch. The training courses were held during weekends and holidays to accommodate staff schedule. Once all target branch clients had received the two half-day training course, the branch staff delivered briefing sessions at the end of weekly and monthly client meetings to refresh the clients' knowledge on the five training topics and to reinforce client skills. After the regular client meeting activities had been completed (such as collecting loan repayments and savings), the branch staff reiterated the key messages of one of the five training topics using participatory methods and visual aids. Each briefing session lasted 15 to 20 minutes.

4.2.3 Financial education with an emphasis on entrepreneurship

In the Philippines, the microfinance institution participating in the MF4DW action research implemented financial education focussing on entrepreneurship. The MFI found that many clients default on their loan obligations due to incapacity to manage the businesses they started and the inability of businesses to earn enough profit, hence leading to business failure. It also found that clients often view the loan

as a consumption loan rather than for use in enterprise start-ups. Financial education focussing on entrepreneurship aims to improve business management, thereby reducing business failures. Thus, the training is expected to help clients to increase profit and income to avoid repayment problems.

The entrepreneurship training was conducted using ILO's microfinance version of the GYB-SYB tools for the Philippines. The Generate Your Business (GYB) part of the training was delivered through a one-day training course. Its primary purpose is to help clients generate business ideas and business plans. The Start Your Business (SYB) part of the training was conducted after the clients received the loan, delivered during center meetings and provided training on bookkeeping, budgeting and marketing.

New clients and those applying for a re-loan were required to undertake the training to help them generate feasible business ideas and educate them on the basics of entrepreneurship. The business plan was evaluated before approving the loan application.

The microfinance institution implemented the training in one branch in Negros Occidental, a second branch in the same province forms the control group. It was estimated that the targeted number of clients in the target and control groups could be reached after 2.5 months based on the average number of clients applying for the first time or renewing a business loan.

4.2.4 Financial education delivered through interaction with credit officers

The Cambodian MFI implemented financial education through interaction between credit officers and clients during regular meetings. The MFI has branches in every province throughout the country and, as of December 2011, serves over 280,000

clients with a staff of nearly 1,000. It provides a wide range of financial services such as group and individual loans, savings products and money transfer, mostly in rural areas of Cambodia. The MFI conducted the MF4DW action research in two provinces: Kompong Cham and Kompong Thom. The MFI's branches that span these two provinces were selected as they tend to have comparable characteristics in terms of loan size per client, dropout rate and the percentage of portfolio at risk. Kompong Cham branch provides the target group while Kompong Thom branch provides the control group.

The MFI observed a sharp increase in repayment difficulties and over-indebtedness of its clients in early 2009. It suspected a number of contributing factors, in particular the economic crisis, rapid growth of the microfinance industry and possibly weak internal assessment processes. The MFI believes that these problems were exacerbated by clients' limited knowledge and skills on financial management which prevented them to make informed financial decisions and adopt sound risk management strategies.

To address the client's risk management and over-indebtedness challenges, the MFI first introduced an internal financial training program. The training targeted MFI staff at central and branch level with the expectation that trained field staff will be in a better position to advise clients, through group and individual counselling, on financial matters including risk management and over-indebtedness. The internal financial education program was based on the ILO financial education trainer's manual for Cambodia. The curriculum included eight financial education topics:

1. Setting goals and how much it costs to reach them

2. Managing your money

3. Debt or equity financing

4. The dangers of over-indebtedness and default

5. Comparing savings devices

6. Making a budget

7. Staying within your budget

8. Managing a savings plan

Client officers of the target branch provided individual and group counselling to their clients on the eight financial education topics during regular interactions with them, such as application process, monthly payment collection meetings, and individual follow-up meetings.

4.2.5 Financial education delivered through a two-day training course

The second Cambodian MFI implemented a two-day financial education training. Being one of the leading MFIs in Cambodia, it has 11 branches and operates in 19 of the 24 provinces of the country. As of December 2011, it serves over 132,000 clients. It provides a wide range of financial services such as group and individual loans, savings products, safety net programs and training, mostly in rural areas. The MFI conducted the MF4DW action research in three provinces: Kompong Chnang, Kandal and Kompong Thom. The branches in these three provinces were selected as they tend to have comparable characteristics. Kompong Chnang and Kandal branches provide the target group while Kompong Thom branch provides the control group. The financial education training was based on the ILO's financial education trainer's manual for Cambodia. The ILO training curriculum aims to equip households with

skills and knowledge on financial management. It covers the eight financial education topics mentioned above (see Section 4.2.4). Trainers from the MFI's central training department delivered a two-day training course to 1004 clients in target branches of Kandal and Kompong Chnang provinces.

4.3 Data

Data were collected through a questionnaire which is similar for all four financial education programs, covering socio-demographic information on the client's household; household income; household expenditures; money management; business registration; savings and insurance; loan and indebtedness information; unforeseen expenses; and situational questions covering financial attitude and behavior. In addition, we use management information system (MIS) data obtained from the microfinance institutions, in particular we use data on the clients' borrowing history.

Data were collected during a baseline survey before the start of the training and in two to four follow-up surveys. Table 4.1 presents the sample size for each financial education training. Except for Cambodia 2, data were collected in one target branch and one control branch. In Cambodia 2, two branches form the target group and one branch forms the control group. Study branches were pre-selected by the microfinance institutions on the basis of being similar along a set of observable characteristics. Branches span entire provinces or districts of a country.

In Vietnam, attrition was very low (less than 1% in the treatment group and 3.6% in the control group), while it was much larger in Cambodia 2 (30.3% in target branch 1, 27.6% in target branch 2 and 18.3% in the control branch). In Cambodia 2, the area of study has been subject to flooding which made it difficult for the survey team to reach the clients. If attrition leads to a selected sample over time, this will be

Table 4.1: Sample size

	Vietnam		Philippines		Cambodia 1		Cambodia 2		
	TB	CB	TB	CB	TB	CB	TB 1	TB 2	CB
Baseline	499	499	359	421	600	600	267	286	607
Follow-up survey 1	500	498	188	396	517	510	215	220	495
Follow-up survey 2	499	495	320	380	456	486	186	207	496
Follow-up survey 3	499	486	382	424					
Follow-up survey 4	496	481	365	369					

Notes: TB: Target branch, CB: Control branch.

of concern to our study. As long as attrition is based on observable characteristics, we can solve this issue by including covariates in the analysis. However, concerns remain that attrition is also based on unobservable characteristics.

Tables 4.7-4.10 (in the Appendix) report key socio-economic and financial characteristics before the start of the training. Unfortunately, treatment and control groups are not always observably similar along these characteristics. We find the two groups to be similar along most variables in the Philippines (Table 4.8), whereas they are observably different along a number of variables in Vietnam (Table 4.7).

Such differences may occur if the branches under study were less comparable than anticipated, exacerbated by the small number of branches among which randomization took place. Therefore, it is important to control for characteristics in the analysis, accounting for differences in characteristics before the training began.

4.4 Empirical specification and results

4.4.1 Empirical specification

In each case, target and control branches were selected randomly from a pool of pre-selected branches. As randomization was performed at the level of the branch, the variable of interest, whether a client participated in training, only varies at the branch level. Given resources, capacities and time constraints, the MF4DW action

research opted for the introduction of the innovation at branch level rather than at the level of the individual or the village. Unfortunately, the number of branches is small (see Table 4.1).

For the quantitative evaluation of the training, we employ a difference-in-differences methodology similar to Card and Krueger (1994). The fact that the training varies only at the branch level circumvents unobserved heterogeneity at the individual level. However, this only shifts the selection problem up to the branch level. The difference-in-differences approach yields causal effects of the training if the branches (or treatment and control groups) follow a common trend, which is the key identifying assumption.[4] However, we have little information on how factors at the branch level may have affected outcomes, e.g. local changes in economic policy or other economic conditions or extreme weather conditions affecting one branch but not the other. Given the small number of units over which randomization took place, unobserved time-varying factors at the branch-level, e.g. differential exposure of branches to shocks, remain an issue as they may introduce bias.[5]

We define the dependent variable Y_{ijt} as the outcome of interest for client i in the control or target group $j = 0, 1$, respectively at time $t = 0$ up to $t = 4$. The innovation is introduced in $t = 1$ in the target group and remains active in all subsequent periods of time. Prior to $t = 1$ no innovation is in place.

We use the following regression formulation of the difference-in-differences approach, specifying a linear model to estimate the training effect:

$$Y_{ijt} = \alpha + \gamma T_j + \lambda d_t + \beta(T_j * \text{post}_t) + u_{ijt}, \tag{4.1}$$

[4]There must also be no contamination of the target group to the control group. Given that the geographic distance between selected branches is usually rather large, this assumption does not appear to be problematic.

[5]These unobserved time-varying factors specific to the branch would average out over a large number of branches. Randomization at the individual level would also resolve such issues.

where T_j is a binary indicator that is group-specific and fixed over time, in particular T_j is equal to one for any branch pertaining to the target group and zero for any control group branch. d_t is a vector of time dummies common across groups and varying over time. The coefficient β on the interaction between the group dummy T_j and post_t gives the average treatment effect; post_t is a binary indicator equal to one for all time periods after the introduction of the training. As most of the outcomes are binary variables we use the linear probability model.

If we consider only two time periods, for example $t = 0, 1$, the above regression formulation of the difference-in-differences approach yields double differences in sample means, that is the difference in outcomes across treatment and control group and over time periods: $DD = (\bar{Y}_{11} - \bar{Y}_{10}) - (\bar{Y}_{01} - \bar{Y}_{00})$, where $\bar{Y}_{jt}$ is the average outcome over individuals i within group j and period of time t.

We modify the basic specification in equation (4.1) to check the stability of our estimated coefficients. Our biggest concern is the possibility of omitted variables at the branch and wave level. In addition to the regression without controls as in equation (4.1), we therefore include control variables.[6] We control for household and individual characteristics to account for possible deviations from a common time trend across branches. As we do not observe (time-varying) branch-specific shocks, we include household and client characteristics that *inter alia* determine how well an individual is able to cope with these shocks. In addition, including household and client characteristics will potentially increase the precision of the estimates.

[6]We control, among others, for client age, household income, household size, year of start of main activity, land ownership, and year of first loan with the microfinance institution providing the training.

4.4.2 Impact on financial attitudes

Financial attitude reflects a client's opinions and judgements about financial issues and the use of financial services. We expect the training to instill financial attitudes that support sound financial behavior.[7]

In Table 4.2 we evaluate the effect of the training on up to 21 outcomes. We divide financial attitude into four categories: budgeting, saving, borrowing, and insurance. The first three topics are at the core of financial literacy training. Clients were asked to which extend they agreed or disagreed with given statements related to financial attitude.

Table 4.2: Impact on financial attitudes

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Budgeting								
(1) It is not necessary to analyze which expenses are most important for the family because, anyway, there is not enough money to pay for everything.								
Coefficient	-.037	-.041	.037	.016	-.063	-.038	-.027	-.056
Standard error	.032	.033	.1	.09	.037	.038	.038	.045
p-value	.25	.21	.71	.86	.08	.31	.47	.22
Treatment group mean at $t = 0$	.297		.293		.514		.508	
(2) When your income is low, it is not necessary to keep detailed track of your monthly income and expenses.								
Coefficient	-.15	-.16	-.033	-.044	.048	.042	.045	.019
Standard error	.034	.035	.72	.6	.034	.035	.037	.045
p-value	0	0	.72	.6	.15	.23	.22	.67
Treatment group mean at $t = 0$	.471		.415		.606		.555	
(3) There is no need to worry in advance and budget for emergencies.								
Coefficient	-.158	-.162	.101	.098	-.055	-.027	.096	.098
Standard error	.03	.03	.094	.09	.024	.025	.034	.041
p-value	0	0	.29	.28	.02	.28	.005	.02
Treatment group mean at $t = 0$	.319		.345		.132		.213	
(4) I try to plan my household budget for a period longer than a year.								
Coefficient	.177	.171	.127	.123	-.026	-.043	-.017	.098
Standard error	.031	.032	.074	.072	.018	.018	.037	.045
p-value	0	0	.09	.09	.15	.02	.65	.03

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[7]Results on financial behavior are presented in Section 4.4.3.

... table 4.2 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Treatment group mean at $t = 0$	.689		.64		.94		.651	
Saving								
(5) It is worth saving even if your income is low.								
Coefficient	.099	.094	-.105	-.085	-.026	-.033	-.049	-.03
Standard error	.019	.019	.051	.046	.011	.011	.022	.027
p-value	0	0	.05	.07	.02	.004	.03	.26
Treatment group mean at $t = 0$	.882		.903		.983		.939	
(6) I try to save these days, even if these are just small amounts.								
Coefficient	.109	.1	-.08	-.08	.004	.004	.039	.062
Standard error	.019	.019	.042	.039	.01	.01	.022	.028
p-value	0	0	.06	.04	.68	.73	.07	.03
Treatment group mean at $t = 0$	.88		.872		.978		.949	
(7) It is impossible to save because there are always expenses coming up that force you to use your savings.								
Coefficient	-.111	-.128	.037	.027	-.083	-.087	.103	.019
Standard error	.033	.034	.111	.105	.036	.037	.037	.044
p-value	.001	0	.74	.8	.02	.02	.005	.67
Treatment group mean at $t = 0$	.437		.387		.674		.566	
(8) It does not make sense to save since you do not know what tomorrow will bring.								
Coefficient	-.171	-.156	.041	.034	-.02	-.013	.092	.092
Standard error	.027	.028	.091	.083	.019	.02	.033	.039
p-value	0	0	.65	.68	.29	.51	.005	.02
Treatment group mean at $t = 0$	.313		.284		.075		.219	
(9) Even small savings can improve your stability and security in the future.								
Coefficient	.054	.041	-.15	-.14	.014	.011	.058	.068
Standard error	.019	.019	.044	.039	.007	.007	.019	.025
p-value	.004	.03	.001	.001	.06	.11	.002	.006
Treatment group mean at $t = 0$	.882		.92		.983		.967	
(10) When things are going well, I try to put money aside to see me through difficult times.								
Coefficient	.023	.021	.016	.01	-.026	-.033	.033	.01
Standard error	.013	.013	.045	.044	.011	.012	.018	.021
p-value	.07	.11	.72	.81	.02	.00403	.07	.66
Treatment group mean at $t = 0$	.958		.947		.977		.955	
(11) I cannot keep an emergency reserve because my income is so low that there is never any money left.								
Coefficient	-.17	-.176	-.018	-.02	.037	.06	.061	-.014
Standard error	.033	.034	.087	.084	.036	.036	.037	.045
p-value	0	0	.84	.81	.31	.1	.1	.75
Treatment group mean at $t = 0$	.453		.423		.612		.566	
(12) I am able to put aside enough money for emergency expenses to make their impact less severe.								

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... table 4.2 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Coefficient	.22	.229	-.006	-.01	-.046	-.054	-.009	.033
Standard error	.029	.03	.045	.042	.016	.016	.026	.033
p-value	0	0	.89	.82	.003	.00091	.72	.32
Treatment group mean at $t = 0$	.659		.834		.978		.922	
Borrowing								
(13) It is shameful to borrow money.								
Coefficient			.037	.021	-.079	-.081	.037	-.019
Standard error			.088	.081	.036	.037	.032	.04
p-value			.67	.8	.03	.03	.25	.63
Treatment group mean at $t = 0$			.291		.415		.799	
(14) We can achieve our goals more quickly with borrowed money.								
Coefficient	.09	.075	.039	.046	-.079	-.086	-.079	-.108
Standard error	.023	.024	.081	.08	.021	.023	.02	.025
p-value	0	.002	.63	.57	.00021	.00014	0	0
Treatment group mean at $t = 0$	.846		.785		.112		.971	
(15) We consider a loan only as a last resort.								
Coefficient	-.001	-.009	.292	.298	-.002	.018	-.106	-.115
Standard error	.031	.032	.065	.065	.028	.029	.024	.028
p-value	.99	.77	0	0	.95	.53	0	0
Treatment group mean at $t = 0$	.569		.697		.816		.94	
(16) It is easy to fall into a debt trap.								
Coefficient			.074	.073	-.098	-.086		
Standard error			.091	.092	.036	.037		
p-value			.42	.43	.00651	.02		
Treatment group mean at $t = 0$			.446		.406			
(17) It is easy to service multiple loans.								
Coefficient					.047	.029		
Standard error					.022	.022		
p-value					.04	.2		
Treatment group mean at $t = 0$					.125			
Insurance								
(18) We don't need insurance because nothing bad can happen to my family or assets.								
Coefficient	-.148	-.145					-.108	-.11
Standard error	.028	.029					.037	.043
p-value	0	0					.004	.01
Treatment group mean at $t = 0$	.293						.59	
(19) Insurance is expensive.								
Coefficient	-.173	-.151					-.086	-.082
Standard error	.034	.035					.035	.043
p-value	0	0					.01	.05
Treatment group mean at $t = 0$	.547						.814	

Continued on next page...

... table 4.2 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
(20) There is no need for insurance we can solve our problems by our own.								
Coefficient	-.07	-.082					-.164	-.162
Standard error	.034	.035					.037	.044
p-value	.04	.02					0	0
Treatment group mean at $t = 0$	.489						.644	
(21) Insurance companies are reliable.								
Coefficient	.022	.042					-.172	.007
Standard error	.032	.033					.035	.043
p-value	.49	.2					0	.87
Treatment group mean at $t = 0$	.685						.814	

Notes: Clients were asked to which extend they agreed/disagreed with given statements related to financial attitude. Possible answers were: (1) 'I definitely agree', (2) 'I rather agree', (3) 'I rather disagree' or (4) 'I definitely disagree'. The coefficient gives the change in the share of clients agreeing (defined as 'I definitely agree' or 'I rather agree') as opposed to disagreeing (defined as 'I rather disagree' or 'I definitely disagree').
Specification (1) is without controls, while specification (2) includes controls.

Attitudes related to budgeting

Investigating financial education with an emphasis on microinsurance implemented in Vietnam (see Section 4.2.2), the main message from column 1 in Table 4.2 is that the marginal effect of training on most budgeting-related variables, in regressions as specified in equation (4.1), is statistically significant and as intended. Clients who received the training are more likely to disagree that it is not necessary to keep detailed track of monthly income and expenses. They are also more likely to disagree that there is no need to worry in advance and budget for emergencies, and more likely to report that they plan their household budget for a period longer than a year. However, we find no effect on whether clients find it necessary to analyze which expenses are most important for the family. Column 2 in Table 4.2 presents estimates of the treatment effect including control variables. The key result is that the estimates are robust to including controls.

Investigating financial education with an emphasis on generating business ideas and starting a business in the Philippines (see Section 4.2.3), among the four outcomes the only statistically significant treatment effect (at the 10% level of statistical significance) is found on whether clients plan their household budget for more than a year (column 3 in Table 4.2), which is as intended. This effect is robust to including controls (see column 4). One explanation for the lack of effects is that the focus of this training was on entrepreneurship rather than on budgeting of (household) expenses.

Investigating financial education delivered through interaction with credit officers in Cambodia (see Section 4.2.4), we find an unintended treatment effect on whether clients feel that there is no need to worry in advance and budget for emergencies (column 5 in Table 4.2). We also find an unintended effect on whether clients find it necessary to analyze which expenses are most important for the family. However, both effects are not robust to including controls (see column 6). Furthermore, we find an unintended effect with respect to household budget planning for more than a year, but only when including controls. According to an unpublished ILO report on the topics that credit officers discussed with their clients, budgeting-related issues came out on last place. Only about 50% of credit officers had discussed this topic with their clients. Clients were more exposed to discussions on savings (80%) and the use of loans (60%). It should be noted, however, that this survey was conducted at an early stage of the implementation of client training. Nevertheless, it may suggest that rather low priority was given to budgeting-related issues, which may explain the lack of a training effect.

Investigating financial education delivered through a two-day training course in Cambodia (see Section 4.2.5), we find a statistically significant treatment effect on

whether clients feel no need to worry in advance and budget for emergencies. This effect is unintended as training participants are more likely to agree that there is no need to worry in advance and budget for emergencies. Furthermore, we find an intended effect with respect to household budget planning for more than a year, but only when including controls. We detect no impact on the remaining two outcomes.

Attitudes related to saving

In Table 4.2, the first four savings-related attitudes refer to savings in general, while the remaining four outcomes refer to savings for emergencies.

In Vietnam, all eight savings-related attitudes move in the intended direction. Except for the effect on the statement 'I try to put money aside to see me through difficult times when things are going well', all results are robust to including covariates. Some of the effects are substantial, e.g. treated clients are 17 percentage points (s.e. = 3.3%) less likely to indicate that they cannot keep an emergency reserve because their income is so low that there is never any money left, compared to 45.3% of clients in the treatment group who indicated such attitude at baseline.

In the Philippines, the training is found to have unintended impact on three outcome variables. Treated clients are less likely to agree that it is worth saving even if your income is low, that they try to save these days, even if these are just small amounts, and that even small savings can improve their stability and security in the future. These results are robust to including covariates (see column 4). We do not detect a treatment effect on the remaining five outcome variables. Again, it should be noted that in the Philippines the training focussed on generating and starting a business, which may at least partially serve as an explanation as to why we do not find impact on savings-related attitudes as intended. Clients who apply for business

loans are supposed to invest the loan into their businesses which is why we may find negative effects on savings-related attitudes.

In Cambodia 1, where financial education was delivered through interaction with credit officers, we find an effect as intended on the following two outcomes (see column 5 in Table 4.2): Clients are less likely to agree that it is impossible to save because there are always expenses coming up that force you to use your savings, and they are more likely to agree that even small savings can improve their stability and security in the future. However, we also find an effect on the following three outcomes, which is unintended: Clients are less likely to agree that it is worth saving even if income is low, and that when things are going well, they try to put money aside to see them through difficult times; they are more likely to be unable to put aside enough money for emergency expenses to make their impact less severe. Except for the result on the attitude that even small savings can improve their stability and security in the future, all results are robust to including covariates (column 6). We do not find an effect on the remaining three outcomes. In sum, the training is found to generate rather mixed effects on savings-related attitudes.

For the other financial training in Cambodia, where financial education was delivered through a two-day training course, we find the following three intended effects (see column 7 in Table 4.2): Treated clients are more likely to agree that they try to save these days, even if these are just small amounts, that even small savings can improve their stability and security in the future, and that when things are going well, they try to put money aside to see them through difficult times. However, the last effect is not robust to including covariates. We also find the following three unintended effects. First, treated clients are less likely to indicate that it is worth saving even if their income is low. Second, they are more likely to indicate that it is

impossible to save because there are always expenses coming up that force them to use their savings. Third, they are more likely to agree that it does not make sense to save since you do not know what tomorrow will bring. However, only the last unintended effect is robust to including covariates.

Attitudes related to borrowing

Investigating the effect of the training on attitudes related to borrowing, we use up to five outcome variables. Two of them, whether clients agree with the statements 'We can achieve our goals more quickly with borrowed money' and 'We consider a loan only as a last resort' were asked to all clients.

The two outcome variables 'It is shameful to borrow money' and 'We can achieve our goals more quickly with borrowed money' probe a client's attitude towards borrowing. We consider believing that it is shameful to borrow, as well as not realizing that sometimes it is useful to borrow money to achieve a (business) goal more quickly, to be harmful in terms of missing out profitable business opportunities. The remaining three outcome variables, 'We consider a loan only as a last resort', 'It is easy to fall into a debt trap' and 'It is easy to service multiple loans', probe a client's awareness about not becoming over-indebted.

In Vietnam, training participants are more likely to indicate that they can achieve their goals more quickly with borrowed money, which is intended as explained above. On the remaining borrowing-related outcome, whether clients consider a loan only as a last resort, we detect no impact. These results are robust to including covariates.

In the Philippines, we find a positive treatment effect on whether clients consider a loan only as a last resort. Thus, the training is found to improve an attitude that is considered to be important for not becoming over-indebted. We detect no impact on

the remaining outcomes – whether it is shameful to borrow money, whether clients can achieve their goals more quickly with borrowed money or whether it is easy to fall into a debt trap.

In Cambodia 1, we find a training effect on four outcomes; in three instances the effect is unintended. First, training participants are less likely to consider borrowing to be shameful, which is intended. Second, treated clients are less likely to agree that goals can be achieved more quickly with borrowed money, which is unintended. They may not find it easier to achieve their goals more quickly with borrowed money because available loans might be too small[8] or clients lack business opportunities, something that the training may have made them realize. Third, training participants are less likely to consider that it is easy to fall into a debt trap. Fourth, treated clients are more likely to agree that it is easy to service multiple loans. However, the latter effect is not robust to including covariates. Considering the last two effects, it appears that the training made clients more confident to handle debt. We find no effect on whether clients consider a loan only as a last resort.

For the other financial training intervention in Cambodia, we find the following: Treated clients are less likely to agree that goals can be achieved more quickly with borrowed money, which is unintended. Furthermore, treatment group clients are less likely to consider a loan only as a last resort, which is also unintended, potentially putting clients at risk of becoming over-indebted. We do not detect impact on whether clients think that it is shameful to borrow money.

[8]According to the MFI's Annual Report 2010, 59% of outstanding loans are less than US$ 151 and 35% are between US$ 151 and 300.

Attitudes related to insurance

Two microfinance institutions devoted part of the training to insurance.[9] The first three indicators address the demand for insurance; clients were asked whether they agree with the statement 'We don't need insurance because nothing bad can happen to my family or assets', whether they agree that 'insurance is expensive', and whether they agree with 'There is no need for insurance, we can solve our problems by our own'. The fourth outcome relates to a potential lack of trust in insurance companies (see Table 4.2).

In Vietnam and Cambodia, treated clients are less likely to state that they do not need insurance because nothing bad can happen to their family or assets. They are also less likely to believe that they can solve their problems on their own, which is consistent with the former. Furthermore, fewer treated clients agree that insurance is expensive. From these three results we may conclude that the training increases demand for insurance.

In Cambodia, treated clients are less likely to agree that insurance companies are reliable. However, this result is not robust to including covariates. In Vietnam, we do not find impact on trust in insurance companies.

Across the four financial training interventions, financial training has not been overwhelmingly successful in generating intended effects on financial attitudes. On attitudes related to budgeting, saving and borrowing we find intended as well as unintended impact. On insurance-related attitudes, we find financial education to have impact as intended. Generally, we find financial education to perform best in Vietnam where the training was delivered through a two half-day training course with the key messages being reiterated during regular bank meetings.

[9]Data on insurance-related attitudes were only collected for these two training interventions.

4.4.3 Impact on financial behavior

We expect that financially informed clients are able to better assess risks (health shocks, natural disasters, business failure, and over-indebtedness) and take effective steps to eliminate or reduce them. For example, we expect that clients use financial planning and budgeting to make decisions about business and household spending, that they consider their needs and their capacity to repay and the risk of default before taking a loan, that they spend wisely to be able to save for emergencies and to build assets, and that clients use a mix of financial services including insurance to cover against risks.[10]

In Table 4.3, we evaluate the effect of the training on up to 9 outcomes. We divide financial behavior into four categories: planning of expenses, budgeting, saving, and spending.

Table 4.3: Impact on financial behavior

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Planning expenses								
(1) Plan household expenses								
Coefficient	.222	.223	.015	.016	-.082	-.085	.106	.163
Standard error	.031	.032	.021	.021	.023	.023	.027	.034
p-value	0	0	.46	.44	0	0	0	0
Treatment group mean at $t = 0$	.703		.949		.09		.063	
(2) Plan business expenses								
Coefficient	.108	.089	-.008	-.008			0	.061
Standard error	.034	.035	.016	.016			.033	.041
p-value	.001	.01	.64	.63			.99	.14
Treatment group mean at $t = 0$	.699		.962				.178	
Budgeting								
(3) We run out of money before making income.								
Coefficient	-.131	-.123	.115	.101	-.046	-.011	.23	.153
Standard error	.034	.035	.071	.064	.033	.032	.035	.043

Continued on next page...

[10]Results on asset building, including savings and use of insurance, are presented in Section 4.4.4.

... table 4.3 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
p-value	0	0	.11	.12	.16	.73	0	0
Treatment group mean at $t = 0$	.405		.242		.289		.303	
(4) We do not have enough money left to meet fixed monthly payments.								
Coefficient	.034	.039	.047	.029	-.015	.007	.267	.152
Standard error	.031	.032	.075	.064	.033	.033	.035	.043
p-value	.28	.22	.53	.66	.64	.84	0	0
Treatment group mean at $t = 0$	.291		.181		.349		.26	
(5) Major seasonal expenses (e.g. celebrations) have a negative impact on our living standard in the months when they occur because we do not budget for them in advance.								
Coefficient	.144	.133	.09	.078	-.059	-.032	.196	.161
Standard error	.03	.03	.07	.065	.032	.032	.036	.044
p-value	0	0	.2	.23	.06	.32	0	0
Treatment group mean at $t = 0$	.192		.24		.284		.315	
(6) We set aside money for emergencies when planning our budget.								
Coefficient	.157	.169	-.028	-.033	-.04	-.081	.063	.089
Standard error	.033	.034	.072	.073	.035	.036	.038	.045
p-value	0	0	.7	.65	.26	.02	.1	.05
Treatment group mean at $t = 0$	.604		.68		.412		.508	
(7) At the end of the month, we have some money left that can be put into savings or spent on extra purchases.								
Coefficient	-.116	-.116	.128	.118	.008	-.044	.092	.157
Standard error	.034	.035	.076	.077	.033	.033	.038	.044
p-value	.001	.001	.1	.13	.81	.19	.01	0
Treatment group mean at $t = 0$	.653		.558		.267		.483	
Spending								
(8) We give in to the temptation and buy things which we later regret.								
Coefficient	-.068	-.051	.135	.125	-.021	-.021	.129	.083
Standard error	.025	.025	.06	.055	.02	.021	.024	.03
p-value	.006	.04	.03	.03	.3	.3	0	.005
Treatment group mean at $t = 0$	.188		.183		.11		.071	
(9) When we run out of money, we borrow or buy on credit and pay our debts a month later.								
Coefficient	-.074	-.083	.023	.025	-.036	-.009	.194	.136
Standard error	.033	.034	.073	.066	.031	.031	.03	.036
p-value	.02	.01	.76	.71	.24	.78	0	0
Treatment group mean at $t = 0$	.335		.221		.257		.154	

Notes: Clients were asked to which extend they agreed/disagreed with given statements related to financial attitude. Possible answers were: (1) 'I definitely agree', (2) 'I rather agree', (3) 'I rather disagree' or (4) 'I definitely disagree'. The coefficient gives the change in the share of clients agreeing (defined as 'I definitely agree' or 'I rather agree') as opposed to disagreeing (defined as 'I rather disagree' or 'I definitely disagree').
Specification (1) is without controls, while specification (2) includes controls.

Planning expenses

In Vietnam, we find the training to have an effect on whether households plan their expenses. This effect is substantial. While 70.3% of clients in the treatment group have already been planning household expenses at baseline, we find them to be 22.2 percentage points (s.e.= 3.1%) more likely to plan their household expenses after the introduction of the training. We also find a positive effect on the planning of business expenses. In the Philippines, we do not find an effect on the planning of household or business expenses. In Cambodia 1, treated clients are less likely to plan their household expenses, which is puzzling. In Cambodia 2, while we find the training to have a positive effect on the planning of household expenses, we detect no impact on the planning of business expenses.

Budgeting

In Vietnam, treated clients are less likely to report that they run out of money before making income. Furthermore, they are more likely to report that they set money aside when planning the budget. We also find two unintended effects. First, training participants are more likely to indicate that major seasonal expenses have a negative impact on their living standard because they do not budget for them in advance. Second, they are less likely to indicate that at the end of the month, they have some money left that can be put into savings or spent on extra purchases. However, as treated clients are more likely to set money aside when planning the budget, it follows that, at the end of the month, there should be less (unplanned) money left. We find no effect on whether clients have enough money left to meet fixed monthly expenses.

In the Philippines, we do not find an effect on any of the five outcome variables. As already mentioned, the lack of effect on budgeting practices may be explained by the training having a focus on generating and starting a business, as opposed to budgeting. These results are consistent with what we found on financial attitude (Table 4.2), as we may think that informed financial attitudes should translate into sound financial behavior.

In Cambodia 1, we find an effect, which is as intended, on whether major seasonal expenses have a negative impact on the living standard because clients do not budget for them in advance. However, this result is not robust to including covariates. We also find an unintended effect on whether clients set aside money for emergencies when planning their budget, but only when including covariates. We do not detect impact on the remaining outcomes.

In Cambodia 2, we find the training to have impact as intended on two outcomes. First, treated clients are more likely to indicate that at the end of the month, they have some money left that can be put into savings or spent on extra purchases. Second, they are more likely to report that they set aside money for emergencies when planning their budget. On the other hand, the training is found to have unintended impact on the following three outcomes. First, training participants are more likely to report to run out of money before making income. Second, they are more likely to indicate that they do not have enough money left to meet fixed monthly payments. Third, they are more likely to indicate that major seasonal expenses have a negative impact on their living standard because they do not budget for them in advance.

Spending

In Vietnam, there is evidence for more prudent spending as for training participants the following indicators move in the expected direction: 'We give in to the temptation and buy things which we later regret' and 'When we run out of money, we borrow or buy on credit and pay debts later'. In the Philippines and Cambodia 2, however, treated clients are more likely to indicate that they give in to the temptation and buy things which they later regret. In Cambodia 2, participants are also more likely to indicate that when they run out of money, they borrow or buy on credit. One explanation for these results is that the training may have made clients more aware of such behavior. Thus, they are more likely to report that such behavior has been occurring. We do not detect impact on spending-related behavior in Cambodia 1. All results are robust to including covariates.

In sum, while we find some evidence for the training to improve financial behavior, we also find a worsening in several financial behavior indicators. These results could be explained by the findings in the previous section on financial attitudes, as we expect informed financial attitudes to translate into sound financial behavior.

4.4.4 Impact on asset building

In Table 4.4, we evaluate the effect of the training on asset building, dividing assets into four categories: insurance, profit, physical assets, and savings. We expect that financially informed clients will be in a better position to build and maintain their financial assets (savings and insurance) as well as physical assets (land, property and equipment).

Table 4.4: Impact on assets

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Insurance								
(1) Life insurance								
Coefficient	.026	.021						
Standard error	.016	.017						
p-value	.11	.21						
TG mean at $t = 0$	.05							
(2) Mandatory social insurance								
Coefficient	.013	.012						
Standard error	.01	.01						
p-value	.16	.21						
TG mean at $t = 0$	.014							
(3) Voluntary social insurance								
Coefficient	-.007	-.009						
Standard error	.008	.008						
p-value	.4	.28						
TG mean at $t = 0$	.016							
(4) Motorbike liability insurance								
Coefficient	.053	.048						
Standard error	.027	.028						
p-value	.05	.08						
TG mean at $t = 0$	.192							
(5) Unemployment insurance								
Coefficient	.005	.004						
Standard error	.004	.004						
p-value	.31	.35						
TG mean at $t = 0$	.004							
(6) Health insurance								
Coefficient	.055	.028						
Standard error	.03	.03						
p-value	.07	.35						
TG mean at $t = 0$	.327							
(7) Household property insurance								
Coefficient	-.001	-.001						
Standard error	.002	.002						
p-value	.47	.49						
TG mean at $t = 0$	.002							
(8) Business assets insurance								
Coefficient	-.002	-.003						
Standard error	.003	.003						
p-value	.53	.35						

Continued on next page...

... table 4.4 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
TG mean at $t = 0$	.002							
(9) Car insurance								
Coefficient	-.008	-.007						
Standard error	.006	.006						
p-value	.23	.26						
TG mean at $t = 0$	.014							
(10) Household uses insurance								
Coefficient					.093	.108		
Standard error					.025	.026		
p-value					.00023	.00003		
TG mean at $t = 0$					.043			
Profit								
(11) Profit in main activity								
Coefficient			2718.2	2173.4				
Standard error			1299.8	1024				
p-value			.04	.04				
TG mean at $t = 0$			2987.1					
Physical assets								
(12)New land/real estate bought								
Coefficient			.03	.03				
Standard error			.022	.022				
p-value			.17	.17				
TG mean at $t = 0$			NA					
(13) Household bought land								
Coefficient					-.019	-.023		
Standard error					.019	.019		
p-value					.32	.23		
TG mean at $t = 0$					.085			
(14) New motorized vehicle bought								
Coefficient			.036	.033				
Standard error			.012	.011				
p-value			.003	.005				
TG mean at $t = 0$			NA					
(15) Household bought other assets								
Coefficient					.004	-.035		
Standard error					.036	.037		
p-value					.91	.34		
TG mean at $t = 0$					.432			
Savings								
(16) Household saves								

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... table 4.4 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Coefficient					-.049	-.118	.007	.105
Standard error					.033	.032	.035	.04
p-value					.14	.00025	.85	.01
TG mean at $t = 0$					.718		.717	
(17) Savings increased								
Coefficient					-.064	-.132		
Standard error					.032	.032		
p-value					.05	.00004		
TG mean at $t = 0$					.277			
(18) Household savings amount								
Coefficient							-1920158.2	461133.91
p-value							.009	.65
Standard error							736854.7	1024261.5
TG mean at $t = 0$							3879742.5	

Notes: Specification (1) is without controls, while specification (2) includes controls.
TG: Treatment group.

Insurance

In Vietnam, as part of the training was on insurance, we have rich information on insurance outcomes. Insurance is important for asset building as it can protect assets in the event of a shock. We find the training to have a positive effect on motorbike liability insurance. Although we cannot say how much each of the topics of the financial literacy training contributed to this finding, this effect might actually be driven by the topic 'The civil responsibility of motor vehicle owners' that was part of the training. We also find a positive effect on health insurance, which is not robust to including covariates. We do not find an effect on life insurance, mandatory social insurance, voluntary social insurance, unemployment insurance, household property insurance, business assets insurance or car insurance.

In Cambodia 1, we find a positive treatment effect on the use of insurance; however, we do not know which type of insurance clients use.

Profit

We include profit in the asset building category as profits can be reinvested into enterprise assets. In the Philippines, we find the training to have a positive effect on the profit in the main activity. As the training in the Philippines had a focus on entrepreneurship, this result provides some evidence that knowledge acquired through the training translated into larger profits.[11]

Physical assets

In the Philippines, we find that treatment group clients are 4 percentage points (s.e.= 1.2%) more likely to buy a motorized vehicle. On the purchase of real estate or land, we do not detect impact. Neither do we detect impact on land or other assets in Cambodia 1.

Savings

In Cambodia 1, the training is found to have a negative effect on household savings, as measured by both the incidence of saving and by a binary variable whether the savings amount has increased. As mentioned above, we also found that treated clients are more likely to use insurance. One explanation for this result is that clients might be substituting between insurance and savings.

In Cambodia 2, we find the training to have a positive effect on the incidence of saving when including covariates. On the savings amount, the point estimate is unstable as it changes sign and becomes statistically insignificant when including covariates.

[11]Unfortunately, we are unable to use this outcome for exploring the other training interventions in Vietnam and Cambodia, since the questionnaires did not include questions on profit.

In sum, we find some evidence for the training to positively affect the building of assets as we find positive impact on the use of insurance, the size of profits and the incidence of savings. There is also weak evidence that treatment group clients substitute between savings and insurance.

4.4.5 Impact on over-indebtedness/multiple borrowing

In Table 4.5, we evaluate the effect of the training on measures of over-indebtedness, dividing over-indebtedness into two categories: borrowing and repayment difficulties. We expect that financially informed clients will be able to minimize the number of active loans and corresponding amounts owed to formal and informal financial service providers. As a consequence, they should have fewer repayment difficulties, and reduce late loan repayment and default.

Table 4.5: Impact on over-indebtedness

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Borrowing								
(1) Borrowed from other informal sources								
Coefficient	.043	.018	.038	.04			.207	.218
Standard error	.022	.022	.036	.036			.062	.072
p-value	.05	.41	.29	.27			.001	.003
Treatment group mean at $t = 0$	.04		.129				.632	
(2) Borrowed from other formal sources (other than the MFI that provided the training)								
Coefficient	.037	.033	-.016	-.015			-.19	-.247
Standard error	.033	.034	.018	.018			.061	.072
p-value	.27	.33	.39	.41			.002	.001
Treatment group mean at $t = 0$	.281		.025				.342	
(3) Number of different sources								
Coefficient					.005	-.004		
Standard error					.044	.044		
p-value					.91	.93		
Treatment group mean at $t = 0$					1.36			
(4) Amount owed to other loan providers								
Coefficient			712	573	-121422	-223844		

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... table 4.5 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Standard error			350	427	125880	131432		
p-value			.05	.19	.33	.09		
Treatment group mean at $t = 0$			546		418940			
Repayment difficulties								
(6) Repayment difficulties during the last year								
Coefficient	.014	.011	.022	.019	-.04	-.015	.112	.072
Standard error	.009	.009	.029	.029	.028	.028	.025	.029
p-value	.13	.21	.45	.53	.15	.58	0	.01
Treatment group mean at $t = 0$	.014		.065		.155		.114	
(7) Expect repayment difficulties								
Coefficient	.014	.011	-.054	-.06			.066	.052
Standard error	.01	.011	.037	.036			.02	.025
p-value	.17	.33	.14	.1			.001	.04
Treatment group mean at $t = 0$	.012		.084				.078	
(8) Took out loan to repay another loan								
Coefficient	-.123	-.15	-.098	-.097	-.008	-.009	.096	.096
Standard error	.026	.026	.068	.065	.016	.017	.018	.023
p-value	0	0	.015	.14	.61	.6	0	0
Treatment group mean at $t = 0$	.154		.196		.053		.033	
(9) Late repayment (as measured by the MFI's management information system)								
Coefficient	0	.002	-.056	-.057				
Standard error	.003	.004	.024	.025				
p-value	.89	.67	.02	.03				
Treatment group mean at $t = 0$	0		.072					
(10) Late repayment ever experienced (self-reported)								
Coefficient							-.209	-.179
Standard error							.019	.019
p-value							.005	.02
Treatment group mean at $t = 0$							.415	
(11) Late repayment (self-reported)								
Coefficient					-.034	-.031		
Standard error					.019	.019		
p-value					.08	.1		
Treatment group mean at $t = 0$					.079			
(12) Late repayment $\leq$ 30 days								
Coefficient					-.018	-.022		
Standard error					.013	.014		
p-value					.17	.1		
Treatment group mean at $t = 0$					.037			
(13) Late repayment 30-60 days								
Coefficient					0	-.002		

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... table 4.5 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Standard error					.007	.007		
p-value					.98	.81		
Treatment group mean at $t = 0$					.009			
(14) Late repayment 61-90 days								
Coefficient					.008	.011		
Standard error					.005	.006		
p-value					.14	.09		
Treatment group mean at $t = 0$					.004			
(15) Late repayment > 90 days								
Coefficient					-.028	-.023		
Standard error					.012	.012		
p-value					.02	.04		
Treatment group mean at $t = 0$					.035			

Notes: Specification (1) is without controls, while specification (2) includes controls.

Borrowing

In Vietnam, we find a positive treatment effect on the incidence of borrowing from other informal sources. However, this effect becomes statistically insignificant when including covariates. We find no impact on borrowing from other formal sources.

In the Philippines, while we find no effect on the incidence of borrowing from another source (formal or informal), we do find a treatment effect on the amount borrowed from a formal or informal source. Treated clients appear to have increased the amount of money owed to formal or informal financial service providers. However, this effect becomes statistically insignificant when including covariates.

In Cambodia 1, we are not able to explore the effect on the incidence of borrowing from other formal or informal sources due to lack of data. Instead, we use a variable that measures the number of different loan sources, on which we find no treatment effect. We find a negative treatment effect on the amount owed to other loan providers, but only when we include covariates.

In Cambodia 2, treated clients are more likely to borrow from other informal sources. At the same time, they are less likely to borrow from other formal sources. Thus, there is weak evidence that the training resulted in clients substituting between informal and formal borrowing.

Repayment difficulties

In Vietnam, we do not detect impact on (self-reported) repayment difficulties during the last year; neither do we find an effect on client expectations about repayment difficulties within the next 6 months. However, we do find impact on the incidence of borrowing to repay another loan; we find target group clients to be less likely to have taken a loan to repay another loan. This effect is substantial. Treated clients are less likely to borrow to repay another loan by 12.3 percentage points (s.e.= 2.6%). We do not find impact on late repayment (as measured by the MFI's management information system). It should be noted, however, that late loan repayment in the target group was already 0 percent before the introduction of the training.

In the Philippines, we find no effect on repayment difficulties during the last year nor on client expectations about repayment difficulties within the next 6 months. We do find the training to reduce the incidence of borrowing to repay another loan. However, this effect is not robust to including covariates. We also find that training participants are less likely to repay late as measured by the MFI's management information system. The estimated magnitude of this effect is -5.6 percentage points (s.e.= 2.4%).

In Cambodia 1, we find no effect on repayment difficulties during the last year or whether clients borrowed to repay. Data are available on overall late repayment, repayment 30 days late, between 30 and 60 days late and more than 90 days late,

all of which are self-reported. We find an effect on overall late repayment and on repayment more than 90 days late. Training is estimated to lead to a reduction in repayment more than 90 days late by 2.8 percentage points (s.e.= 1.2%).

In Cambodia 2, all three outcome variables move in an unintended direction. Target group clients are more likely to report repayment difficulties during the last year and they are also more likely to expect repayment difficulties. They are also more like to have taken out a loan to repay another loan. On the other hand, we find treatment group clients to have an improved repayment performance as measured by whether they have ever experienced late repayment. Thus, we may cautiously interpret this result that improved loan repayment may come at the cost of clients taking out (new) loans. Earlier, in Section 4.4.5, we saw that treated clients were more likely to borrow from other informal sources, suggesting that clients take out new informal loans.

In sum, we find the training to improve loan repayment performance despite increased borrowing. We also find weak evidence that improved loan repayment may come at the cost of clients taking out loans to make these repayments. If this were proven to be true, it would underline the importance of raising clients' awareness on fulfilling current loan obligations without incurring additional obligations with other loan providers.

4.4.6 Impact on vulnerability

In Table 4.6 we evaluate the effect of the training on measures of vulnerability, dividing vulnerability into two categories: ability to cover (unforeseen) expenses and coping mechanisms. We expect that financially informed clients are in a better position to meet their monthly expenses no matter whether they are planned or

unplanned. We also expect that clients' need to sell assets in times of hardship will be reduced.

Table 4.6: Impact on vulnerability

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Ability to cover expenses								
(1) Whether income covers expenses								
Coefficient	.033	.04	-.019	-.006	-.028	-.105	-.222	-.17
Standard error	.019	.019	.016	.017	.03	.029	.027	.033
p-value	.08	.04	.26	.74	.35	.00026	0	0
Treatment group mean at $t = 0$	.926		.975		.792		.919	
(2) Could cover unforeseen household expenses								
Coefficient	.081	.084	-.457	-.409			.086	.135
Standard error	.087	.087	.125	.113			.043	.051
p-value	.35	.33	.001	.001			.05	.009
Treatment group mean at $t = 0$	.659		.675				.61	
(3) Could cover unforeseen business expenses								
Coefficient	-.144	-.128	-.007	.017			-.351	-.312
Standard error	.208	.21	.299	.325			.081	.097
p-value	.49	.54	.98	.96			0	.001
Treatment group mean at $t = 0$	.667		.194				.688	
(4) Could cover unforeseen expenses								
Coefficient					-.011	-.066		
Standard error					.045	.044		
p-value					.8	.13		
Treatment group mean at $t = 0$					.43			
Coping mechanisms								
(5) Used savings to cover unforeseen expenses								
Coefficient	-.033	-.031	.11	.022			-.176	-.043
Standard error	.049	.049	.134	.106			.036	.042
p-value	.5	.53	.42	.83			0	.3
Treatment group mean at $t = 0$	.96		.508				.772	
(6) Sold assets to cover unforeseen expenses								
Coefficient	-.1	-.099	-.025	-.022			-.026	.034
Standard error	.048	.048	.04	.043			.025	.033
p-value	.04	.04	.53	.61			.3	.29
Treatment group mean at $t = 0$	.104		.016				.125	
(7) Used microinsurance to cover unforeseen expenses								
Coefficient	.025	.025	.053	.06			.004	0
Standard error	.035	.035	.036	.037			.005	.006
p-value	.48	.48	.15	.11			.38	1

Continued on next page...

... table 4.6 continued

	Vietnam		Philippines		Cambodia 1		Cambodia 2	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Column	1	2	3	4	5	6	7	8
Treatment group mean at $t = 0$	.043		0				.004	
(8) Sacrificed household expenditures to cover unforeseen expenses								
Coefficient	.09	.085	.017	.018			-.062	-.067
Standard error	.068	.068	.05	.049			.022	.028
p-value	.19	.21	.73	.72			.006	.01
Treatment group mean at $t = 0$	.191		.024				.121	
(9) Sold assets to cover asset shock								
Coefficient					-.211	-.226		
Standard error					.135	.142		
p-value					.12	.11		
Treatment group mean at $t = 0$					.333			
(10) Used savings to cover asset shock								
Coefficient					-.22	-.198		
Standard error					.173	.182		
p-value					.21	.28		
Treatment group mean at $t = 0$					.458			
(11) Sold assets to cover health shock								
Coefficient					.036	.033		
Standard error					.067	.069		
p-value					.59	.64		
Treatment group mean at $t = 0$					.222			
(12) Used savings to cover health shock								
Coefficient					-.166	-.199		
Standard error					.071	.073		
p-value					.02	.0065		
Treatment group mean at $t = 0$					75			

Notes: Specification (1) is without controls, while specification (2) includes controls.

Ability to cover expenses

In Vietnam, we find a positive training effect on whether clients' household income covered all household expenses in the last 12 months, the ability of which is found to increase by 3.3 percentage points (s.e.= 1.9%). We do not detect impact on unforeseen expenses, whether these are household or business expenses.

In the Philippines, we find that target group clients are less likely to be able to cover their unforeseen business expenses. We do not find impact on whether a

client's income covered all household expenses or whether clients could cover their unforeseen business expenses.

In Cambodia 1, we find the training to have a negative impact on the ability to cover household expenses through income, but only when including covariates. We also detect a negative effect on whether clients could cover unforeseen expenses. However, this effect is not robust to including covariates.

In Cambodia 2, we find the training to improve the ability to cover unforeseen household expenses. However, target group clients are less likely able to cover household expenses through income. In addition, target group clients are less likely to be able to cover unforeseen business expenses.

Coping mechanisms

In Vietnam, we find that treated clients are 10 percentage points (s.e.= 4.9%) less likely to sell their assets to cover unforeseen expenses. We do not find impact on whether clients used savings, whether they used microinsurance or whether they sacrificed household expenses to cover unforeseen expenses.

In the Philippines, we do not find impact on any of the four indicators representing mechanisms to cope with shocks. However, as treated clients were found to be less likely able to cover their unforeseen household expenses, in order to cope with a shock they may have actually increased the amount that they borrow, as we found in Table 4.5.

In Cambodia 1, we find treated clients to be less likely to use savings to cover health-related expenses. One explanation for this effect may be a higher use of insurance among target group clients, as in Table 4.4 we found a positive treatment effect on the use of insurance. We do not find impact on whether clients sold assets

to cover asset shocks, used savings to cover asset shocks or sold assets to cover health shocks.

In Cambodia 2, we find that target group clients are less likely to sacrifice household expenditures to cover unforeseen expenses. They are also less likely to use savings to cover unforeseen expenses. However, this last result is not robust to including covariates. As clients appear to neither use savings nor sacrifice household expenditures, they may have actually increased informal borrowing, as we found in Table 4.5.

In sum, on the ability to cover planned or unforeseen expenses, while we also find positive impact, sometimes our findings suggest a negative training effect. One explanation for this result is that treated clients might be better aware as to whether they generate enough income to cover their regularly occurring expenses and also about their actual ability to cover unforeseen expenses. We find little evidence that training participants cope with shocks as per the indicators we explored. However, this does not necessarily mean that clients use unsustainable coping mechanisms. As the choice of exploring potential coping mechanisms is limited by the data at hand, we might be missing important channels through which clients respond to shocks.

4.5 Conclusion

This paper explored the role of four financial training programs implemented in Vietnam, the Philippines and Cambodia on outcomes related to financial attitude, risk management, broadly defined as financial behavior including asset building, over-indebtedness and vulnerability.

Across all four financial training interventions, we found financial education to be somewhat successful in generating intended effects on financial attitudes. We found

intended, but also unintended, impact on attitudes related to budgeting, saving and borrowing, except for insurance-related attitudes, where we found impact as intended.

While we found some evidence for financial literacy training to improve financial behavior, we also found a worsening in several financial behavior indicators. These results could be explained by our findings on financial attitudes, as we expected financial attitudes to translate into financial behavior. We found some evidence for financial education to positively affect the building of assets, including weak evidence that treatment group clients substitute between savings and insurance. Hence, financial education was somewhat successful in generating effects on risk management as intended.

Moreover, we found financial literacy training to improve loan repayment performance despite increased borrowing. We also found weak evidence that improved loan repayment may come at the cost of clients taking out loans to make repayments.

Our findings suggest a negative training effect on the ability to cover planned or unforeseen expenses. One explanation for this result is that treated clients might be better aware as to whether they are able to cover their planned or unforeseen expenses. We find little evidence on the use of improved coping mechanisms. This does not necessarily mean that clients use unsustainable coping mechanisms as we might be missing other important channels through which clients respond to shocks.

The four financial education interventions differed with respect to content and as to how the training was delivered. Overall, we found the training impact to be strongest in Vietnam, where financial education was delivered through a two half-day training course with the key messages reiterated during regular bank meetings. The

other financial education programs showed more mixed results. We found that the financial training which had a focus on business skills increased profits.

Our findings show that financial literacy training can play an important role in terms of improving attitudes towards financial issues as well as improving risk management strategies. The recent literature has focussed on business training rather than financial literacy in developing countries. More research is needed on the mode of delivery and the content to teach, in particular as to whether a general financial literacy training or a training with a focus on starting or managing a business can build the human capital poor households and microentrepreneurs may need in order to improve their livelihoods.

Appendix

Table 4.7: Summary statistics of client/household characteristics at baseline – Vietnam

Variable Names	Treatment	Control	Difference	p-value
Sex of client (% female)	100	100	0	.
Client age	42.14	44.92	-2.78	0
Household income VND $<$ 1 million	3.8	13.3	-9.5	0
Household income VND 1-2 million	23.5	29	-5.4	.05
Household income VND 2-5 million	48.7	45.5	3.2	.31
Household income VND $>$ 5 million	23.9	12.3	11.7	0
Household size	4.9	4.5	.4	0
Unforeseen expenses (%)	10	52.1	-42.1	0
Amount owed to others (VND)	4732465	8876453	-4143988	0
Year of first loan with MFI	2003.7	2003.9	-.2	.62
Last MFI loan amount (VND)	9073695	5640974	3432721	0
Year of start main activity	1989.6	1987.2	2.3	0

The p-value stems from a means comparing t-test.

Table 4.8: Summary statistics of client/household characteristics at baseline – Philippines

Variable Names	Treatment	Control	Difference	p-value
Sex of client (% female)	99.2	99.8	-.6	.22
Client age 18-24	3.6	2.6	1	.37
Client age 25-60	94.3	92.8	1.5	.35
Client age $\geq$ 60	2.1	4.7	-2.5	.03
Below PHP 2600 monthly income (%)	4.8	7.4	-2.6	.1
PHP 2601-4250 monthly income (%)	13.1	16.5	-3.5	.14
PHP 4251-5400 monthly income (%)	13.5	16.5	-3	.2
PHP 5401-6750 monthly income (%)	12.4	13.7	-1.3	.56
PHP 6751-8300 monthly income (%)	15.2	14.2	1	.68
PHP 8301-10300 monthly income (%)	18.1	14	4.2	.09
Above PHP 10300 monthly income (%)	22.9	17.7	5.3	.05
Household size	4.8	4.9	-.1	.27
Unforeseen household expenses (%)	24.6	15.1	9.5	0
Unforeseen business expenses (%)	15.2	12.6	2.6	.26
Amount owed to others (PHP)	546	572	-26	.9
Year of first loan with MFI	2005.8	2003.7	2	0
Last MFI loan amount (PHP)	8510	10583	-2073	0

The p-value stems from a means comparing t-test.

Table 4.9: Summary statistics of client/household characteristics at baseline – Cambodia 1

Variable Names	Treatment	Control	Difference	p-value
Sex of client (% female)	84	91.8	-7.8	0
Client age	41.32	41.5	-.18	.78
Years as client	1.61	2.11	-.51	0
Monthly household income (KHR)	768092	1263599	-495507	0
Household size	5.18	5.49	-.31	.01
Log of value of land in USD	6.34	6.41	-.07	.64
Household member sick/injured (%)	51.7	47	4.7	.11
Death, funeral or birth (%)	8.7	10	-1.3	.43
Crop damage due to natural disaster (%)	15.3	31.2	-15.8	0
Other damage due to natural disaster (%)	2.7	13	-10.3	0
Total amount owed (KHR)	92154900	67136825	25018075	0

The p-value stems from a means comparing t-test.

Table 4.10: Summary statistics of client/household characteristics at baseline – Cambodia 2

Variable Names	Treatment	Control	Difference	p-value
Sex of client (% female)	92.2	92.3	0	.98
Client age 18-24	1.6	2.8	-1.2	.18
Client age 25-60	93.3	93.4	-.1	.95
Client age $\geq$ 60	5.1	3.8	1.3	.29
Below KHR 230,000 monthly income	12.8	35.8	-22.9	0
KHR 230,000-460,000 monthly income	27.5	29.3	-1.9	.49
KHR 460,000-1,250,000 monthly income	42	28.5	13.5	0
Above KHR 1,250,000 monthly income	17.7	6.4	11.3	0
Household size	5.3	4.9	.3	0
Unforeseen household expenses (%)	75.9	74	2	.44
Unforeseen business expenses (%)	24.1	21.6	2.4	.32
Amount owed to others (KHR)	328635	72109	256526	.07
Year of first loan with MFI	2007.4	2008.2	-.8	0
Last MFI loan amount (KHR)	694864	670830	24034	.41
Year of start of main activity	1992.5	1994.1	-1.6	.02

The p-value stems from a means comparing t-test.

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CHAPTER V

Parental Migration and the Education of Children Left Behind

5.1 Introduction

Migration can have important consequences for both receiving and sending countries. A growing empirical literature investigates the impact of migration on human capital accumulation in sending countries of which a relatively new feature is parental migration.

Parental migration contributes to children's education by making more resources available (Edwards and Ureta, 2003; Yang, 2008). Through remittances, migration has the potential to alleviate credit constraints and thereby positively affect enrollment in education. Another channel through which migration may increase educational attainment is based on the idea that education has a high return when migrating. Thus, the prospect of migration raises the expected returns of education, inducing individuals to invest in education.[1] However, as parental migration implies family separation, it involves social and psychological costs (Ginther and Pollak, 2004). Migration can have a negative effect on educational outcomes through

[1]Batista et al. (2012) find that the prospect of own future migration has a positive impact on educational attainment. On the other hand, this is not necessarily the case as Chiquiar and Hanson (2005) find the returns to education to be higher in Mexico than in the United States which gives rise to a negative incentive effect to invest in education.

parental absence, in particular due to lack of parental supervision and interaction, lack of a role model, as well as family break-up. Communities with large remittances inflows may experience social tensions, particularly if those that are perceived to benefit most from migration are households that appear to have always been better off. Additionally, parental migration may lead to a reallocation of labor within the household as to replace the migrants' labor or income. In particular, it may lead to changes in duties and responsibilities within the household, leading to more pressure on older children to help in the household or agriculture. Hence, children of migrants may neglect school-related activities.

Empirical studies provide mixed evidence on whether migration has a net positive or negative impact on educational outcomes. Many of the existing studies focus on the role of migration in alleviating household budget constraints through remittances. For example, Edwards and Ureta (2003), using data from El Salvador, find that remittances reduce school dropout by providing additional sources of income. Yang (2008) also provides evidence for a favourable effect of remittances on schooling in the Philippines. A body of literature takes the potentially negative consequences of parental absence into account. Giannelli and Mangiavacchi (2010), in a study based on Albania, show that past parental migration has a negative effect on school attendance and increases the likelihood of school dropout for children left behind. Hanson and Woodruff (2003) find that having an international migrant raises educational attainment for 10-15 years old girls, but only in households in which the mother has less than 3 years of education. On the other hand, McKenzie and Rapoport (2011) provide evidence that living in a migrant household lowers the probability for boys completing junior high school and for boys and girls completing high school. In addition, the authors find that the effect of migration is less negative in poorer

households, as proxied by maternal education. Also, de Brauw and Giles (2006) show that rural-urban migration opportunities reduce the probability of high school enrollment in rural China. Antman (2011) explores the short-run effects of paternal migration from Mexico to the United States, providing evidence that in the short-run children reduce study hours and increase work hours in response to a father's migration. In the long-run, however, paternal migration appears to increase educational attainment for girls, but not for boys, suggesting that any adverse short-run effects for boys are not reversed in the long-run (Antman, 2012). Nguyen and Purnamasari (2011), who explore the gender dimension of parental migration in Indonesia, find that female migration reduces child labor. However, they do not find an effect on school enrollment or attendance.

In Moldova, parental migration is of considerable magnitude. According to UNICEF (2009), around one fifth of children have at least one parent who has migrated abroad. Children left behind by both parents mostly live with their grandparents, but also with their siblings and other relatives. Lücke et al. (2009) report that, when asked about the main effect of migration, households most frequently respond with increased income through remittances as well as emotional stress for partners and lack of parental care. Also in Moldova, Görlich et al. (2007) find that living in a migrant household substantially increases the probability of university enrollment. Hence, part of the increase in university enrollment in recent years in Moldova may be attributed to international migration. Parental migration may lead to behavioral changes among children left behind in various ways. Based on a qualitative study in Moldova, Vladicescu et al. (2008) find that children affected by parental migration more often engage in "rule-breaking activities", e.g. criminal delinquency or alcohol/drug abuse.

This paper is interested in identifying the effect of parental migration on schooling outcomes. However, identification is complicated as migration is correlated with family and individual characteristics, many of which are unobserved. Recent studies rely on instrumental variables for identification. Hanson and Woodruff (2003) instrument for whether a household has an international migrant with historical migration rates at the state level interacted with household characteristics. McKenzie and Rapoport (2011) also use historical migration rates at the state level. To instrument for migration behavior, de Brauw and Giles (2006) exploit the timing of ID card distribution in rural China. Görlich et al. (2007) use as an instrument the differential degree to which the 35 Moldovan districts were exposed to demand for migrant labor from abroad. Amuedo-Dorantes et al. (2008) use the geographic location of all current and past migration spells in the United States of household members in each household, assigning the US state-level unemployment rate and real weekly earnings of Hispanic workers. For households without migration experience in the United States, the authors use the unemployment rate as well as the real weekly informal sector earnings in the Dominican Republic, an alternative destination for migrants from Haiti. Generally, the exclusion restriction remains an issue for identification of migration effects. For example, historical migration rates might be an indicator of the current level of community development. Thus, through the quality of schools within a community, the instrument may actually affect educational outcomes directly.

This paper contributes to the literature by investigating the role of migration across the migrant parent's gender. Whereas other studies have looked at the impact of migration on children's education in the home country, the gender dimension of parental migration has been much less explored in the literature. In particular, the paper investigates whether maternal migration, which is associated with migration

to Western and Southern Europe as well as Turkey, has an impact on the likelihood of participation in school of children left behind. On the other hand, migration to Russia and Ukraine is dominated by seasonal migration of male migrants. If children are more sensitive to a father's seasonal migration, then these children may be more at risk of leaving school, despite any favourable effect of remittances.

My main empirical strategy consists of an instrumental variable approach where I take advantage of the fact that some migration destinations are preferred by male migrants, while others are preferred by female migrants. In addition, I use a fixed-effects model to explore the impact of parental migration on household expenditures for education. As a robustness check, I use a difference-in-differences approach.

I begin with a brief description of emigration in Moldova. Section 5.3 describes the data. Section 5.4 presents the empirical specification and the results. Section 5.5 concludes.

5.2 Emigration in Moldova

The focus of this paper is on Moldova. In the Republic of Moldova, labor migration and workers' remittances started off during the Russian financial crisis in 1998. More than 80% of migrants departed for the first time since then (Cuc et al., 2005). As of mid-2006, approximately one quarter of the economically active population was employed abroad (Lücke et al., 2007). According to regularly conducted labor force surveys in Moldova, the number of migrants grew from less than 100,000 in 1999 to more than 400,000 at the end of 2005, compared to an economically active population of 1,474,000 people in 2003. The Department of Migration of the Government of Moldova estimated the number of migrants at around 600,000 as of August 2004 (Ruggiero, 2005). Total remittances reported in the balance of payments increased

from around US$ 100 million annually in the late 1990s to just under US$ 1 billion in 2005, which is equivalent to about one third of GDP. In 2007, total remittances stood at US$ 1.5 billion and at US$ 1.9 billion in 2008 (Lücke et al., 2009).

Moldovan labor migrants choose two broad regions as destinations: the Commonwealth of Independent States (CIS), and Western and Southern Europe as well as Turkey. Most migrants are occupied in Russia, followed by Italy. Other important destinations include Ukraine, Portugal, France, Spain and Turkey. Male and female migrants choose different destinations depending on job characteristics. Destinations preferred by male migrants are CIS member countries, mainly Russia and Ukraine, where migrant worker jobs are predominantly in the construction sector. Destinations with migrant worker jobs predominantly in the service sector, such as Italy and Turkey, are preferred by female migrants (Ruggiero, 2005).

Job characteristics and travel costs also affect the seasonality of migration. Migration to Western Europe tends to be on a permanent basis, while Ukraine and Russia attract mostly seasonal migrants as there is not much construction in the winter. Travel costs to Western Europe are considerable, amounting to as much as US$ 3,600 one way in 2006. Crossing borders illegally makes traveling to Western Europe so costly. In contrast, the average cost of (visa free) travel to CIS member countries was around US$ 100 (Lücke et al., 2007).

5.3 Data

The empirical analysis in this paper is based on the IOM-CBSAXA survey, a household panel survey conducted in 2006 and 2008. The survey was commissioned by the International Organization for Migration (IOM) Moldova Office and executed by CBSAXA, an opinion research firm. The total number of households interviewed

was close to 4,000. The survey is designed to be representative of Moldovan households at the national level (excluding Transnistria); one goal of the survey is to compare households with migrants to those without. The second wave re-interview rate was 89 percent in rural areas and 69 percent in urban areas (Lücke et al., 2009).

The survey involves interviewing one household member, usually the head of household, to give information on all household members, including those staying abroad. Information has been collected on households' socio-economic characteristics and, since the survey centers on migration and remittances, on the year of migration and the destination country, working and living conditions abroad, legal status abroad, reasons for migration, and frequency and method of sending monetary and in-kind remittances.

In this paper, the analysis is focused on children aged 11-18 years. I restrict the sample for analysis in a number of ways. First, I restrict the sample to households that report having both a household head and a spouse (not necessarily present at the time of the survey as they might have been abroad). These households may be headed by a male or female household member. Second, I restrict the sample to households with children reported to be the household head's own children. Using own as opposed to any children present in the household helps to avoid observing children for whom individuals other than the parents make schooling decisions (Hanson and Woodruff, 2003).

For the purpose of this paper, information on household members' educational status is of particular importance. However, the corresponding question on what kind of education was pursued at the time of the survey was only asked in the second wave of the survey. Hence, I cannot fully exploit the panel structure of the sample with respect to this variable.

Table 5.1 shows summary statistics on whether a child was enrolled in school. Among households without parental migration experience, enrollment is universal for children aged 7 to 10 years, while being almost universal among parental migrant households. Therefore, this paper excludes this age group from the analysis. Among children aged 11 to 15 years, school enrollment is smaller in non-migrant households (92.5%) than in migrant households (96.4%). School enrollment drops to 84.6% and 81.8% in non-migrant and migrant households, respectively among children who are between 16 and 18 years old. Across gender, differences in school enrollment are statistically significant among 16-18 years old children only, both in non-migrant and migrant households (see Table 5.10 in the Appendix).

Table 5.2 shows summary statistics on migration. In 2006, the share of households with migration experience is 34% (in 2008: 37%).[2] When I apply above-mentioned sample restrictions, the sample size decreases from 3853 to 1878 households (in 2006). Effectively, the restricted sample is comprised of households with children who live with both parents and who are the household head's own children. In non-parental migrant households, neither the head nor the spouse have migration experience, while in parental migrant households the head or the spouse are reported to have been abroad currently or in the past. The share of households with parental migration experience is 38% (in 2008: 41%). The father is more often the migrant than the mother, more precisely the spouse;[3] in 22.5% of cases (not shown) both the father and the mother have migration experience (in 2008: 24.1%). Total time spent

[2]The sample size in 2008 is only marginally smaller than in 2006. The reason is that in case a household interviewed in 2006 could not be re-interviewed, a new household was drawn as replacement.

[3]Households report the relationship between any household member and the head of household only. Thus, I do not know whether the household head's own children are also the spouse's children. Nevertheless, the assumption that the spouse is the mother (if the spouse is female) appears to be reasonable.

Table 5.1: Summary statistics (means) on school enrollment in 2008, by parental migration status

	Non-migrant households	Parent-migrant households	Difference
Boys and girls			
7-10 years old	1	0.994	0.00610
			(0.00638)
11-15 years old	0.925	0.964	-0.0387**
			(0.0183)
16-18 years old	0.846	0.818	0.0274
			(0.0335)
Boys			
7-10 years old	1	0.989	0.0115
			(0.0116)
11-15 years old	0.913	0.951	-0.0374
			(0.0296)
16-18 years old	0.796	0.765	0.0309
			(0.0541)
Girls			
7-10 years old	1	1	0
			(0)
11-15 years old	0.938	0.974	-0.0351
			(0.0225)
16-18 years old	0.892	0.864	0.0275
			(0.0403)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.2: Summary statistics on migration

	2006		2008	
	Obs	Mean	Obs	Mean
Migrant household	3853	.34	3812	.37
Parental migration	1878	.38	1775	.41
Migrant mother	1878	.16	1775	.18
Migrant father	1878	.31	1775	.34
Migration duration (in months)	709	19.23	733	19.77
Years since last migration	0	.	462	1.46
Destination Turkey	688	.036	726	.032
Destination Russia	688	.669	726	.697
Destination Italy	688	.157	726	.165
Destination Cyprus	718	.007	734	.003
Destination Spain	718	.018	734	.014
Destination France	718	.017	734	.014
Destination Romania	688	.02	726	.026
Destination Greece	688	.016	726	.012
Destination Ukraine	688	.041	726	.05

abroad averages 19.2 and 19.8 months in 2006 and 2008, respectively. Time elapsed since the last migration spell, reported in the second wave of the survey only, is on average 1.5 years. Among parental migrant households, the majority have migration experience in Russia, followed by Italy. This pattern is highly stable between 2006 and 2008. Distinguishing parental migration by whether the mother or the father went abroad, Table 5.3 shows that, while still the majority of both migrant mothers and migrant fathers went to Russia, there is a marked difference in the distribution of destination countries across gender. A much larger share of migrant mothers went to Italy or Turkey, while an overwhelming majority of migrant fathers went to Russia. As mentioned above, Italy and Turkey demand migrant labor in the service sector (household help, elder care etc.), which is predominantly met by women migrant workers.

Table 5.3: Summary statistics (shares) on migration by maternal/paternal migration

	2006		2008	
	Mother	Father	Mother	Father
Destination Turkey	.081	.036	.073	.022
Destination Russia	.509	.748	.553	.779
Destination Italy	.302	.093	.291	.1
Destination Cyprus	.01	.009	.006	.003
Destination Spain	.023	.016	.022	.012
Destination France	.02	.014	.022	.01
Destination Romania	.025	.016	.038	.024
Destination Greece	.025	.013	.022	.01
Destination Ukraine	.039	.048	.054	.059

Table 5.4 reports household characteristics by parental migration status. Not surprisingly, in almost all households the sex of the head of household is male. Parental migrant households are relatively young, compared to non-parental migrant households, in terms of the household head's age as well as the age of the spouse. Household heads as well as spouses in migrant households have less often primary education and more often secondary education compared to their counterparts in non-migrant households who have more often higher education. Migrant households have a larger household size. One may expect that migrant households have a larger number of household members, in particular grandparents or siblings, as they may take care of children left behind by their parents. While this is the case for children below age 18 years and young adults, parent-migrant households have fewer members aged 65 years or above. Migrant households live more often in rural areas and they also more often possess land. Moreover, they live less often in the municipality of Chisinau (the capital) and more often in the northern and southern districts (except the autonomous region of Gagauzia), compared to non-migrant households.

Table 5.4: Summary statistics (means) on household characteristics in 2008, by parental migration status

	Non-migrant households	Parent-migrant households	Difference
Head is male	0.954	0.964	-0.0104
			(0.0100)
Age of head	48.74	42.95	5.795***
			(0.519)
Head has no completed formal education	0.00430	0.00716	-0.00287
			(0.00371)
Head has primary education	0.140	0.0903	0.0494***
			(0.0161)
Head has secondary education	0.534	0.670	-0.137***
			(0.0244)
Head has higher education	0.322	0.232	0.0901***
			(0.0225)
Age of spouse	45.88	39.79	6.090***
			(0.529)
Spouse has no completed formal education	0.00644	0.00860	-0.00215
			(0.00428)
Spouse has primary school	0.140	0.0917	0.0479***
			(0.0162)
Spouse has secondary school	0.483	0.586	-0.103***
			(0.0249)
Spouse has higher education	0.371	0.314	0.0568**
			(0.0238)
Household size	3.936	4.239	-0.304***
			(0.0569)
No. of adults 18-25 years old	0.676	0.764	-0.0880**
			(0.0406)
No. of adults 26-64 years old	2.070	2.100	-0.0305
			(0.0332)
No. of adults $\geq$ 65 years old	0.245	0.0788	0.166***
			(0.0243)
No. of children $\leq$ 6 years old	0.271	0.401	-0.130***
			(0.0293)
No. of children 7-17 years old	0.673	0.921	-0.248***
			(0.0427)
Rural	0.600	0.775	-0.175***
			(0.0231)
Household owns land	0.683	0.761	-0.0776***
			(0.0225)
Expenditure sum per adult equivalent	1392.6	1416.0	-23.39
			(54.70)
Central district	0.269	0.301	-0.0323
			(0.0225)
Municipality Chisinau	0.273	0.109	0.164***
			(0.0197)
Northern district	0.261	0.335	-0.0742***
			(0.0227)
Southern district (except Gagauzia)	0.168	0.212	-0.0445**
			(0.0195)
Gagauzia	0.0301	0.0430	-0.0129
			(0.00928)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.4 Empirical specification and results

This paper is interested in identifying the effect of parental migration on schooling outcomes. However, migration is correlated with family and individual characteristics, many of which are not observed by the econometrician. Selection into migration is of concern to the study as it is likely to be based on unobserved individual or household characteristics. Generally, the direction of bias is unclear a priori. It may be upward or downward depending on the type of selection into migration.

In a study on the gains from migration, McKenzie et al. (2006) compare several non-experimental methods to the experimental estimate. The authors use data from a natural experiment in which migrant applicants to New Zealand from Tonga are selected by a lottery, concluding that among the non-experimental methods the instrumental variable approach performed best, but only with a good instrument. Difference-in-differences and propensity score matching performed better than the ordinary least squares estimator.

My main empirical strategy consists of an instrumental variable approach where I take advantage of the fact that some migration destinations are preferred by male migrants, while others are preferred by female migrants. In addition, I use a fixed-effects model to explore the impact of parental migration on household expenditures for education.

5.4.1 Instrumental variables

I begin by estimating the impact of parental migration on education using ordinary least squares. The reduced form regression is:

$$Y_i = \alpha + \beta PM_i + \mathbf{X}_i\delta + \epsilon_i, \tag{5.1}$$

where I estimate the effect of individual i's parental migration experience PM_i on her schooling outcome Y_i. $\mathbf{X}_i$ is an individual and household-specific vector of controls, and ϵ_i is the error term. Since school participation is a binary variable, I estimate the effect of parental migration using the linear probability model.

I control for household and individual characteristics to account for possible correlation between parental migration experience and the error term. For example, I do not observe local labor market shocks – a variable that is likely to be correlated with migration as well as with education. However, I do observe household and individual characteristics that *inter alia* determine how well a household is able to cope with labor market shocks. Furthermore, controlling for a variable such as wealth is mandated as wealthy households may be more likely to migrate and invest more in education relative to poor households.

The vector $\mathbf{X}_i$ includes the following household and individual characteristics. Variables controlling for household composition are comprised of the sex and the age of the household head, and the number of children below the age of 7. Additional household-level control variables include dummy variables indicating the level of education of the head of household and the spouse, expenditures per adult equivalent, whether the household owns land and whether the household lives in a rural area. I also include regional variables or, alternatively, a full set of district controls. Variables controlling for individual characteristics are the child's age and sex.

Tables 5.5-5.7 in columns 1-6 present results based on ordinary least squares. Columns 1-3 use regional controls, while columns 4-6 use a full set of district-level controls. I do not find a statistically significant coefficient of parental migration in Table 5.5. Differentiating by the gender of the parent migrant, I still do not find a statistically significant coefficient, despite a negative coefficient on maternal

migration for girls (Table 5.7). Neither do I find a statistically significant coefficient of parental migration when disaggregating children's age into age groups 11-15 and 16-18 years old (see columns 1-6 in Tables 5.11-5.16 in the Appendix).

In Table 5.8 in columns 1-6, I explore the impact of parental migration on household expenditures for education based on ordinary least squares. I find parental migration to increase education expenditures. Parental migrant households spend 43.5 Moldovan lei (s.e.= 25.9) more on education per month, which is around US$ 3.5.

To account for selection into migration, I use an instrumental variables strategy that relies on the differential degree to which the 35 Moldovan districts were exposed to migration in 2004. All else equal, households with better access to migration networks should be more likely to send migrants abroad. This instrumental variables strategy is likely to be valid only conditionally as, for example, migration rates in 2004 might be indicators of district-level development in 2008. Therefore, I use regional controls to account for differences in community development that might be driven by migration.[4]

Figure 5.1 shows migration rates in 2004 according to the 2004 population census and the sample shares of migrant households in 2008. It is apparent that migration rates in 2004 are strongly correlated with the share of migrant households in the year 2008 sample.

In addition, following Hanson and Woodruff (2003), I interact district-level migration rates with household characteristics. Access to migration networks is unlikely to be the only factor influencing household migration decisions, differences in expected

[4]I cannot use district controls as these would be collinear with the instrument.

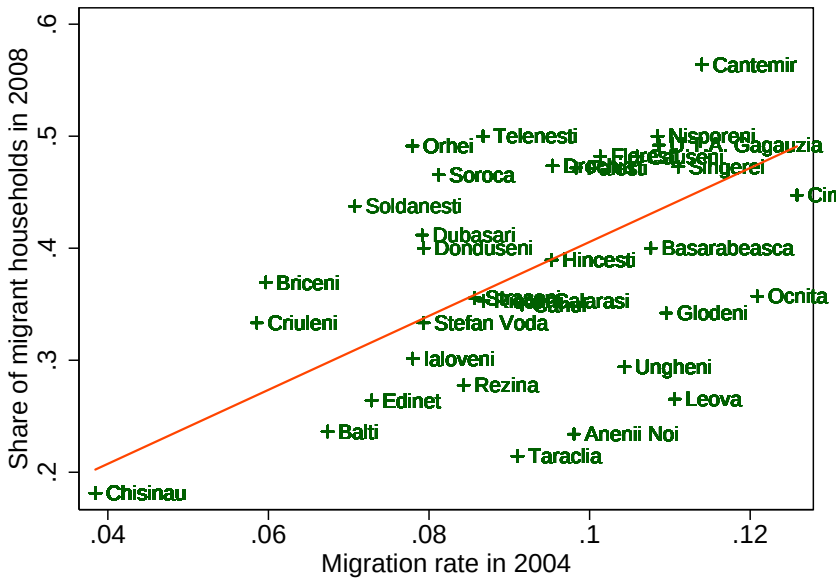

Figure 5.1: Migration rate (census-based) in 2004 and share of migrant households in year 2008 sample

earnings profiles between the home country and potential destinations are also expected to play a role. In order to account for differences in expected earnings profiles, I interact district-level migration rates with the spouse's age. Additionally, this empirical strategy allows me to include a full set of district controls as the instrument now varies at the household level.

From Figure 5.2 it is apparent that spouses from parental migrant households tend to be younger than spouses from non-migrant households with children. Households with younger spouses, who may be migrants themselves, are over-represented among emigrant households, arguably due to differences in earnings profiles.

I define the instrument depending on the gender of the parent migrant. While for parental migration I use the general district-level migration rate, for a father's migration I restrict the migration rate to cover male-dominated destination countries only, in particular Russia and Ukraine. For a mother's migration I restrict the migration

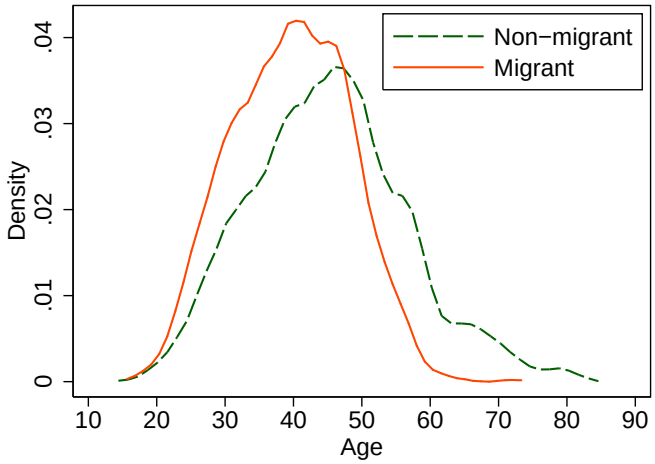

Figure 5.2: Density of spouse's age by parental migration status

rate to cover the region of Western and Southern Europe as well as Turkey, including female-dominated destination countries such as Turkey, Cyprus, Italy, Greece, and Spain.

Tables 5.5-5.7 in columns 7-12 present results based on the instrumental variable approach. Columns 7-9 use the migration rate in 2004 and its interaction with the spouse's age as instruments along with regional controls, while columns 10-12 use only the interacted migration rate as an instrument along with a full set of district-level controls.

Compared to the coefficients stemming from the ordinary least squares estimations, the coefficients are now much larger in size. However, it should be noted that the binary variable indicating parental migration status has been replaced by the probability of parental migration. As a consequence, a coefficient of 0.48 should be interpreted as follows: an increase in the probability of parental migration by 10 percentage points raises school enrollment by $0.1 * 0.48 = 0.048$ percentage points.[5]

[5]See also Amuedo-Dorantes et al. (2008).

In Table 5.5 I do not detect impact of parental migration on school enrollment. Differentiating by the gender of the migrant, I still do not detect impact (see Tables 5.6 and 5.7), except for a negative effect of maternal migration (see column 9 in Table 5.7); however, this effect is not robust to using a full set of district controls (see column 12). Neither do I detect impact when disaggregating children into age groups 11-15 and 16-18 years old (see columns 7-12 in Tables 5.11-5.16 in the Appendix).

The findings on the other covariates are in line with expectations. The negative coefficient on the child's age suggests that children are less likely to be enrolled with increasing age. Children with better educational household background are more likely to be enrolled. Children from households with a larger number of younger children are less likely to be enrolled. The positive coefficient on a child being female suggests that girls do not suffer from a gender bias; to the contrary, they are more likely to be enrolled compared to boys. Land ownership is found to reduce the probability of school enrollment for boys, but not for girls, suggesting that boys might be engaged in agriculture or other activities rather than being enrolled in school.

In some instances, the F-statistic for testing the joint significance of excluded instruments (reported at the bottom of the tables) is rather low, particularly when instrumenting for paternal migration, indicating a potential problem of weak instruments. Therefore, I redefine the outcome variable to include participation in school at the household level. This variable now measures the share of children being enrolled in school within a household. Results are reported in Tables 5.17-5.19 in the Appendix. As can be seen from the bottom of the tables, the F-statistic for testing the joint significance of excluded instruments has improved considerably. However, I still do not detect impact of parental migration on school enrollment.

Exploring the impact of parental migration on household expenditures for education, in column 7 in Table 5.8 I find parental migration to reduce education expenditures. However, the point estimate becomes statistically insignificant when including district controls (see column 10), suggesting that education expenditures might be driven by differences that are inherent to districts rather than by parental migration. Differentiating by the gender of the migrant, I do not detect impact.

5.4.2 Fixed-effects

As mentioned earlier, the question on what kind of education was pursued at the time of the survey was only asked in the second wave of the survey. However, I do observe the same household over time with respect to education expenditures. Hence, I can use the fixed-effects estimator to investigate the impact of migration on household expenditures for education.

The model to be estimated is as follows:

$$Y_{it} = \alpha + \beta PM_{it} + \mathbf{X}_{it}\gamma + c_i + u_{it}, \tag{5.2}$$

where PM_{it} is a binary variable indicating household i's parental migration experience,[6] $\mathbf{X}_{it}$ is vector of time-varying household-specific characteristics, c_i is an unobserved household fixed effect and u_{it} is the error term.

The time-varying household controls include the age of the household head, the number of children below the age of 7, the number of children aged between 7 and 17 years, the number of young adults, and the number of elderly household members; the number of adults aged between 26 and 64 years form the reference category.

In Table 5.9 I find positive impact of parental migration on household expenditures for education. Children who are affected by parental migration live in house-

[6]Household i's parental migration experience is time-varying as some households switch from non-migrant to migrant status during the two waves of the survey.

holds that have 133.9 Moldovan lei (s.e.= 37.2) larger education expenditures per month, which is around US$ 11. Differentiating by the gender of the migrant, point estimates remain statistically significant and are similar in size.

Table 5.5: Linear probability model: Parental migration, 11-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Parental migration	-0.001	0.001	0.005	-0.010	-0.001	-0.006	-0.001	0.283	-0.289	0.478	0.514	0.040
	(0.019)	(0.030)	(0.025)	(0.020)	(0.033)	(0.027)	(0.232)	(0.311)	(0.325)	(0.388)	(0.373)	(0.674)
Age	-0.023***	-0.034***	-0.013**	-0.025***	-0.035***	-0.014**	-0.024***	-0.038***	-0.018**	-0.024***	-0.044***	-0.013
	(0.004)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.009)	(0.009)	(0.006)	(0.011)	(0.014)
Female	0.051***			0.050***			0.051**			0.014		
	(0.019)			(0.019)			(0.023)			(0.036)		
Household size	-0.016	-0.034**	0.001	-0.012	-0.026	0.003	-0.017	-0.048**	-0.006	-0.019	-0.050*	0.004
	(0.010)	(0.016)	(0.011)	(0.011)	(0.017)	(0.012)	(0.011)	(0.023)	(0.016)	(0.014)	(0.026)	(0.018)
Head is male	0.039	0.026	0.064	0.071	0.046	0.086	0.060	0.019	0.133	0.036	-0.015	0.094
	(0.057)	(0.080)	(0.079)	(0.058)	(0.083)	(0.084)	(0.071)	(0.101)	(0.116)	(0.079)	(0.106)	(0.114)
Age of head	-0.002	-0.003	-0.003	-0.002	-0.003	-0.003	-0.002	0.001	-0.005	0.003	0.006	-0.003
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.005)	(0.003)	(0.005)	(0.007)	(0.007)
Head has secondary education	0.027	-0.000	0.042	0.019	-0.016	0.045	0.027	-0.051	0.024	0.006	-0.096	0.049
	(0.049)	(0.079)	(0.061)	(0.049)	(0.079)	(0.062)	(0.050)	(0.103)	(0.063)	(0.062)	(0.111)	(0.082)
Head has higher education	0.072	0.026	0.102*	0.058	-0.008	0.101*	0.071	0.022	0.088	0.078	-0.011	0.104
	(0.048)	(0.077)	(0.059)	(0.048)	(0.079)	(0.060)	(0.047)	(0.083)	(0.061)	(0.063)	(0.091)	(0.078)
Spouse has secondary school	0.076	0.167**	0.008	0.106**	0.189**	0.027	0.075	0.194**	0.028	0.095	0.226**	0.022
	(0.051)	(0.081)	(0.061)	(0.051)	(0.081)	(0.058)	(0.051)	(0.086)	(0.065)	(0.061)	(0.090)	(0.088)
Spouse has higher education	0.078	0.200**	-0.023	0.110**	0.227***	0.007	0.077	0.199**	-0.002	0.089	0.228***	0.002
	(0.051)	(0.082)	(0.059)	(0.051)	(0.081)	(0.059)	(0.051)	(0.081)	(0.065)	(0.063)	(0.087)	(0.088)
No. of children $\leq$ 6 years old	-0.011	0.030	-0.048	-0.022	0.029	-0.071**	-0.010	0.048	-0.024	-0.021	0.061	-0.072*
	(0.024)	(0.031)	(0.035)	(0.025)	(0.036)	(0.036)	(0.024)	(0.037)	(0.048)	(0.030)	(0.047)	(0.041)
Rural	0.033	0.091*	-0.011	0.034	0.115*	-0.039	0.036	0.053	0.045	-0.040	0.042	-0.048
	(0.033)	(0.051)	(0.041)	(0.037)	(0.060)	(0.047)	(0.054)	(0.073)	(0.081)	(0.073)	(0.082)	(0.134)
Household owns land	-0.074***	-0.123***	-0.037	-0.073***	-0.130***	-0.029	-0.072***	-0.114**	-0.017	-0.083**	-0.107*	-0.030
	(0.026)	(0.041)	(0.031)	(0.027)	(0.047)	(0.033)	(0.026)	(0.046)	(0.040)	(0.036)	(0.057)	(0.049)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	965	456	509	965	456	509	953	451	502	953	451	502
F-statistic for test of joint significance of excluded instruments							2.98	1.87	1.39	4.45	4.54	.91

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 11-18 years.

Table 5.6: Linear probability model: Paternal migration, 11-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Paternal migration	0.009	0.000	0.024	0.004	0.006	0.017	0.517	0.554	0.383	0.533	0.660	-0.682
	(0.020)	(0.031)	(0.025)	(0.021)	(0.034)	(0.028)	(0.531)	(0.498)	(0.462)	(0.486)	(0.429)	(3.414)
Age	-0.023***	-0.034***	-0.013**	-0.025***	-0.036***	-0.013**	-0.022***	-0.038***	-0.009	-0.023***	-0.042***	-0.022
	(0.004)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)	(0.006)	(0.010)	(0.008)	(0.006)	(0.011)	(0.040)
Female	0.051***			0.049***			0.047*			0.041*		
	(0.019)			(0.019)			(0.024)			(0.024)		
Household size	-0.016	-0.034**	0.002	-0.012	-0.026	0.004	-0.014	-0.045**	0.015	-0.010	-0.035*	-0.014
	(0.010)	(0.016)	(0.011)	(0.011)	(0.017)	(0.012)	(0.013)	(0.019)	(0.023)	(0.013)	(0.019)	(0.086)
Head is male	0.039	0.026	0.061	0.070	0.045	0.085	-0.005	-0.048	0.050	0.039	-0.073	0.105
	(0.057)	(0.080)	(0.079)	(0.057)	(0.082)	(0.083)	(0.099)	(0.122)	(0.101)	(0.076)	(0.113)	(0.128)
Age of head	-0.002	-0.003	-0.003	-0.002	-0.003	-0.003	0.004	0.005	0.000	0.004	0.008	-0.010
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.006)	(0.008)	(0.005)	(0.006)	(0.008)	(0.037)
Head has secondary education	0.026	-0.000	0.042	0.018	-0.017	0.047	-0.038	-0.150	0.043	-0.016	-0.179	-0.006
	(0.049)	(0.079)	(0.062)	(0.050)	(0.080)	(0.062)	(0.087)	(0.164)	(0.073)	(0.069)	(0.142)	(0.264)
Head has higher education	0.073	0.026	0.105*	0.059	-0.008	0.105*	0.110	0.030	0.155	0.135	0.008	-0.055
	(0.048)	(0.077)	(0.059)	(0.048)	(0.079)	(0.060)	(0.075)	(0.098)	(0.104)	(0.094)	(0.102)	(0.782)
Spouse has secondary school	0.076	0.167**	0.007	0.106**	0.190**	0.024	0.078	0.218**	-0.016	0.096	0.243**	0.111
	(0.052)	(0.082)	(0.061)	(0.051)	(0.081)	(0.058)	(0.062)	(0.102)	(0.080)	(0.062)	(0.098)	(0.429)
Spouse has higher education	0.077	0.200**	-0.026	0.109**	0.227***	0.002	0.036	0.184**	-0.077	0.053	0.218**	0.154
	(0.051)	(0.081)	(0.060)	(0.051)	(0.081)	(0.059)	(0.075)	(0.091)	(0.099)	(0.078)	(0.094)	(0.748)
No. of children $\leq$ 6 years old	-0.011	0.030	-0.049	-0.022	0.030	-0.072**	-0.011	0.069	-0.072	-0.017	0.067	-0.064
	(0.024)	(0.031)	(0.035)	(0.025)	(0.036)	(0.036)	(0.030)	(0.052)	(0.053)	(0.031)	(0.052)	(0.062)
Rural	0.031	0.091*	-0.015	0.032	0.114*	-0.043	-0.074	-0.024	-0.093	-0.066	-0.004	0.084
	(0.033)	(0.051)	(0.041)	(0.037)	(0.060)	(0.048)	(0.119)	(0.123)	(0.116)	(0.100)	(0.102)	(0.629)
Household owns land	-0.073***	-0.123***	-0.038	-0.073***	-0.129***	-0.030	-0.055	-0.060	-0.047	-0.056	-0.049	-0.006
	(0.025)	(0.040)	(0.031)	(0.027)	(0.046)	(0.034)	(0.039)	(0.077)	(0.044)	(0.039)	(0.082)	(0.126)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	965	456	509	965	456	509	953	451	502	953	451	502
F-statistic for test of joint significance of excluded instruments							1.06	1.3	.75	2.69	3.25	.08

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 11-18 years.

Table 5.7: Linear probability model: Maternal migration, 11-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Maternal migration	-0.016	0.019	-0.035	-0.025	0.008	-0.045	-0.343	-0.208	-0.405*	0.594	0.576	0.270
	(0.024)	(0.036)	(0.031)	(0.025)	(0.041)	(0.031)	(0.258)	(0.575)	(0.228)	(0.604)	(1.064)	(0.439)
Age	-0.023***	-0.034***	-0.013**	-0.025***	-0.036***	-0.014**	-0.024***	-0.033***	-0.016**	-0.027***	-0.044***	-0.012*
	(0.004)	(0.007)	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.010)	(0.007)	(0.006)	(0.017)	(0.007)
Female	0.052***			0.050***			0.066***			0.023		
	(0.019)			(0.019)			(0.023)			(0.036)		
Household size	-0.016	-0.035**	0.002	-0.011	-0.026	0.003	-0.006	-0.023	0.006	-0.022	-0.048	0.004
	(0.010)	(0.016)	(0.011)	(0.011)	(0.018)	(0.012)	(0.014)	(0.032)	(0.016)	(0.018)	(0.045)	(0.013)
Head is male	0.038	0.027	0.062	0.070	0.045	0.082	0.061	0.050	0.098	0.069	0.048	0.096
	(0.057)	(0.080)	(0.080)	(0.058)	(0.083)	(0.083)	(0.064)	(0.082)	(0.097)	(0.078)	(0.103)	(0.096)
Age of head	-0.002	-0.003	-0.003	-0.002	-0.003	-0.003	-0.003	-0.004	-0.004	-0.000	-0.001	-0.003
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)
Head has secondary education	0.028	-0.001	0.040	0.019	-0.016	0.044	0.027	0.015	0.011	0.014	-0.046	0.059
	(0.049)	(0.077)	(0.061)	(0.049)	(0.078)	(0.062)	(0.053)	(0.093)	(0.071)	(0.056)	(0.105)	(0.069)
Head has higher education	0.074	0.023	0.104*	0.061	-0.009	0.105*	0.111*	0.059	0.125*	-0.013	-0.087	0.081
	(0.048)	(0.077)	(0.060)	(0.049)	(0.079)	(0.060)	(0.063)	(0.133)	(0.072)	(0.095)	(0.173)	(0.071)
Spouse has secondary school	0.075	0.170**	0.008	0.104**	0.190**	0.025	0.048	0.137	0.006	0.154*	0.263	0.033
	(0.052)	(0.081)	(0.061)	(0.052)	(0.080)	(0.058)	(0.062)	(0.129)	(0.070)	(0.079)	(0.168)	(0.063)
Spouse has higher education	0.076	0.203**	-0.024	0.107**	0.228***	0.004	0.038	0.161	-0.034	0.183*	0.330	0.020
	(0.051)	(0.082)	(0.060)	(0.051)	(0.081)	(0.060)	(0.067)	(0.146)	(0.072)	(0.098)	(0.218)	(0.067)
No. of children $\leq$ 6 years old	-0.011	0.030	-0.050	-0.022	0.030	-0.074**	-0.022	0.027	-0.065	-0.003	0.036	-0.058
	(0.024)	(0.031)	(0.035)	(0.025)	(0.036)	(0.036)	(0.029)	(0.033)	(0.041)	(0.036)	(0.043)	(0.042)
Rural	0.033	0.092*	-0.007	0.033	0.115*	-0.036	0.042	0.087	0.022	0.021	0.140*	-0.064
	(0.033)	(0.050)	(0.040)	(0.037)	(0.060)	(0.047)	(0.037)	(0.059)	(0.051)	(0.048)	(0.080)	(0.064)
Household owns land	-0.073***	-0.123***	-0.035	-0.071***	-0.131***	-0.027	-0.047	-0.110*	-0.002	-0.122**	-0.188	-0.047
	(0.026)	(0.041)	(0.031)	(0.027)	(0.047)	(0.033)	(0.035)	(0.065)	(0.038)	(0.062)	(0.115)	(0.050)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	965	456	509	965	456	509	953	451	502	953	451	502
F-statistic for test of joint significance of excluded instruments							3.36	.8	3.27	2.47	.84	2.63

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 11-18 years.

Table 5.8: Expenditures for education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Parental migration	40.4			43.5*			-511.6**			-38.4		
	(25.9)			(25.9)			(207.3)			(185.8)		
Paternal migration		39.4			43.4			-375.5			-79.7	
		(28.0)			(28.1)			(236.7)			(220.7)	
Maternal migration			20.6			13.0			-279.6			4.7
			(28.4)			(27.7)			(224.5)			(417.2)
Head is male	-9.0	-9.9	-7.3	18.4	17.5	19.3	1.2	-0.4	-21.9	8.9	9.5	8.8
	(44.2)	(44.3)	(44.5)	(49.3)	(49.3)	(49.5)	(57.4)	(50.8)	(46.7)	(48.5)	(48.5)	(55.8)
Age of head	-0.6	-0.6	-1.0	-0.6	-0.6	-1.0	-6.2**	-5.0*	-1.5	-1.5	-1.9	-1.1
	(1.2)	(1.2)	(1.1)	(1.1)	(1.2)	(1.1)	(2.7)	(3.0)	(1.2)	(2.3)	(2.8)	(1.3)
Head has secondary education	40.1	40.3	40.1	38.9	39.6	39.1	59.9	54.0	61.1	40.8	40.9	39.3
	(42.2)	(42.2)	(42.0)	(42.1)	(42.1)	(41.7)	(46.7)	(45.2)	(43.5)	(41.8)	(41.8)	(53.3)
Head has higher education	46.6	48.6	43.7	42.1	44.7	39.5	36.3	19.6	74.7	40.6	34.6	41.3
	(49.6)	(49.6)	(48.8)	(54.2)	(54.1)	(53.8)	(56.9)	(55.3)	(49.4)	(53.1)	(54.0)	(68.7)
Spouse has secondary school	-41.7	-41.0	-38.7	-39.1	-38.5	-36.4	-20.2	-31.3	-58.8	-36.5	-35.8	-37.8
	(45.4)	(45.3)	(44.9)	(46.9)	(46.8)	(46.5)	(51.2)	(49.5)	(49.6)	(47.2)	(47.4)	(53.4)
Spouse has higher education	87.2	86.3	89.6*	89.1	88.0	90.9	98.3	104.1*	67.3	91.6	94.1*	91.2
	(53.5)	(53.4)	(53.1)	(56.5)	(56.3)	(56.3)	(61.0)	(58.1)	(57.4)	(55.9)	(56.0)	(64.3)
No. of children $\leq$ 6 years old	-30.7	-31.4	-29.6	-31.7	-32.6	-30.1	-9.1	-8.1	-23.4	-28.6	-25.2	-30.3
	(22.5)	(22.4)	(22.8)	(22.3)	(22.2)	(22.6)	(27.3)	(27.1)	(25.0)	(23.2)	(25.1)	(24.0)
No. of children 7-17 years old	57.9***	58.7***	58.8***	56.7***	57.2***	57.7***	83.2***	71.2***	73.0***	60.2***	60.9***	58.6***
	(13.6)	(13.7)	(13.5)	(13.9)	(13.9)	(13.7)	(18.6)	(17.0)	(16.5)	(15.5)	(15.2)	(22.1)
No. of adults 18-25 years old	109.5***	110.0***	110.9***	105.9***	106.3***	107.9***	139.2***	127.2***	122.2***	107.9***	109.6***	105.4***
	(15.5)	(15.6)	(16.0)	(15.7)	(15.8)	(16.2)	(22.4)	(20.1)	(20.5)	(18.5)	(18.4)	(24.4)
Rural	-33.1	-33.6	-28.8	-46.9	-47.9	-43.6	13.6	10.1	-40.5	-42.7	-37.9	-45.2
	(32.1)	(32.5)	(31.5)	(36.9)	(37.3)	(36.5)	(42.8)	(47.8)	(33.2)	(39.8)	(45.3)	(37.8)
Household owns land	-5.5	-4.3	-6.6	-5.7	-4.2	-6.2	1.4	-12.7	17.1	-0.8	-4.0	-1.0
	(27.4)	(27.3)	(27.5)	(24.8)	(24.6)	(24.8)	(32.8)	(31.1)	(28.7)	(23.9)	(25.0)	(30.5)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	1333	1333	1333	1333	1333	1333	1321	1321	1321	1321	1321	1321
F-statistic for test of joint significance of excluded instruments							10.39	16.38	5.71	12.11	7.06	2.85

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: Household expenditures for education.

Table 5.9: Fixed-effects estimator, expenditures for education

	(1)	(2)	(3)
Parental migration	133.9***		
	(37.2)		
Paternal migration		137.1***	
		(38.4)	
Maternal migration			119.6*
			(47.1)
Age of head	0.5	0.5	0.7
	(2.6)	(2.6)	(2.6)
No. of children $\leq$ 6 years old	-87.7*	-91.2*	-84.0*
	(38.2)	(38.2)	(38.2)
No. of children 7-17 years old	-40.2	-40.6	-41.7
	(30.9)	(30.9)	(30.9)
No. of adults 18-25 years old	80.6**	82.0**	78.8**
	(26.8)	(26.8)	(26.9)
No. of adults $\geq$ 65 years old	-96.2	-99.2	-98.6
	(56.4)	(56.4)	(56.5)
Observations	3265	3265	3265

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Dependent variable: Household expenditures for education.

5.4.3 Robustness check

As the data stem from a panel survey, an obvious strategy to resolve issues related to unobserved variables would be to exploit the time dimension of the data. As a robustness check, I use a difference-in-differences methodology. The key identification assumption is that there are no time-varying unobserved variables influencing the outcome and that are correlated with migration behavior. As the question on the kind of education each household member pursued was only asked in the second wave of the survey, I use instead a measure of school participation that is based on the labor force status which households reported in 2006 and 2008. As the survey restricted labor force related questions to individuals above the age of 16, I use school participation for children aged 17-18 years. It should be noted that I cannot perform a fixed-effects estimation as children who belong to the age group 17-18 years old in 2006 will have outgrown their age group two years later in 2008, making it impossible to observe the same individual twice in the data. Nevertheless, I can use a difference-in-differences approach, using the 17-18 years age group in 2006 and 2008 for estimation.

Table 5.20 in the Appendix presents summary statistics on the labor force based outcome variable. Compared to Table 5.1, school participation is generally lower, which is not surprising as children are older under the labor force based measure. Across gender, the difference in school participation becomes statistically significant in 2006, school participation being larger for girls than for boys, only when I pool non-migrant and parental migrant households (see Table 5.21 in the Appendix).

I use the following regression formulation of the difference-in-differences approach, specifying a linear model:

$$Y_{it} = \alpha + \gamma PM_{it} + \lambda t_{2008} + \mathbf{X}_{it}\delta + \beta(PM_{it} * t_{2008}) + u_{it}, \tag{5.3}$$

where PM_{it} is a binary variable indicating parental migration experience, t_{2008} is a time dummy, $\mathbf{X}_{it}$ is an individual and household-specific vector of controls, and u_{it} is the error term. The coefficient β on the interaction between PM_{it} and t_{2008} gives the average treatment effect. The vector $\mathbf{X}_{it}$ includes the same set of household and individual characteristics as in Section 5.4.1.

Tables 5.22-5.24 in the Appendix present results on the impact of parental migration using three specifications. Specification (1) does not include any controls, giving the simple double difference in sample means, that is the difference in changes in outcomes over time and across treatment and control group. Specification (2) uses individual, household, and regional controls. Specification (3) uses a full set of district controls instead of regional controls.

In Table 5.22, while the coefficient on the interaction term is positive when including covariates, it is never statistically significant. Differentiating by the gender of the parent migrant in Tables 5.23 and 5.24, I still do not detect impact. In Table 5.24, reporting results on maternal migration, the coefficient on the interaction term is mostly negative, though it is never statistically significant.

Apart from participation in school, I also explore the impact of parental migration on monthly household education expenditures using the difference-in-differences estimator (see Table 5.25 for results). While the coefficient on the interaction term is positive, except for maternal migration, it is never statistically significant.

As an additional robustness check, I reran the full analysis restricting the sample to rural households. Alternatively, I restrict the sample to households that have adult equivalent household expenditures below the median. I still do not detect impact on school enrollment (not shown).

Furthermore, I drop households which have both paternal and maternal migration experience. As mentioned in Section 5.3, in 24.1% of cases both the father and the mother have migration experience in 2008. When re-running the full analysis, changes in results are only minor (not shown).

Finally, I restrict the sample to households where the head of household has both sons and daughters.[7] This is important because if the impact of parental migration differed across households – only boy children households, only girl children households, and mix-sex children households –, then my results would be confounded by this. Re-running the full analysis using the restricted sample, changes in results are only minor (not shown).

5.5 Conclusion

Parental migration may contribute to children's education by making more resources available. However, as parental migration implies family separation, it involves social and psychological costs. Additionally, it may lead to changes in duties and responsibilities within the household as well as changes in the incentives to obtain education.

This paper evaluated the impact of migration on school enrollment of children who are left behind by their parents, allowing the effect to vary with the gender of the migrant. Whereas other studies have explored the impact of migration on children's

[7]The sample used in the main analysis is comprised of households with at least one child, irrespective of the sex, being the household head's own child.

education in the sending country, the migrant gender dimension of parental migration has received less attention in the literature.

I found parental migration to increase household education expenditures, providing evidence that migration makes more resources available that are spent on children's education. On the other hand, I did not detect impact on school participation. Results are consistent with migration having both positive and negative effects that cancel each other out.

Appendix

Table 5.10: Summary statistics (means) on school enrollment in 2008, by children's sex

	Boys	Girls	Difference
All			
7-10 years old	0.994	1	-0.00581
			(0.00640)
11-15 years old	0.932	0.959	-0.0277
			(0.0183)
16-18 years old	0.782	0.880	-0.0973***
			(0.0330)
Non-migrant			
7-10 years old	1	1	0
			(0)
11-15 years old	0.913	0.938	-0.0251
			(0.0316)
16-18 years old	0.796	0.892	-0.0963**
			(0.0426)
Parental migrant			
7-10 years old	0.989	1	-0.0115
			(0.0122)
11-15 years old	0.951	0.974	-0.0228
			(0.0208)
16-18 years old	0.765	0.864	-0.0997*
			(0.0519)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.11: Linear probability model: Parental migration, 11-15 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Parental migration	0.011	0.010	0.011	0.002	0.003	0.008	-0.163	-0.171	-0.207	-0.341	-0.187	-0.381
	(0.020)	(0.031)	(0.027)	(0.022)	(0.032)	(0.034)	(0.197)	(0.212)	(0.326)	(0.488)	(0.351)	(0.563)
Age	-0.008	-0.017	-0.002	-0.006	-0.014	-0.004	-0.003	-0.008	-0.001	0.003	-0.003	-0.002
	(0.007)	(0.012)	(0.007)	(0.006)	(0.012)	(0.008)	(0.008)	(0.015)	(0.008)	(0.015)	(0.020)	(0.011)
Female	0.012			0.014			0.030			0.050		
	(0.019)			(0.019)			(0.030)			(0.055)		
Household size	0.003	-0.007	0.018*	0.010	0.008	0.018*	0.005	-0.004	0.019*	0.016	0.014	0.026
	(0.007)	(0.012)	(0.010)	(0.007)	(0.016)	(0.010)	(0.008)	(0.013)	(0.011)	(0.012)	(0.018)	(0.017)
Head is male	0.139*	0.128	0.153	0.156*	0.119	0.163	0.172*	0.147	0.210	0.186*	0.144	0.187
	(0.081)	(0.123)	(0.095)	(0.084)	(0.121)	(0.102)	(0.092)	(0.123)	(0.129)	(0.105)	(0.131)	(0.130)
Age of head	-0.002	0.003	-0.006**	-0.002	0.003	-0.006**	-0.005	0.001	-0.010	-0.008	0.001	-0.013
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)	(0.006)	(0.008)	(0.006)	(0.011)
Head has secondary education	-0.007	0.023	-0.050	-0.004	0.026	-0.050	0.009	0.045	-0.037	0.020	0.040	0.001
	(0.054)	(0.095)	(0.048)	(0.053)	(0.090)	(0.048)	(0.055)	(0.093)	(0.055)	(0.065)	(0.088)	(0.108)
Head has higher education	0.029	0.072	-0.012	0.023	0.053	-0.010	0.041	0.058	0.021	0.038	0.028	0.075
	(0.051)	(0.087)	(0.048)	(0.051)	(0.085)	(0.053)	(0.052)	(0.084)	(0.075)	(0.059)	(0.084)	(0.158)
Spouse has secondary school	0.099*	0.088	0.129*	0.118**	0.117	0.121**	0.110*	0.095	0.145*	0.150**	0.140	0.129*
	(0.060)	(0.092)	(0.076)	(0.057)	(0.086)	(0.060)	(0.063)	(0.096)	(0.077)	(0.076)	(0.090)	(0.073)
Spouse has higher education	0.099*	0.098	0.110	0.124**	0.131	0.109*	0.104*	0.121	0.110	0.144**	0.164	0.101
	(0.059)	(0.090)	(0.076)	(0.058)	(0.088)	(0.063)	(0.062)	(0.098)	(0.077)	(0.071)	(0.100)	(0.078)
No. of children $\leq$ 6 years old	-0.014	0.036	-0.070**	-0.021	0.029	-0.081**	-0.011	0.033	-0.058	-0.013	0.037	-0.075*
	(0.023)	(0.028)	(0.035)	(0.024)	(0.034)	(0.035)	(0.025)	(0.028)	(0.041)	(0.031)	(0.038)	(0.043)
Rural	0.019	0.053	-0.036	0.032	0.089	-0.038	0.045	0.079	0.002	0.068	0.085	0.027
	(0.039)	(0.045)	(0.055)	(0.047)	(0.061)	(0.068)	(0.053)	(0.060)	(0.086)	(0.077)	(0.062)	(0.134)
Household owns land	-0.043	-0.075*	-0.010	-0.050	-0.067	-0.036	-0.031	-0.080*	0.016	-0.031	-0.078	0.001
	(0.030)	(0.043)	(0.037)	(0.034)	(0.051)	(0.049)	(0.034)	(0.047)	(0.054)	(0.051)	(0.053)	(0.077)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	534	251	283	534	251	283	531	249	282	531	249	282
F-statistic for test of joint significance of excluded instruments							2.02	1.92	.61	1.88	1.69	1.29

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 11-15 years.

Table 5.12: Linear probability model: Parental migration, 16-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Parental migration	-0.012	0.008	-0.008	-0.028	0.009	-0.035	0.338	0.396	-0.901	0.869	0.507	-4.013
	(0.036)	(0.057)	(0.044)	(0.039)	(0.071)	(0.046)	(0.457)	(0.298)	(1.371)	(0.734)	(0.425)	(31.228)
Age	-0.036*	-0.058*	-0.027	-0.042*	-0.053	-0.029	-0.048*	-0.078**	-0.037	-0.079*	-0.077*	0.015
	(0.021)	(0.033)	(0.028)	(0.022)	(0.037)	(0.028)	(0.028)	(0.038)	(0.049)	(0.043)	(0.042)	(0.378)
Female	0.102***			0.106***			0.094**			0.082		
	(0.035)			(0.036)			(0.038)			(0.055)		
Household size	-0.042**	-0.054*	-0.035	-0.035*	-0.041	-0.030	-0.056**	-0.096**	-0.092	-0.068*	-0.096*	-0.167
	(0.018)	(0.028)	(0.023)	(0.019)	(0.031)	(0.027)	(0.026)	(0.041)	(0.100)	(0.036)	(0.051)	(1.097)
Head is male	-0.069*	-0.067	-0.055	-0.028	0.009	-0.024	-0.101	-0.090	0.145	-0.191	-0.141	0.995
	(0.040)	(0.078)	(0.053)	(0.044)	(0.087)	(0.070)	(0.092)	(0.107)	(0.293)	(0.145)	(0.149)	(8.104)
Age of head	-0.005	-0.012**	0.001	-0.005	-0.015**	0.001	-0.004	-0.007	0.004	-0.002	-0.007	0.018
	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)	(0.004)	(0.007)	(0.009)	(0.006)	(0.009)	(0.133)
Head has secondary education	0.105	0.026	0.190	0.108	-0.027	0.239*	0.096	-0.099	-0.022	0.147	-0.179	-1.022
	(0.097)	(0.141)	(0.128)	(0.099)	(0.152)	(0.130)	(0.105)	(0.178)	(0.354)	(0.151)	(0.205)	(9.920)
Head has higher education	0.173*	0.045	0.276**	0.172*	-0.038	0.332***	0.207*	-0.034	0.003	0.331	-0.128	-1.007
	(0.096)	(0.146)	(0.125)	(0.098)	(0.153)	(0.126)	(0.121)	(0.166)	(0.453)	(0.203)	(0.168)	(10.504)
Spouse has secondary school	0.043	0.270*	-0.171**	0.086	0.320**	-0.151	0.071	0.411**	-0.111	0.161	0.507**	0.247
	(0.091)	(0.142)	(0.086)	(0.093)	(0.160)	(0.092)	(0.104)	(0.179)	(0.171)	(0.141)	(0.209)	(3.193)
Spouse has higher education	0.034	0.305**	-0.204**	0.085	0.370**	-0.142	0.032	0.398**	-0.050	0.072	0.504**	0.548
	(0.091)	(0.149)	(0.088)	(0.093)	(0.164)	(0.094)	(0.101)	(0.173)	(0.276)	(0.138)	(0.196)	(5.428)
No. of children $\leq$ 6 years old	0.009	0.004	0.026	-0.033	0.010	-0.041	0.038	0.105	0.097	0.053	0.197	0.185
	(0.054)	(0.104)	(0.067)	(0.059)	(0.132)	(0.074)	(0.065)	(0.130)	(0.152)	(0.111)	(0.204)	(1.789)
Rural	0.038	0.105	0.020	0.052	0.152	-0.000	-0.018	0.072	0.201	-0.114	0.054	0.804
	(0.053)	(0.087)	(0.058)	(0.055)	(0.102)	(0.073)	(0.096)	(0.096)	(0.308)	(0.161)	(0.149)	(6.387)
Household owns land	-0.100**	-0.128*	-0.091*	-0.077*	-0.135	-0.047	-0.070	-0.100	-0.129	-0.039	-0.061	-0.257
	(0.043)	(0.071)	(0.051)	(0.044)	(0.087)	(0.057)	(0.057)	(0.083)	(0.121)	(0.076)	(0.129)	(1.738)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	431	205	226	431	205	226	422	202	220	422	202	220
F-statistic for test of joint significance of excluded instruments							1.13	4.28	.31	1.98	5.64	.01

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 16-18 years.

Table 5.13: Linear probability model: Paternal migration, 11-15 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Paternal migration	0.017	0.030	0.004	0.011	0.028	0.002	-0.344	-0.327	-0.305	-0.187	0.028	-0.487
	(0.020)	(0.032)	(0.026)	(0.022)	(0.034)	(0.032)	(0.606)	(1.135)	(0.781)	(0.368)	(0.271)	(0.639)
Age	-0.008	-0.018	-0.002	-0.007	-0.015	-0.004	0.001	-0.001	-0.000	-0.002	-0.015	-0.000
	(0.007)	(0.012)	(0.007)	(0.006)	(0.012)	(0.008)	(0.016)	(0.052)	(0.012)	(0.010)	(0.012)	(0.014)
Female	0.013			0.014			0.022			0.019		
	(0.019)			(0.019)			(0.028)			(0.022)		
Household size	0.003	-0.008	0.018*	0.010	0.008	0.018*	0.001	-0.003	0.011	0.010	0.007	0.017
	(0.008)	(0.012)	(0.010)	(0.007)	(0.016)	(0.010)	(0.010)	(0.022)	(0.023)	(0.008)	(0.014)	(0.015)
Head is male	0.137*	0.123	0.153	0.155*	0.113	0.162	0.211	0.193	0.223	0.180*	0.113	0.159
	(0.081)	(0.121)	(0.096)	(0.083)	(0.118)	(0.102)	(0.151)	(0.270)	(0.171)	(0.099)	(0.123)	(0.148)
Age of head	-0.002	0.004	-0.006**	-0.002	0.004	-0.006**	-0.007	-0.001	-0.011	-0.005	0.004	-0.015
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.009)	(0.014)	(0.013)	(0.006)	(0.004)	(0.012)
Head has secondary education	-0.008	0.018	-0.049	-0.005	0.021	-0.049	0.035	0.096	-0.041	0.008	0.021	-0.044
	(0.054)	(0.097)	(0.048)	(0.053)	(0.092)	(0.049)	(0.090)	(0.251)	(0.062)	(0.056)	(0.097)	(0.068)
Head has higher education	0.030	0.074	-0.010	0.025	0.056	-0.008	0.012	0.038	-0.020	0.002	0.056	-0.033
	(0.050)	(0.087)	(0.049)	(0.051)	(0.086)	(0.054)	(0.062)	(0.153)	(0.054)	(0.064)	(0.086)	(0.074)
Spouse has secondary school	0.098	0.088	0.129*	0.116**	0.116	0.121**	0.132	0.093	0.178	0.141*	0.116	0.176*
	(0.060)	(0.091)	(0.076)	(0.057)	(0.085)	(0.061)	(0.095)	(0.111)	(0.151)	(0.076)	(0.080)	(0.105)
Spouse has higher education	0.097*	0.095	0.109	0.122**	0.127	0.108*	0.140	0.139	0.162	0.152*	0.127	0.197
	(0.059)	(0.089)	(0.077)	(0.058)	(0.086)	(0.064)	(0.108)	(0.187)	(0.165)	(0.085)	(0.088)	(0.151)
No. of children $\leq$ 6 years old	-0.015	0.036	-0.070**	-0.021	0.028	-0.081**	-0.005	0.032	-0.051	-0.016	0.028	-0.072
	(0.023)	(0.028)	(0.035)	(0.024)	(0.034)	(0.035)	(0.033)	(0.035)	(0.063)	(0.028)	(0.035)	(0.050)
Rural	0.018	0.052	-0.035	0.031	0.090	-0.037	0.076	0.092	0.030	0.055	0.090	0.061
	(0.039)	(0.044)	(0.055)	(0.047)	(0.061)	(0.067)	(0.114)	(0.136)	(0.191)	(0.066)	(0.059)	(0.156)
Household owns land	-0.043	-0.074*	-0.009	-0.050	-0.066	-0.036	-0.034	-0.100	0.019	-0.049	-0.067	-0.018
	(0.030)	(0.043)	(0.037)	(0.033)	(0.051)	(0.048)	(0.040)	(0.098)	(0.081)	(0.036)	(0.050)	(0.073)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	534	251	283	534	251	283	531	249	282	531	249	282
F-statistic for test of joint significance of excluded instruments							.59	.12	.29	2.05	1.42	1.09

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 11-15 years.

Table 5.14: Linear probability model: Paternal migration, 16-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Paternal migration	-0.000	-0.044	0.048	-0.014	-0.050	0.019	0.664	0.318	0.119	0.623	0.476	-0.058
	(0.038)	(0.063)	(0.046)	(0.043)	(0.074)	(0.054)	(0.873)	(0.383)	(0.458)	(0.680)	(0.460)	(1.740)
Age	-0.037*	-0.056*	-0.028	-0.042*	-0.051	-0.030	-0.061	-0.071*	-0.031	-0.070*	-0.067*	-0.028
	(0.021)	(0.033)	(0.028)	(0.022)	(0.037)	(0.028)	(0.041)	(0.037)	(0.029)	(0.039)	(0.039)	(0.072)
Female	0.102***			0.105***			0.116**			0.108**		
	(0.035)			(0.036)			(0.051)			(0.045)		
Household size	-0.042**	-0.050*	-0.034	-0.036*	-0.037	-0.029	-0.054**	-0.071**	-0.034	-0.046**	-0.068*	-0.029
	(0.018)	(0.027)	(0.023)	(0.019)	(0.031)	(0.027)	(0.024)	(0.034)	(0.029)	(0.021)	(0.037)	(0.029)
Head is male	-0.069*	-0.069	-0.060	-0.030	0.026	-0.031	-0.089	-0.065	-0.032	-0.090	-0.123	-0.035
	(0.039)	(0.084)	(0.056)	(0.044)	(0.088)	(0.071)	(0.086)	(0.122)	(0.062)	(0.084)	(0.151)	(0.146)
Age of head	-0.005	-0.013**	0.000	-0.005	-0.016***	0.001	-0.001	-0.008	0.001	-0.001	-0.008	0.001
	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)	(0.006)	(0.008)	(0.004)	(0.006)	(0.010)	(0.004)
Head has secondary education	0.104	0.046	0.193	0.110	-0.004	0.253*	0.004	-0.100	0.194	0.069	-0.212	0.242
	(0.097)	(0.141)	(0.131)	(0.100)	(0.150)	(0.133)	(0.175)	(0.223)	(0.135)	(0.127)	(0.262)	(0.256)
Head has higher education	0.174*	0.054	0.293**	0.174*	-0.028	0.350***	0.244	-0.014	0.314	0.304	-0.113	0.323
	(0.096)	(0.145)	(0.127)	(0.098)	(0.152)	(0.129)	(0.161)	(0.172)	(0.201)	(0.189)	(0.177)	(0.586)
Spouse has secondary school	0.043	0.255*	-0.169*	0.086	0.300*	-0.154	0.137	0.358*	-0.168*	0.160	0.480**	-0.155*
	(0.091)	(0.144)	(0.087)	(0.093)	(0.160)	(0.094)	(0.167)	(0.186)	(0.086)	(0.132)	(0.212)	(0.083)
Spouse has higher education	0.034	0.297**	-0.211**	0.086	0.357**	-0.151	0.025	0.346**	-0.219**	0.055	0.465**	-0.139
	(0.092)	(0.150)	(0.089)	(0.093)	(0.163)	(0.095)	(0.120)	(0.165)	(0.109)	(0.119)	(0.187)	(0.274)
No. of children $\leq$ 6 years old	0.010	-0.011	0.026	-0.032	-0.012	-0.042	0.078	0.101	0.030	0.053	0.185	-0.044
	(0.054)	(0.105)	(0.067)	(0.059)	(0.130)	(0.075)	(0.110)	(0.164)	(0.072)	(0.117)	(0.231)	(0.083)
Rural	0.036	0.116	0.012	0.050	0.167	-0.011	-0.130	0.029	-0.001	-0.112	0.022	0.004
	(0.053)	(0.089)	(0.059)	(0.056)	(0.103)	(0.073)	(0.229)	(0.145)	(0.120)	(0.180)	(0.187)	(0.378)
Household owns land	-0.099**	-0.136*	-0.086*	-0.077*	-0.147*	-0.044	-0.009	-0.072	-0.070	-0.013	-0.029	-0.049
	(0.043)	(0.072)	(0.051)	(0.044)	(0.088)	(0.057)	(0.120)	(0.111)	(0.076)	(0.082)	(0.156)	(0.182)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	431	205	226	431	205	226	422	202	220	422	202	220
F-statistic for test of joint significance of excluded instruments							.46	3.8	.6	1.43	5.38	.16

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 16-18 years.

Table 5.15: Linear probability model: Maternal migration, 11-15 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Maternal migration	0.016	0.034	-0.005	0.011	0.032	-0.009	-0.050	0.121	-0.349	2.650	1.325	-0.108
	(0.021)	(0.030)	(0.030)	(0.022)	(0.031)	(0.032)	(0.220)	(0.240)	(0.379)	(14.572)	(2.772)	(0.554)
Age	-0.008	-0.018	-0.002	-0.007	-0.016	-0.004	-0.006	-0.022	0.005	-0.106	-0.092	-0.001
	(0.006)	(0.011)	(0.007)	(0.006)	(0.011)	(0.007)	(0.010)	(0.017)	(0.012)	(0.548)	(0.164)	(0.016)
Female	0.012			0.014			0.017			-0.195		
	(0.019)			(0.019)			(0.026)			(1.145)		
Household size	0.003	-0.007	0.018*	0.010	0.008	0.018*	0.005	-0.008	0.031	-0.027	0.008	0.021
	(0.008)	(0.012)	(0.010)	(0.008)	(0.016)	(0.010)	(0.010)	(0.012)	(0.021)	(0.209)	(0.030)	(0.018)
Head is male	0.141*	0.131	0.154	0.157*	0.118	0.161	0.147*	0.135	0.161	0.292	0.090	0.178*
	(0.081)	(0.124)	(0.096)	(0.084)	(0.121)	(0.103)	(0.085)	(0.125)	(0.107)	(0.750)	(0.220)	(0.107)
Age of head	-0.002	0.003	-0.006**	-0.002	0.003	-0.006**	-0.002	0.004	-0.008**	0.014	0.009	-0.007
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.090)	(0.013)	(0.005)
Head has secondary education	-0.007	0.023	-0.048	-0.005	0.025	-0.048	-0.002	0.021	-0.010	-0.267	-0.007	-0.033
	(0.054)	(0.092)	(0.049)	(0.053)	(0.089)	(0.049)	(0.054)	(0.088)	(0.066)	(1.453)	(0.151)	(0.106)
Head has higher education	0.027	0.068	-0.009	0.021	0.051	-0.005	0.039	0.059	0.069	-0.457	-0.008	0.019
	(0.051)	(0.088)	(0.050)	(0.051)	(0.086)	(0.054)	(0.058)	(0.085)	(0.096)	(2.646)	(0.184)	(0.169)
Spouse has secondary school	0.103*	0.092	0.129*	0.119**	0.120	0.119*	0.091	0.103	0.059	0.556	0.227	0.100
	(0.061)	(0.092)	(0.077)	(0.058)	(0.087)	(0.062)	(0.074)	(0.090)	(0.124)	(2.415)	(0.265)	(0.140)
Spouse has higher education	0.102*	0.104	0.109	0.126**	0.136	0.107*	0.089	0.117	0.035	0.669	0.300	0.084
	(0.060)	(0.093)	(0.077)	(0.059)	(0.090)	(0.064)	(0.078)	(0.092)	(0.131)	(2.994)	(0.366)	(0.146)
No. of children $\leq$ 6 years old	-0.013	0.035	-0.070**	-0.021	0.027	-0.082**	-0.016	0.033	-0.103**	0.083	-0.052	-0.092
	(0.023)	(0.027)	(0.035)	(0.024)	(0.034)	(0.036)	(0.025)	(0.028)	(0.052)	(0.589)	(0.183)	(0.065)
Rural	0.020	0.055	-0.034	0.032	0.090	-0.036	0.022	0.054	-0.024	0.008	0.152	-0.035
	(0.038)	(0.044)	(0.054)	(0.047)	(0.062)	(0.067)	(0.038)	(0.045)	(0.058)	(0.241)	(0.176)	(0.063)
Household owns land	-0.044	-0.077*	-0.008	-0.051	-0.069	-0.034	-0.038	-0.082*	0.038	-0.313	-0.141	-0.019
	(0.030)	(0.044)	(0.038)	(0.034)	(0.052)	(0.050)	(0.037)	(0.044)	(0.062)	(1.447)	(0.174)	(0.091)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	534	251	283	534	251	283	531	249	282	531	249	282
F-statistic for test of joint significance of excluded instruments							1.88	1.14	.89	.03	.21	.61

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 11-15 years.

Table 5.16: Linear probability model: Maternal migration, 16-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Maternal migration	-0.055	0.012	-0.076	-0.072	0.004	-0.097	0.016	0.308	-0.227	0.634	0.459	0.677
	(0.048)	(0.076)	(0.065)	(0.052)	(0.090)	(0.065)	(0.267)	(0.377)	(0.252)	(0.463)	(0.474)	(0.655)
Age	-0.038*	-0.058*	-0.029	-0.044**	-0.053	-0.032	-0.038*	-0.053	-0.038	-0.031	-0.042	-0.016
	(0.021)	(0.033)	(0.028)	(0.022)	(0.036)	(0.028)	(0.022)	(0.034)	(0.032)	(0.027)	(0.036)	(0.039)
Female	0.102***			0.105***			0.101***			0.104**		
	(0.035)			(0.036)			(0.035)			(0.043)		
Household size	-0.040**	-0.054*	-0.036	-0.033*	-0.040	-0.033	-0.044**	-0.081*	-0.046*	-0.057**	-0.086	0.002
	(0.018)	(0.029)	(0.023)	(0.019)	(0.033)	(0.027)	(0.021)	(0.045)	(0.025)	(0.026)	(0.053)	(0.046)
Head is male	-0.070*	-0.067	-0.053	-0.028	0.012	-0.021	-0.045	-0.007	0.023	-0.132	-0.034	-0.205
	(0.041)	(0.078)	(0.059)	(0.044)	(0.085)	(0.072)	(0.059)	(0.085)	(0.088)	(0.088)	(0.098)	(0.183)
Age of head	-0.005	-0.012**	0.001	-0.005	-0.015**	0.001	-0.005	-0.013**	0.001	-0.005	-0.014***	0.001
	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)	(0.003)	(0.004)	(0.005)	(0.006)
Head has secondary education	0.098	0.027	0.166	0.101	-0.024	0.221	0.106	-0.001	0.108	0.182	-0.093	0.465*
	(0.098)	(0.140)	(0.135)	(0.102)	(0.150)	(0.138)	(0.101)	(0.147)	(0.161)	(0.117)	(0.151)	(0.271)
Head has higher education	0.176*	0.043	0.268**	0.179*	-0.037	0.334**	0.173*	-0.031	0.246*	0.163	-0.144	0.418**
	(0.097)	(0.147)	(0.130)	(0.100)	(0.152)	(0.131)	(0.094)	(0.181)	(0.138)	(0.106)	(0.176)	(0.169)
Spouse has secondary school	0.048	0.269*	-0.153*	0.090	0.318**	-0.139	0.039	0.324*	-0.125	0.071	0.421**	-0.258
	(0.091)	(0.144)	(0.089)	(0.093)	(0.159)	(0.095)	(0.090)	(0.167)	(0.099)	(0.110)	(0.186)	(0.158)
Spouse has higher education	0.035	0.306**	-0.192**	0.084	0.368**	-0.138	0.032	0.367**	-0.168*	0.098	0.482**	-0.223
	(0.091)	(0.150)	(0.092)	(0.093)	(0.162)	(0.097)	(0.090)	(0.184)	(0.096)	(0.112)	(0.202)	(0.145)
No. of children $\leq$ 6 years old	0.008	0.004	0.027	-0.034	0.007	-0.038	0.016	0.044	0.044	0.000	0.128	-0.079
	(0.056)	(0.106)	(0.068)	(0.060)	(0.134)	(0.076)	(0.055)	(0.112)	(0.070)	(0.066)	(0.162)	(0.086)
Rural	0.037	0.107	0.027	0.048	0.154	0.003	0.042	0.167	0.043	0.044	0.170*	-0.070
	(0.053)	(0.087)	(0.058)	(0.055)	(0.101)	(0.074)	(0.054)	(0.108)	(0.065)	(0.066)	(0.102)	(0.100)
Household owns land	-0.098**	-0.129*	-0.089*	-0.073*	-0.137	-0.044	-0.095**	-0.168**	-0.069	-0.120*	-0.183**	-0.077
	(0.043)	(0.070)	(0.051)	(0.044)	(0.086)	(0.055)	(0.048)	(0.077)	(0.051)	(0.070)	(0.091)	(0.094)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	431	205	226	431	205	226	422	202	220	422	202	220
F-statistic for test of joint significance of excluded instruments							4.23	4.02	3.43	6.52	5.85	1.95

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: School enrollment, children aged 16-18 years.

Table 5.17: Parental migration, share of enrolled children aged 11-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Parental migration	0.035	0.028	0.016	0.032	0.017	0.013	-0.123	0.256	-0.473	-0.024	0.373	-0.604
	(0.022)	(0.031)	(0.027)	(0.023)	(0.034)	(0.031)	(0.228)	(0.241)	(0.354)	(0.283)	(0.274)	(0.626)
Head is male	0.011	-0.035	0.025	0.037	-0.003	0.037	0.026	-0.029	0.099	0.038	-0.022	0.094
	(0.051)	(0.062)	(0.070)	(0.052)	(0.064)	(0.075)	(0.059)	(0.070)	(0.110)	(0.055)	(0.067)	(0.120)
Age of head	-0.003	-0.004	-0.003	-0.003	-0.005*	-0.003	-0.005	-0.001	-0.009*	-0.004	-0.001	-0.011
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.006)	(0.004)	(0.004)	(0.009)
Head has secondary education	-0.025	-0.004	-0.014	-0.027	0.002	-0.018	-0.010	-0.035	0.009	-0.023	-0.051	-0.023
	(0.054)	(0.079)	(0.058)	(0.055)	(0.081)	(0.059)	(0.057)	(0.090)	(0.067)	(0.058)	(0.099)	(0.073)
Head has higher education	0.027	0.031	0.041	0.022	0.023	0.045	0.027	0.037	0.065	0.021	0.026	0.041
	(0.054)	(0.077)	(0.062)	(0.056)	(0.081)	(0.063)	(0.054)	(0.081)	(0.076)	(0.054)	(0.086)	(0.082)
Spouse has secondary school	0.080	0.089	0.035	0.090	0.085	0.047	0.081	0.082	0.041	0.090*	0.076	0.052
	(0.056)	(0.081)	(0.062)	(0.055)	(0.082)	(0.060)	(0.058)	(0.083)	(0.077)	(0.054)	(0.084)	(0.082)
Spouse has higher education	0.085	0.118	0.012	0.094*	0.107	0.032	0.088	0.096	0.013	0.094*	0.082	0.030
	(0.057)	(0.081)	(0.065)	(0.056)	(0.082)	(0.064)	(0.059)	(0.085)	(0.083)	(0.055)	(0.085)	(0.089)
No. of children $\leq$ 6 years old	-0.032	0.006	-0.070**	-0.033	0.005	-0.074**	-0.025	0.007	-0.047	-0.030	0.004	-0.051
	(0.023)	(0.030)	(0.033)	(0.024)	(0.030)	(0.034)	(0.027)	(0.030)	(0.047)	(0.028)	(0.032)	(0.053)
No. of children 7-17 years old	0.023	0.009	0.020	0.023	0.006	0.022	0.026	-0.001	0.014	0.024	-0.006	0.009
	(0.016)	(0.026)	(0.018)	(0.016)	(0.028)	(0.019)	(0.016)	(0.030)	(0.024)	(0.016)	(0.029)	(0.030)
No. of adults 18-25 years old	-0.031*	-0.050*	-0.028	-0.029*	-0.044	-0.032	-0.028	-0.065**	-0.027	-0.028	-0.063*	-0.024
	(0.017)	(0.026)	(0.021)	(0.017)	(0.027)	(0.022)	(0.018)	(0.031)	(0.026)	(0.018)	(0.032)	(0.028)
Rural	0.039	0.086*	-0.005	0.039	0.116**	-0.033	0.068	0.058	0.069	0.046	0.072	0.043
	(0.037)	(0.051)	(0.043)	(0.040)	(0.059)	(0.048)	(0.051)	(0.063)	(0.075)	(0.052)	(0.068)	(0.099)
Household owns land	-0.049	-0.087**	-0.029	-0.044	-0.089*	-0.023	-0.051	-0.081*	-0.001	-0.046	-0.081	0.007
	(0.030)	(0.043)	(0.035)	(0.032)	(0.048)	(0.037)	(0.031)	(0.047)	(0.051)	(0.032)	(0.052)	(0.061)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	815	463	493	815	463	493	806	458	488	806	458	488
F-statistic for test of joint significance of excluded instruments							5.32	3.66	2.6	8.1	8.56	2.82

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: Share of enrolled children aged 11-18 years within household.

Table 5.18: Paternal migration, share of enrolled children aged 11-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Paternal migration	0.031	0.016	0.021	0.026	0.010	0.020	0.025	0.442	-0.214	0.009	0.586	-0.888
	(0.022)	(0.033)	(0.027)	(0.023)	(0.035)	(0.030)	(0.303)	(0.348)	(0.256)	(0.346)	(0.389)	(0.837)
Head is male	0.010	-0.036	0.025	0.036	-0.003	0.036	0.022	-0.063	0.051	0.038	-0.070	0.068
	(0.051)	(0.061)	(0.070)	(0.052)	(0.064)	(0.075)	(0.058)	(0.076)	(0.084)	(0.055)	(0.076)	(0.119)
Age of head	-0.003	-0.004	-0.003	-0.003	-0.005*	-0.003	-0.003	0.000	-0.006	-0.003	0.001	-0.014
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.011)
Head has secondary education	-0.025	-0.003	-0.015	-0.027	0.003	-0.017	-0.024	-0.082	-0.003	-0.025	-0.108	-0.042
	(0.054)	(0.079)	(0.058)	(0.055)	(0.081)	(0.059)	(0.063)	(0.112)	(0.057)	(0.061)	(0.124)	(0.090)
Head has higher education	0.029	0.031	0.044	0.024	0.023	0.048	0.029	0.054	0.027	0.022	0.052	-0.087
	(0.054)	(0.077)	(0.061)	(0.056)	(0.081)	(0.062)	(0.058)	(0.093)	(0.064)	(0.063)	(0.100)	(0.155)
Spouse has secondary school	0.080	0.090	0.035	0.090	0.085	0.047	0.080	0.080	0.035	0.090*	0.079	0.048
	(0.057)	(0.081)	(0.062)	(0.055)	(0.082)	(0.060)	(0.056)	(0.089)	(0.064)	(0.054)	(0.093)	(0.098)
Spouse has higher education	0.084	0.119	0.011	0.093*	0.107	0.030	0.084	0.078	0.023	0.094*	0.072	0.087
	(0.057)	(0.081)	(0.065)	(0.056)	(0.082)	(0.063)	(0.060)	(0.092)	(0.070)	(0.056)	(0.096)	(0.118)
No. of children $\leq$ 6 years old	-0.032	0.005	-0.071**	-0.033	0.005	-0.074**	-0.031	0.007	-0.058	-0.032	-0.004	-0.042
	(0.023)	(0.030)	(0.033)	(0.024)	(0.030)	(0.034)	(0.029)	(0.031)	(0.038)	(0.031)	(0.036)	(0.063)
No. of children 7-17 years old	0.023	0.010	0.020	0.023	0.007	0.022	0.024	-0.000	0.018	0.024	0.002	0.019
	(0.016)	(0.026)	(0.018)	(0.016)	(0.028)	(0.019)	(0.016)	(0.027)	(0.018)	(0.016)	(0.027)	(0.032)
No. of adults 18-25 years old	-0.031*	-0.049*	-0.029	-0.029*	-0.043	-0.032	-0.032*	-0.064**	-0.027	-0.029	-0.057*	-0.010
	(0.017)	(0.026)	(0.022)	(0.017)	(0.027)	(0.022)	(0.018)	(0.030)	(0.023)	(0.018)	(0.031)	(0.039)
Rural	0.039	0.087*	-0.006	0.039	0.116**	-0.033	0.044	0.001	0.034	0.042	0.013	0.068
	(0.037)	(0.051)	(0.043)	(0.040)	(0.059)	(0.048)	(0.063)	(0.093)	(0.061)	(0.060)	(0.096)	(0.121)
Household owns land	-0.049	-0.087**	-0.029	-0.044	-0.089*	-0.023	-0.048	-0.055	-0.020	-0.045	-0.051	0.010
	(0.030)	(0.043)	(0.035)	(0.032)	(0.048)	(0.037)	(0.031)	(0.057)	(0.037)	(0.032)	(0.064)	(0.070)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	815	463	493	815	463	493	806	458	488	806	458	488
F-statistic for test of joint significance of excluded instruments							3.09	2.8	2.77	5.46	5.31	1.99

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: Share of enrolled children aged 11-18 years within household.

Table 5.19: Maternal migration, share of enrolled children aged 11-18 years

	(1) All	(2) Boys	(3) Girls	(4) All	(5) Boys	(6) Girls	(7) All	(8) Boys	(9) Girls	(10) All	(11) Boys	(12) Girls
Maternal migration	-0.000	0.029	-0.030	-0.005	0.007	-0.035	-0.387	-0.100	-0.262	-0.173	0.169	-0.380
	(0.025)	(0.036)	(0.032)	(0.027)	(0.039)	(0.034)	(0.347)	(0.444)	(0.323)	(1.086)	(0.937)	(1.210)
Head is male	0.010	-0.035	0.026	0.037	-0.002	0.037	0.010	-0.019	0.038	0.034	0.002	0.042
	(0.052)	(0.062)	(0.071)	(0.053)	(0.064)	(0.075)	(0.064)	(0.066)	(0.077)	(0.062)	(0.064)	(0.080)
Age of head	-0.003*	-0.004	-0.004	-0.003*	-0.005*	-0.004*	-0.005**	-0.005	-0.005*	-0.004	-0.005	-0.006
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.004)	(0.007)
Head has secondary education	-0.021	-0.002	-0.013	-0.024	0.004	-0.018	0.006	0.008	-0.008	-0.013	-0.008	-0.021
	(0.053)	(0.077)	(0.058)	(0.055)	(0.079)	(0.059)	(0.065)	(0.086)	(0.063)	(0.092)	(0.116)	(0.063)
Head has higher education	0.027	0.026	0.046	0.022	0.022	0.049	0.087	0.043	0.079	0.048	-0.002	0.088
	(0.054)	(0.077)	(0.062)	(0.056)	(0.081)	(0.063)	(0.083)	(0.100)	(0.080)	(0.180)	(0.165)	(0.155)
Spouse has secondary school	0.080	0.092	0.035	0.089	0.085	0.046	0.055	0.085	0.032	0.078	0.094	0.036
	(0.057)	(0.081)	(0.063)	(0.056)	(0.082)	(0.060)	(0.070)	(0.087)	(0.069)	(0.095)	(0.099)	(0.078)
Spouse has higher education	0.086	0.122	0.011	0.093*	0.109	0.029	0.045	0.110	-0.000	0.076	0.122	0.007
	(0.058)	(0.082)	(0.066)	(0.057)	(0.082)	(0.064)	(0.078)	(0.090)	(0.076)	(0.134)	(0.117)	(0.113)
No. of children $\leq$ 6 years old	-0.030	0.005	-0.072**	-0.031	0.005	-0.076**	-0.035	0.005	-0.086**	-0.033	0.003	-0.098
	(0.023)	(0.030)	(0.034)	(0.024)	(0.030)	(0.034)	(0.029)	(0.031)	(0.042)	(0.028)	(0.031)	(0.084)
No. of children 7-17 years old	0.024	0.009	0.020	0.023	0.007	0.022	0.035*	0.017	0.023	0.025	0.002	0.017
	(0.016)	(0.027)	(0.018)	(0.016)	(0.028)	(0.019)	(0.019)	(0.031)	(0.021)	(0.016)	(0.040)	(0.029)
No. of adults 18-25 years old	-0.030*	-0.050*	-0.028	-0.029*	-0.043	-0.031	-0.020	-0.044	-0.025	-0.025	-0.051	-0.027
	(0.017)	(0.026)	(0.022)	(0.017)	(0.027)	(0.022)	(0.020)	(0.035)	(0.024)	(0.029)	(0.050)	(0.030)
Rural	0.044	0.091*	-0.000	0.043	0.118**	-0.029	0.061	0.092*	0.015	0.049	0.127*	-0.005
	(0.037)	(0.051)	(0.042)	(0.040)	(0.059)	(0.047)	(0.044)	(0.055)	(0.051)	(0.056)	(0.069)	(0.098)
Household owns land	-0.050	-0.089**	-0.027	-0.045	-0.090*	-0.021	-0.039	-0.084	-0.012	-0.040	-0.106	-0.006
	(0.030)	(0.043)	(0.035)	(0.032)	(0.048)	(0.036)	(0.035)	(0.053)	(0.040)	(0.048)	(0.088)	(0.062)
Region controls	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
District controls	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
N	815	463	493	815	463	493	806	458	488	806	458	488
F-statistic for test of joint significance of excluded instruments							2.84	1.39	2.25	.81	1.04	.47

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Columns 1-6: Ordinary least squares. Columns 7-12: Instrumental variables.
Dependent variable: Share of enrolled children aged 11-18 years within household.

Table 5.20: Summary statistics (means) on participation in education based on labor force status, by parental migration status

	Non-migrant	Parental migrant	Difference
17-18 years old			
2006	0.719	0.765	-0.0463
			(0.0447)
2008	0.751	0.758	-0.00664
			(0.0466)
17-18 years old, boys			
2006	0.673	0.730	-0.0569
			(0.0673)
2008	0.724	0.729	-0.00443
			(0.0721)
17-18 years old, girls			
2006	0.759	0.800	-0.0411
			(0.0591)
2008	0.775	0.782	-0.00710
			(0.0610)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.21: Summary statistics (means) on participation in education based on labor force status, by children's sex

	Boys	Girls	Difference
17-18 years old			
2006	0.701	0.777	-0.0767*
			(0.0444)
2008	0.726	0.778	-0.0517
			(0.0465)
17-18 years old, non-migrant			
2006	0.673	0.759	-0.0855
			(0.0622)
2008	0.724	0.775	-0.0504
			(0.0633)
17-18 years old, parental migrant			
2006	0.730	0.800	-0.0697
			(0.0635)
2006	0.729	0.782	-0.0530
			(0.0691)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.22: Difference-in-differences: Parental migration, children aged 17-18 years

	All				Boys			Girls	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year 2008	0.005	0.069	0.078*	0.040	0.076	0.036	-0.025	0.042	0.077
	(0.042)	(0.047)	(0.046)	(0.064)	(0.074)	(0.072)	(0.054)	(0.062)	(0.064)
Parental migration	0.036	0.036	0.040	0.059	0.005	-0.027	0.018	0.051	0.041
	(0.042)	(0.045)	(0.045)	(0.065)	(0.065)	(0.071)	(0.054)	(0.064)	(0.064)
Parental migration x Year 2008	-0.013	0.012	0.031	-0.061	0.026	0.099	0.027	0.006	0.014
	(0.061)	(0.066)	(0.068)	(0.095)	(0.100)	(0.104)	(0.080)	(0.088)	(0.091)
Age		-0.014	-0.016		0.020	0.046		-0.058	-0.070
		(0.033)	(0.033)		(0.050)	(0.050)		(0.045)	(0.046)
Female		0.073**	0.070**						
		(0.033)	(0.032)						
Household size		-0.025	-0.019		0.003	-0.003		-0.050**	-0.037
		(0.016)	(0.017)		(0.025)	(0.027)		(0.024)	(0.024)
Head is male		0.057	0.047		0.090	0.110		0.033	0.027
		(0.076)	(0.084)		(0.116)	(0.131)		(0.101)	(0.120)
Age of head		-0.002	-0.002		-0.010*	-0.010**		0.003	0.004
		(0.003)	(0.003)		(0.005)	(0.005)		(0.004)	(0.004)
Head has secondary education		0.088	0.103		0.150	0.139		0.123	0.148
		(0.104)	(0.104)		(0.168)	(0.157)		(0.128)	(0.135)
Head has higher education		0.167	0.187*		0.166	0.135		0.234*	0.244*
		(0.105)	(0.105)		(0.168)	(0.162)		(0.127)	(0.134)
Spouse has secondary school		0.062	0.097		0.249	0.340**		-0.182*	-0.148
		(0.101)	(0.106)		(0.156)	(0.158)		(0.104)	(0.113)
Spouse has higher education		0.128	0.168		0.364**	0.470***		-0.148	-0.102
		(0.102)	(0.107)		(0.153)	(0.158)		(0.104)	(0.113)
No. of children $\leq$ 6 years old		-0.097	-0.127*		-0.209*	-0.161		-0.063	-0.130
		(0.065)	(0.068)		(0.116)	(0.127)		(0.080)	(0.084)
Rural		-0.067	-0.084*		-0.013	-0.047		-0.134**	-0.144**
		(0.043)	(0.044)		(0.065)	(0.070)		(0.056)	(0.059)
Household owns land		0.012	0.029		-0.130**	-0.100*		0.135**	0.127**
		(0.043)	(0.043)		(0.059)	(0.059)		(0.062)	(0.064)
Region controls	No	Yes	No	No	Yes	No	No	Yes	No
District controls	No	No	Yes	No	No	Yes	No	No	Yes
Adjusted R^2	-0.002	0.064	0.113	-0.006	0.106	0.173	-0.005	0.056	0.093
N	830	662	662	382	312	312	448	350	350

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Dependent variable: School participation based on labor force status, children aged 17-18 years.

Table 5.23: Difference-in-differences: Paternal migration, children aged 17-18 years

		All			Boys			Girls	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year 2008	-0.006	0.053	0.069	0.016	0.073	0.059	-0.022	0.017	0.063
	(0.038)	(0.043)	(0.042)	(0.058)	(0.068)	(0.066)	(0.049)	(0.056)	(0.059)
Paternal migration	0.027	0.027	0.038	0.035	0.008	0.016	0.027	0.034	0.028
	(0.045)	(0.047)	(0.047)	(0.068)	(0.069)	(0.072)	(0.058)	(0.066)	(0.065)
Paternal migration x Year 2008	0.014	0.061	0.067	-0.009	0.041	0.063	0.025	0.083	0.061
	(0.065)	(0.069)	(0.072)	(0.100)	(0.104)	(0.108)	(0.084)	(0.094)	(0.096)
Age		-0.015	-0.017		0.020	0.043		-0.059	-0.072
		(0.033)	(0.033)		(0.050)	(0.050)		(0.044)	(0.045)
Female		0.073**	0.070**						
		(0.033)	(0.032)						
Household size		-0.025	-0.019		0.003	-0.001		-0.052**	-0.039
		(0.016)	(0.017)		(0.025)	(0.026)		(0.023)	(0.024)
Head is male		0.059	0.049		0.091	0.113		0.036	0.030
		(0.075)	(0.084)		(0.116)	(0.132)		(0.101)	(0.120)
Age of head		-0.002	-0.002		-0.010*	-0.010**		0.003	0.004
		(0.003)	(0.003)		(0.005)	(0.005)		(0.004)	(0.004)
Head has secondary education		0.080	0.093		0.146	0.129		0.108	0.140
		(0.103)	(0.103)		(0.168)	(0.159)		(0.128)	(0.136)
Head has higher education		0.167	0.187*		0.166	0.132		0.233*	0.245*
		(0.104)	(0.104)		(0.168)	(0.164)		(0.126)	(0.133)
Spouse has secondary school		0.071	0.106		0.251	0.347**		-0.165	-0.139
		(0.100)	(0.105)		(0.156)	(0.160)		(0.105)	(0.113)
Spouse has higher education		0.132	0.171		0.363**	0.472***		-0.139	-0.100
		(0.102)	(0.106)		(0.153)	(0.161)		(0.105)	(0.113)
No. of children $\leq$ 6 years old		-0.097	-0.127*		-0.204*	-0.154		-0.069	-0.133
		(0.065)	(0.067)		(0.115)	(0.128)		(0.079)	(0.083)
Rural		-0.071	-0.087**		-0.016	-0.050		-0.135**	-0.143**
		(0.043)	(0.044)		(0.065)	(0.069)		(0.055)	(0.058)
Household owns land		0.014	0.029		-0.130**	-0.106*		0.139**	0.129**
		(0.043)	(0.043)		(0.060)	(0.059)		(0.061)	(0.064)
Region controls	No	Yes	No	No	Yes	No	No	Yes	No
District controls	No	No	Yes	No	No	Yes	No	No	Yes
Adjusted R^2	-0.002	0.066	0.116	-0.007	0.107	0.173	-0.004	0.061	0.095
N	830	662	662	382	312	312	448	350	350

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Dependent variable: School participation based on labor force status, children aged 17-18 years.

Table 5.24: Difference-in-differences: Maternal migration, children aged 17-18 years

	All				Boys			Girls	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year 2008	0.005	0.090**	0.104***	0.029	0.095	0.068	-0.020	0.065	0.103*
	(0.034)	(0.039)	(0.039)	(0.053)	(0.061)	(0.064)	(0.045)	(0.051)	(0.053)
Maternal migration	0.005	0.010	0.012	0.040	-0.005	-0.065	-0.032	0.016	0.044
	(0.050)	(0.054)	(0.054)	(0.080)	(0.079)	(0.080)	(0.063)	(0.072)	(0.074)
Maternal migration x Year 2008	-0.028	-0.070	-0055	-0.079	-0.030	0.068	0.029	-0.079	-0.091
	(0.076)	(0.083)	(0.084)	(0.118)	(0.125)	(0.127)	(0.099)	(0.109)	(0.111)
Age		-0.018	-0.020		0.019	0.046		-0.066	-0.075*
		(0.033)	(0.033)		(0.050)	(0.050)		(0.044)	(0.045)
Female		0.072**	0.070**						
		(0.033)	(0.032)						
Household size		-0.023	-0.018		0.005	-0.001		-0.051**	-0.038
		(0.016)	(0.017)		(0.025)	(0.027)		(0.024)	(0.024)
Head is male		0.058	0.052		0.089	0.121		0.041	0.035
		(0.076)	(0.084)		(0.117)	(0.132)		(0.100)	(0.121)
Age of head		-0.003	-0.003		-0.010*	-0.011**		0.002	0.004
		(0.003)	(0.003)		(0.005)	(0.005)		(0.004)	(0.004)
Head has secondary education		0.083	0.100		0.154	0.140		0.108	0.139
		(0.103)	(0.103)		(0.167)	(0.159)		(0.126)	(0.135)
Head has higher education		0.165	0.182*		0.171	0.133		0.228*	0.239*
		(0.104)	(0.103)		(0.168)	(0.164)		(0.125)	(0.133)
Spouse has secondary school		0.067	0.096		0.245	0.336**		-0.169	-0.144
		(0.100)	(0.104)		(0.155)	(0.159)		(0.103)	(0.112)
Spouse has higher education		0.132	0.170		0.361**	0.467***		-0.139	-0.099
		(0.101)	(0.105)		(0.153)	(0.159)		(0.103)	(0.112)
No. of children $\leq$ 6 years old		-0.098	-0.129*		-0.211*	-0.168		-0.063	-0.128
		(0.066)	(0.068)		(0.115)	(0.128)		(0.080)	(0.084)
Rural		-0.065	-0.076*		-0.015	-0.041		-0.123**	-0.134**
		(0.043)	(0.044)		(0.065)	(0.070)		(0.055)	(0.058)
Household owns land		0.013	0.029		-0.132**	-0.109*		0.133**	0.125**
		(0.043)	(0.042)		(0.059)	(0.058)		(0.061)	(0.063)
Region controls	No	Yes	No	No	Yes	No	No	Yes	No
District controls	No	No	Yes	No	No	Yes	No	No	Yes
Adjusted R^2	-0.003	0.063	0.110	-0.007	0.106	0.172	-0.006	0.054	0.092
N	830	662	662	382	312	312	448	350	350

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Dependent variable: School participation based on labor force status, children aged 17-18 years.

Table 5.25: Difference-in-differences: Household education expenditures

	Parental migration			Paternal migration			Maternal migration		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year 2008	36.385***	75.482***	73.276***	43.062***	80.332***	78.859***	47.238***	86.751***	85.783***
	(12.274)	(16.061)	(16.051)	(11.650)	(15.276)	(15.289)	(12.657)	(16.671)	(16.507)
Parental migration	30.389*	17.961	18.748	35.217	28.113	29.676	37.677	31.542	31.085
	(18.349)	(20.659)	(20.742)	(23.034)	(24.765)	(25.034)	(26.104)	(31.664)	(31.199)
Parental migration x Year 2008	41.121	23.822	27.135	28.517	14.029	15.941	28.221	-4.431	-3.451
	(27.988)	(30.730)	(30.169)	(33.317)	(34.320)	(33.735)	(36.567)	(42.010)	(41.125)
Head is male		26.061	29.495		25.054	28.487		27.961	31.389
		(25.711)	(26.907)		(25.580)	(26.807)		(25.875)	(26.984)
Age of head		-0.909	-0.866		-0.846	-0.808		-1.101*	-1.080*
		(0.648)	(0.656)		(0.648)	(0.657)		(0.633)	(0.641)
Head has secondary education		49.295*	41.326		49.003*	41.158		49.285*	41.494
		(27.398)	(27.714)		(27.347)	(27.647)		(27.338)	(27.631)
Head has higher education		71.208***	62.953**		71.798***	63.663**		70.257***	62.114**
		(27.177)	(28.026)		(27.221)	(28.024)		(26.833)	(27.706)
Spouse has secondary school		-19.930	-11.065		-19.617	-10.693		-17.759	-9.137
		(29.508)	(30.542)		(29.423)	(30.470)		(29.377)	(30.480)
Spouse has higher education		42.375	50.049		41.790	49.506		44.375	51.821
		(30.557)	(32.827)		(30.533)	(32.752)		(30.273)	(32.603)
No. of children $\leq$ 6 years old		-41.600***	-40.858***		-42.383***	-41.713***		-40.897***	-40.087***
		(12.580)	(12.682)		(12.632)	(12.719)		(12.666)	(12.750)
No. of children 7-17 years old		39.425***	40.519***		39.601***	40.689***		40.089***	41.250***
		(8.615)	(8.638)		(8.670)	(8.687)		(8.570)	(8.528)
No. of adults 18-25 years old		79.840***	77.600***		79.966***	77.746***		80.487***	78.402***
		(9.884)	(9.896)		(9.920)	(9.937)		(10.086)	(10.081)
Rural		-25.359	-33.822		-25.836	-34.316		-23.270	-31.980
		(20.229)	(22.019)		(20.406)	(22.174)		(20.048)	(22.035)
Household owns land		31.548**	25.398*		31.095**	24.879*		31.408**	25.416*
		(14.780)	(14.631)		(14.606)	(14.459)		(15.083)	(14.988)
Region controls	No	Yes	No	No	Yes	No	No	Yes	No
District controls	No	No	Yes	No	No	Yes	No	No	Yes
Adjusted R^2	0.009	0.054	0.063	0.008	0.055	0.063	0.007	0.054	0.062
N	4034	3139	3139	4034	3139	3139	4034	3139	3139

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Dependent variable: Household expenditures for education.

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CHAPTER VI

Conclusion

This dissertation presented four essays on development economics. The first two essays investigated educational challenges in rural Ethiopia. The first essay evaluated the impact of a school meals program on educational outcomes. We did not detect impact on learning achievement, concentration or cognitive development. Findings nevertheless showed that the modalities and the implementation of the program play an important role. We found that supplementing on-site school meals with take-home rations is beneficial. Children were found to benefit from household contributions to the program. The timing of serving meals was also found to play a role. Chapter III explored the role of poor eyesight on educational outcomes in rural Ethiopia. Results showed that poor vision substantially increases school dropout for girls. Girls that suffer from poor eyesight have a 6.1 or 8 percentage points higher probability of school dropout. Conditional on being enrolled in school, the study also provided evidence that, for boys and girls, learning achievement is adversely affected by poor eyesight. Chapter IV explored the role of adding non-financial services, in particular financial literacy training, to a microfinance institution's product portfolio. We investigated the role of four financial training programs implemented in Vietnam, the Philippines and Cambodia on financial attitude, risk management, over-indebtedness

and vulnerability. Our findings showed that financial literacy training can play an important role in terms of improving attitudes towards financial issues as well as improving risk management strategies. We found financial education to improve loan repayment performance despite evidence for increased borrowing. However, on the ultimate goal of reducing vulnerability we did not detect impact. In Chapter V, the final essay examined the impact of parental migration on school participation of children who are left behind in Moldova. The study did not detect impact on school participation. Results nevertheless showed that parental migration increases education expenditures, providing evidence that migration makes more resources available that are spent on children's education.

Eidesstattliche Erklärung

Hiermit erkläre ich, die vorliegende Dissertation selbständig angefertigt und mich keiner anderen als der in ihr angegebenen Hilfsmittel bedient zu haben, insbesondere sind sämtliche Zitate aus anderen Quellen als solche gekennzeichnet und mit Quellenangaben versehen.

Addis Abeba, 6. November 2012

Robert Poppe

Curriculum Vitae

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