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Remittances and educational attainment: Evidence from Tajikistan

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Bayerische Julius-Maximilians-Universität Würzburg

Wirtschaftswissenschaftliche Fakultät

**Remittances and Educational Attainment:
Evidence from Tajikistan**

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Wirtschaftswissenschaftliche Beiträge
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Remittances and Educational Attainment: Evidence from Tajikistan

Sebastian Köllner

Abstract

This paper examines the impact of remittances on educational attainment in Tajikistan using the Tajikistan Living Standards Measurement Survey (TLSS) from 2007 and 2009. Applying an ordered probit framework and controlling for heteroskedasticity, censoring, intra-family correlation, and different measures of remittances, we find a negative impact of receiving remittances on educational outcomes. Calculations of the marginal effects draw a more subtle picture indicating that remittances positively affect educational achievements as long as education is mandatory. For higher, non-mandatory levels of education, however, receiving remittances negatively influences educational attainment. These results support concerns regarding the wide-spread affirmative impact of remittances on human capital formation. Accounting for endogeneity, the coefficients of the remittance variables become insignificant. Our general findings, however, remain unchanged implying that remittances are not used for investments in human capital accumulation once education becomes voluntary.

Introduction

During the past decade, remittances have become an important source of income in many developing countries. Remittances provide additional resources to households, increase their disposable income, and might relax budget constraints of the household (McKenzie/Rapoport, 2011, 1343; Cox Edwards/Ureta, 2003, 1f.). Families, thus, may rely less on children's work, therefore increasing time available for education (Bansak/Chezum, 2009, 145). Additional funds from remittances could either foster consumption or boost investments like education (McKenzie/Sasin, 2007, 3). If remittances are primarily used for consumption, the educational attainment of households should not systematically differ among households receiving remittances and those who do not obtain these supplementary funds. Contrarily, educational attainment should increase if additional resources are invested in education. In this case, children from households receiving remittances attain better educational results than children from other households.

There has been a growing number of publications examining the impact of remittances on schooling decisions of children in developing countries (Acosta, 2011; King/Lillard, 1987; Nguyen/Purnamasari, 2011; McKenzie/Rapoport, 2011). Following the standard model for educational decisions derived from the neo-classical theory, education should not simply be regarded as a consumption activity but as an investment in an individual's human capital. One makes an investment in his education if the associated returns exceed the costs of this investment (Sjaastad, 1962; King/Lillard, 1987, 168; Dustmann/Glitz, 2011, 24f.). Additionally, returns to investments in education will be compared with the returns to alternative investments (Cox Edwards/Ureta, 2003, 438). The costs of investments in education do not only include direct costs, such as tuition fees, but also indirect costs, such as foregone earnings. While the benefits of education will be realized in the future, costs occur at the moment of education. Hence, the costs of schooling have to be paid from current resources (McKenzie/Rapoport, 2011, 1342).

The financing of next generation's education through remittances creates a "forward" link (Rapoport/Docquier, 2005, 69). If remittances positively affect the human capital formation of children, remittances should also improve long-run growth as the younger population becomes more educated. Some studies refer to the "repayment of loans" hypothesis indicating a reverse link (McKenzie/Rapoport, 2011, 1332; Rapoport/Docquier, 2005, 69). Today's investment in the prospective migrant's human capital might be a profitable investment for

the household since education may have a higher return when migrating. So, the chance of migrating in the future increases the expected return to education. Thus, remittances may be considered a repayment of informal loans which were used to finance educational investments of the prospective migrant. This channel can be regarded as a “backward” link since remittances are targeted for the parental generation of the migrant (Rapoport/Docquier, 2005, 69).

Although remittances, if invested, may have positive effects on the educational attainment of children, households receiving remittances are often characterized by out-migration of one parent. Recent studies showed that the absence of one parent can lead to disruptive effects on the household structure and imposes an economic burden on the remaining household members (Hanson/Woodruff, 2003, 2; Amuedo-Dorantes et al., 2010, 237). As a result, children may be forced to work in order to offset the work of the absent household member (Bansak/Chezum, 2009, 145). Information and network effects could be a further source of the depressing effect of migration on educational attainment since children of migrant parents have a higher probability of becoming a migrant than children without migrant household members (McKenzie/Rapoport, 2011, 1343). This may raise the opportunity costs of staying in school due to higher potential earnings abroad. In consequence, children leave school earlier in order to migrate and start working (McKenzie/Rapoport, 2011, 1343). Hence, the overall effect of migration on children’s educational attainment is unclear a priori.

We examine whether remittances foster educational investments and, if so, whether individuals from households receiving remittances from abroad show higher educational attainments than individuals from households without remittances. Employing data from 2007 and 2009, we analyze this question in the context of Tajikistan. During the last two decades, the country turned into a major labor exporting country where remittances have become a source of income of utmost importance, reaching 47 % of the country’s GDP or 3 billion USD in 2011 (World Bank, 2013a). The civil war between 1992 and 1998 and the poor condition of the economy led to massive migration outflows. Official figures show that the number of Tajik labor migrants sums up to one million people, while unofficial figures range up to 1.5 million Tajik labor migrants abroad (Umarov, 2010, 11). The vast majority of these migrants (> 95 %) head to Russia (Danzer/Ivaschenko, 2010, 190; Umarov, 2010, 11). Thus, international labor migration has become a “livelihood strategy” in Tajikistan during the last years

(Bennett et al., 2013, 1). The global economic recession led to a temporary decline of the number of international migrants and the amount of remittances sent to Tajikistan. Current findings indicate that during the crisis migrants additionally withheld a larger part of their earnings as precautionary savings (Danzer/Ivaschenko, 2010, 200).

The Tajik education system generally receives a poor evaluation although the country has a high enrollment rate (2011: primary – 96.9 %, secondary – 86.0 %, World Bank, 2013b) and a high literacy rate (2010: 99.7 %, World Bank, 2013c). However, the level of education has little improved since the breakdown of the former Soviet Union. For individuals aged 25 and older, the average years of schooling have slightly increased to 9.85 years in 2010 from 9.01 years in 1990 (Barro/Lee, 2013). Moreover, the quality of education has been declining since the collapse of the Soviet Union. State spending on education has fallen from 8.9 % of GDP in 1991 to 3.5 % in 2008 (Republic of Tajikistan, 2007, 28; Tajikistan State Statistical Committee, 2013a). Estimations showed that current state spending on education accounts for merely 30 % of the funds needed (Republic of Tajikistan, 2007, 28). The National Development Strategy unveils a number of severe problems in the Tajik education sector. On the one hand “[t]he quality of instruction and training and the knowledge and skill levels achieved by students fall significantly short of contemporary demands” (Republic of Tajikistan, 2007, 28). Another reason could be found in “the shortage of schoolteachers and [...] their poor qualifications”, which can be attributed to the low salaries paid in the public education sector (Republic of Tajikistan, 2007, 28). In 2008, teachers in public schools and universities on average earned 181 Somoni (53 USD) per month or only 78 % of the average common monthly wage in Tajikistan (Tajikistan State Statistical Committee, 2013b). Many teachers have sought better paid jobs in private educational institutions or other sectors.

The educational system in Tajikistan currently consists of four years of primary school and a two-tiered secondary education. After primary school, students spend five years at basic school. According to our data, nearly half of the persons surveyed (45 %) finish their studies after basic school (grade 9), up to which education is compulsory. Those individuals continuing their education could choose between a two year program (secondary general) where students are prepared for university, a technical special secondary education, or some vocational training. After secondary school, individuals can study at university for another five years.

The contribution of this paper is threefold. First, the article aims to estimate the impact of remittances on educational attainment in Tajikistan and to close the existing gap in literature. Second, the paper makes a contribution to the existing literature whether remittances are used for consumption rather than investments. Moreover, the findings give some useful implications encouraging an investment-related use of non-governmental transfers.

The paper is structured as follows. The next section provides an overview of the relevant literature. Section 3 presents the employed data and discusses the econometric model. Section 4 outlines the main empirical results and gives some implications. The final section draws conclusions about the impact of remittances on educational attainment in Tajikistan.

Literature Review

The relationship between migration and educational attainment has been discussed several times (Cox Edwards/Ureta, 2003; Hanson/Woodruff, 2003; McKenzie/Rapoport, 2011). Different measures of educational attainment are applied in the literature, ranging from school attendance (Amuedo-Dorantes, 2010; Acosta, 2011; King/Lillard, 1987; Nguyen/Purnamasari, 2011; Cox Edwards/Ureta, 2003), school years completed (Hanson/Woodruff, 2003), grades attained (McKenzie/Rapoport, 2011), to the probability of selected school transitions (Mare, 1980).

Hanson/Woodruff (2003) detected that children from households with a migrant in the US complete significantly more years of schooling. Using a 10 % subsample of the 2000 Mexico Census of Population and Housing, they estimated an extra 0.23 to 0.89 years of schooling for girls whose mothers have less than three years of education (Hanson/Woodruff, 2003, 21f.). Zhunio et al. (2012) investigated the impact of remittances on educational outcomes employing a sample of 69 low- and middle-income countries. They found a significant positive influence of remittances on primary school completion and secondary school enrollment (Zhunio et al., 2012, 4613). These results remain robust to a couple of different specifications indicating that remittances play an important role in improving educational outcomes. Amuedo-Dorantes et al. (2010) analyzed the impact of remittances on children's schooling in various Haitian communities. They distinguished between children from households with out-migration and those without absent household members. The authors observed that receiving remittances raises school attendance of children regardless of whether their household is confronted with out-migration of household members or not (Amuedo-

Dorantes et al., 2010, 238). In other communities, however, the positive effect of remittances on the likelihood of school attendance could only be found for children from households without absent members (Amuedo-Dorantes et al., 2010, 240). These differences could be explained by the fact that out-migration of one household member may impose an economic burden on the remaining household members (Amuedo-Dorantes et al., 2010, 237; Hanson/Woodruff, 2003, 6). Cox Edwards/Ureta (2003) examined the impact of remittances on school retention from the 1997 Annual Household Survey in El Salvador. They showed that receiving remittances significantly lowers the hazard of a child leaving school. Moreover, they found that income from remittances has a several times stronger impact on the probability of leaving school than other sources of income (Cox Edwards/Ureta, 2003, 449f.). Remittances are not directly correlated with parental schooling and, therefore, closer to a randomly assigned transfer whose effect is a cleaner estimate on school retention rates than the effect of household income (Cox Edwards/Ureta, 2003, 432). Bansak/Chezum (2009) investigated the effects of remittances on school enrollment in Nepal. Their findings indicate a positive impact which is statistically significant only for young children (aged 5 to 10) (Bansak/Chezum, 2009, 147). Moreover, boys appear to gain more from remittances than girls. Adams/Cuecuecha (2010) analyzed the marginal spending behavior of households in Guatemala. They observed that households receiving remittances at the margin spend less on consumption goods, but more on education than households without remittances (Adams/Cuecuecha, 2010, 1633).

Other studies could not detect a positive impact of remittances on educational outcomes. McKenzie/Rapoport (2011) found a significant negative effect of migration on school attendance and educational attainment using data from 1997 ENADID in rural Mexico. Separating by sex and applying an IV-Censored Ordered Probit model, the results showed that the depressing effect of migration is somewhat stronger for boys (McKenzie/Rapoport, 2011, 1345). These findings could be explained by the fact that young males in households with migrants rather migrate themselves instead of attending an educational institution whereas girls in migrant households drop school in order to engage in housework (McKenzie/Rapoport, 2011, 1335). Acosta (2011) came to the conclusion that the overall impact of remittances on school attendance remains quite low. Hence, remittances do not significantly enhance investment in the education of children (Acosta, 2011, 930). Running a probit estimation, remittances increase school enrollment rates significantly. However, these results

are no longer valid after controlling for endogeneity and potential sample selection bias (Acosta, 2011, 925/930). Similar to these findings, Nguyen/Purnamasari (2011) could not provide evidence that migration increases school enrollment of children. The analysis of a data set from Indonesia suggested that migration only has a positive impact on school enrollment when using an OLS estimation. Applying an IV approach with historical migration networks as instruments, the impact is much smaller and statistically not significantly different from zero (Nguyen/Purnamasari, 2011, 17). Chami et al. (2005) concluded that remittances are not primarily devoted to investments but to compensate their recipients for bad economic outcomes.

Most studies focused their analysis on children between 6 and 24 years. This might be reasonable for developing countries where schooling has mostly been marked by considerable progress within the past decades. In Tajikistan, however, this progress has virtually not appeared since the country gained independence in 1991.

There is only limited research on educational attainment in the context of Tajikistan (Clément, 2011; Bennett et al., 2013). Clément (2011) analyzed the impact of remittances on household expenditure patterns in Tajikistan. He did not provide any evidence that remittances have a positive effect on investment expenditures like education (Clément, 2011, 71/75). Applying the Tajikistan Living Standards Measurement Survey (TLSS) 2003 from the World Bank, he concluded that remittances have not been used for investments but rather for consumption activities. Bennett et al. (2013) found ambiguous evidence for the impact of household members' migration on school enrollment of secondary school-aged children (aged 11-17 years) in Tajikistan using the TLSS 2007. Longer-term migration of parents was associated with a significantly higher likelihood of children to be enrolled (Bennett et al., 2013, 9). These results imply that longer-term migration of one parent is an effective strategy where economic benefits outweigh the costs. In contrast, children affected by the migration of siblings or other household members (no parents, no siblings) are less likely to be in school (Bennett et al., 2013, 11). However, only few of the results were statistically significantly different from zero. Using the TLSS 1999 and 2003, Shemyakina (2006) evaluated the effect of the 1992-1998 armed conflict in Tajikistan on school enrollment in the compulsory age group (aged 7-15 years) and the probability of completion of compulsory schooling. The results indicate that the conflict influenced boys and girls differently. While girls were 11-12 % less likely to be enrolled (significant at the 1 % level) in case of damage to the household's

dwelling, boys did not experience a negative impact (Shemyakina, 2006, 27). Moreover, the probability of completing compulsory schooling was significantly lower for boys and girls who were of school age during the civil war (born in 1976-1986), although the effect was greater for girls. Additionally, girls from regions strongly exposed to the conflict had a significantly lower probability to complete compulsory schooling than girls from regions relatively unaffected by the conflict (Shemyakina, 2006, 31).

Other existing studies on Tajikistan have rather focused on the impact of remittances on poverty reduction (Kumo, 2012; Danzer/Ivaschenko, 2010) and labor supply (Justino/Shemyakina, 2012). Kumo (2012) could not find any correlation between household income levels and the amounts of remittances received in Tajikistan. Moreover, he observed that remittances do not lead to a significant reduction of poverty because households with higher incomes are more likely to supply migrants. Danzer/Ivaschenko (2010) analyzed migration patterns within the business cycle in Tajikistan. They identified how the global financial crisis influenced Tajik migration patterns. In contrast to Kumo (2012), they concluded that remittances play a major role in reducing poverty (Danzer/Ivaschenko, 2010, 191).

While Bennett et al. (2013) examined the influence of migration on school enrollment in Tajikistan using TLSS 2007, to the best of our knowledge the impact of remittances on educational attainment in Tajikistan has never been investigated with data from the TLSS 2007 and 2009.

Methodology

Data

The data employed in the analysis were taken from the Tajikistan Living Standards Measurement Surveys in 2007 and 2009 (TLSS 2007/ TLSS 2009), jointly conducted by the World Bank, UNICEF and the State Statistical Committee of Tajikistan. The TLSS 2007 comprises 4,860 households with about 30,000 individuals. The TLSS 2009 consists of 1,503 households with about 10,000 individuals. The data include information about educational aspects as well as migration patterns, and are representative at the national level, the regional level (four regions and Dushanbe), and the urban/rural level (World Bank, 2008, 7; World Bank, 2010, 1). Most of the households who were interviewed during the second wave in 2009 had already been surveyed in 2007. However, the formation of a panel consisting of only two periods would have been misleading. Furthermore, building a balanced panel would have

resulted in a severe loss of the observations of approximately two thirds of the households being interviewed in 2007. In contrast to Danzer/Ivaschenko (2010), investigating migration patterns before and after the global financial crisis, our topic would have required longer series for profound scientific statements. Using a pooled OLS estimation allows us to capitalize on the households interviewed only once, and increase the number of observations considerably. As some households were employed twice, our data set does not consist of independently sampled observations. Thus, we do not have an independently pooled cross section (Wooldridge, 2009, 444).

Model

In this section, we present the conceptual framework and the empirical model of our analysis. Following King/Lillard (1987), we imbed the human capital model into a model of household demand. Educational attainment within this framework is not a decision of the individual but rather one of the entire household. Hence, educational outcomes do not only depend on an assessment of the costs and benefits of education but also on the family’s preferences and budget constraints. Our framework implies that an individual’s educational attainment is not independent of the households’ economic conditions (King/Lillard, 1987, 168).

In our empirical model, educational attainment is measured as the highest diploma an individual has attained. The desired level of educational attainment y^* is a continuous variable depending on several explanatory variables, denoted as \mathbf{x} , and a residual term e . Hence,

$$y^* = \mathbf{x}\boldsymbol{\beta} + e, \quad e|\mathbf{x} \sim \text{normal}(0,1).$$

In reality, however, we cannot observe the desired level y^* . Instead, we can only observe a discrete level of educational attainment, y , expressed in different completed levels of education (Wooldridge, 2010, 655). Thus,

$$\begin{aligned} y &= 0 \text{ if } y^* \leq \alpha_1 \\ &= 1 \text{ if } \alpha_1 < y^* \leq \alpha_2 \\ &= 2 \text{ if } \alpha_2 < y^* \leq \alpha_3 \\ &\vdots \\ &= J \text{ if } \alpha_{j-1} < y^* \leq \alpha_j. \end{aligned}$$

The variables α_1 to α_j constitute threshold parameters denoting the transition from one level of educational attainment to another. We classify educational attainment into eight categories with a natural order: no educational attainment (0), primary school (1), basic school (2), secondary general (3), secondary special (4), secondary technical (5), higher education (6), and graduate school (7). Any observed completed educational level y is an outcome of the optimization of the household's utility function. An individual completes an educational level y if the value of the underlying latent variable y^* is within the thresholds α_j and α_{j+1} . We therefore treat educational attainment as an ordered, discrete variable.

Assuming a standard normal distribution for e , we can derive the conditional distribution of y given \mathbf{x} and compute each response probability summing to unity:

$$P(y = 0 | \mathbf{x}) = P(y^* \leq \alpha_1 | \mathbf{x}) = P(\mathbf{x}\boldsymbol{\beta} + e \leq \alpha_1 | \mathbf{x}) = \Phi(\alpha_1 - \mathbf{x}\boldsymbol{\beta})$$

$$P(y = 1 | \mathbf{x}) = P(\alpha_1 < y^* \leq \alpha_2 | \mathbf{x}) = \Phi(\alpha_2 - \mathbf{x}\boldsymbol{\beta}) - \Phi(\alpha_1 - \mathbf{x}\boldsymbol{\beta})$$

⋮

$$P(y = J - 1 | \mathbf{x}) = P(\alpha_{J-1} < y^* \leq \alpha_J | \mathbf{x}) = \Phi(\alpha_J - \mathbf{x}\boldsymbol{\beta}) - \Phi(\alpha_{J-1} - \mathbf{x}\boldsymbol{\beta})$$

$$P(y = J | \mathbf{x}) = P(y^* > \alpha_J | \mathbf{x}) = 1 - \Phi(\alpha_J - \mathbf{x}\boldsymbol{\beta}).$$

The parameters $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ can be estimated by maximum likelihood estimation. Thus, for each i , the log-likelihood function is (Wooldridge, 2010, 656):

$$l_i(\boldsymbol{\alpha}, \boldsymbol{\beta}) = 1[y_i = 0] \log[\Phi(\alpha_1 - \mathbf{x}_i\boldsymbol{\beta})] + 1[y_i = 1] \log[\Phi(\alpha_2 - \mathbf{x}_i\boldsymbol{\beta}) - \Phi(\alpha_1 - \mathbf{x}_i\boldsymbol{\beta})] + \dots + 1[y_i = J] \log[1 - \Phi(\alpha_J - \mathbf{x}_i\boldsymbol{\beta})].$$

Since we have a discrete dependent variable with a natural order, an ordered probit model, originally developed by King/Lillard (1987), seems appropriate for our estimation. This strategy has been frequently used in the literature (Holmes, 2003, 253; Maitra, 2003).

In this paper we do not apply a sequential model of education like Pal (2004) because educational attainments are ordered in nature, but they are only partly sequential. An individual cannot attain a degree of higher education (6) without graduating basic school (2). However, one can get a university degree without having completed the level of secondary technical education (5). Since our measure of educational attainment is not restricted to schooling levels, we do not have conditional sequence of the dependent variable and therefore cannot apply a sequential model.

To investigate the effect of remittances on the educational attainment of household members, we will test the following empirical model:

$$y_i = \beta_0 + \mathbf{x}_i\boldsymbol{\gamma}_k + \text{rue}_i\beta_2 + \varepsilon_i .$$

In the model, y_i refers to the highest diploma an individual has attained (*m3bq5*). x_i is a set of explanatory variables, including individual and household characteristics, as well as characteristics of the household head. rue_i measures the impact of remittances on our dependent variable. Different variables of remittances are presented in the following chapter.

Although a large number of studies (Amuedo-Dorantes et al., 2010; Maitra, 2003) applies current school enrollment as dependent variable, we prescind from the use of this measure for three different reasons. First, it does not seem appropriate to measure the impact of remittances on educational attainment with the help of a binary variable. Second, measuring current school enrollment ignores some complications of educational attainment, such as grade repetition or late integration in the educational system (Amuedo-Dorantes et al., 2010, 232). Finally, low school enrollment rates are a problem in most developing countries but only to a lesser extent in Tajikistan. The high levels of school enrollment during the Soviet-era have remained until today. However, the quality of education deteriorates in Tajikistan as we have shown in a previous chapter.

Potential endogeneity between our remittance variable and educational attainment may cause inconsistent estimates. Remittances could be correlated with the unmeasured determinants of educational attainment like ability leading to omitted variable bias. The relationship between remittances and educational attainment includes a further uncertainty. Remittances can be the cause and the consequence of migration (Rapoport/Docquier, 2005, 16). Lucas and Stark (1985) found out that migrants with better education tend to remit more, whereas other studies came to the conclusion that households with high incomes are more likely to supply migrants (Kumo, 2012, 14). The impact direction is therefore unclear, forcing us to account for reverse causality. To allow for possible endogeneity we apply an instrumental variable approach. We use information about existing migrant networks, an instrument widely accepted in the literature (McKenzie/Rapoport, 2011; Justino/Shemyakina, 2012). In contrast to studies about the Mexican/US remittance behavior (Hanson/Woodruff, 2003), there are no historical migration rates available for Tajikistan. Thus, we employ the proportion of households in a population point (primary sampling unit) having migrants abroad as an instrumental variable (*hh_psushare*) as proposed by Justino/Shemyakina (2012). Recent studies show that migrant networks facilitate the access to the foreign labor market (Munshi, 2003, 553; Chiquiar/Hanson, 2005, 245; Carrington et al., 1996, 909). That particularly affects members of households with current labor migrants.

Although the size of the migration network at the community level (i.e. within primary sampling units) has not been part of the TLSS 2009, we adopt the TLSS 2007 results to the TLSS 2009. This is possible because we have information about the primary sampling units for both surveys. As migrant networks are highly persistent and do not change substantially within two years, this step seems reasonable. Our instrument has to satisfy two general restrictions as claimed by Wooldridge (2009, 529). First, it must be correlated with the variable which is instrumented. Second, the instrument must be uncorrelated with the model error term. Meeting both conditions, *hh_psushare* seems therefore suitable for the IV estimations.

Descriptive Statistics

The set of explanatory variables includes individual and household level characteristics. On the individual level we account for age and sex of the individual. *Age* and *age squared* control for differences across birth cohorts, allowing for a non-linear relationship between age and educational attainment. Furthermore, we include information about whether an individual has been enrolled in an educational institution during the previous academic year. Since household characteristics influence educational attainment in various ways, we account for several characteristics of the household head and the household in general. We control for the educational level, gender and age of the household head. We use some further variables to account for the number of children under 15 years per household and whether a household is located in a rural region. We employ deflated (at 2007 levels) monthly per capita expenditures on food as an additional regressor to capture the welfare level of the household. This is reasonable since we examine a developing country with 54 % of the population living below the national poverty line in 2007 (World Bank, 2013d), and food expenditures vary greatly between the households. Finally, we account for the deflated monthly per capita expenditures on education and the labor income earned last month from main occupation of the household members which serves as a proxy of permanent income. Tables 1 and 2 give a description of the variables and present the summary statistics for the full sample.

Table 1: Variable description

| variable | description |
|--|---|
| individual characteristics | |
| age | individual age |
| age2 | age squared |
| sex | = 1 if female |
| m3bq5 | highest educational level attained |
| m3bq7 | = 1 if enrolled in an educational institution last year |
| sy | years of education attained accounting for censoring |
| sy1 | years of education attained + 1 additional year accounting for censoring |
| abschluss | educational level attained accounting for censoring |
| household characteristics | |
| lpceduc | ln(per capita expenditures on education) |
| hh_educ | educational level of the household head |
| location | = 1 if rural |
| hh_agegr | age of the household head (grouped) |
| lpcfood | ln(monthly per capita expenditures on food) |
| hh_sex | = 1 if female |
| lhh_eink | ln(monthly labour income from main occupation) |
| ch14 | number of children under 15 years per household |
| ulevel | = 1 if individual with less than 5 years of education in the household other than the household head |
| olevel | = 1 if individual with more than 11 years of education in the household other than the household head |
| rue | = 1 if household receives remittances |
| ruekat | value of the remittances received per household (grouped) |
| gesamtremit3 | ln(remittances) received per household |
| community level characteristics | |
| hh_psushare | share of households in a population point with migrants abroad |

Since our model specification requires information about the household head, we restrict our estimations to children and grand-children of the household head. This is possible because educational progress in Tajikistan has halted during the past 20 years. Using the highest diploma attained as dependent variable, the consideration of young children does not

seem appropriate as their educational attainment might be preliminary and schooling is mandatory up to the age of 15. However, to account for those terminating their education before this age, we only exclude individuals under the age of 11 and account for the possible censoring bias of children enrolled in an educational institution. Thus, we have data on 14,802 individuals.

Table 2: Summary statistics

| Variable | N | Mean | Std. Dev. | Min | Max |
|---------------|-------|-----------|-----------|-----------|----------|
| age | 14802 | 20.15505 | 7.649504 | 11 | 75 |
| age2 | 14802 | 464.7369 | 392.7319 | 121 | 5625 |
| sex | 14802 | 0.4035266 | 0.4906212 | 0 | 1 |
| m3bq5 | 14802 | 2.336644 | 1.334767 | 0 | 7 |
| m3bq7 | 14802 | 0.4950007 | 0.4999919 | 0 | 1 |
| sy | 14802 | 9.374882 | 3.086186 | 0 | 19 |
| sy1 | 14802 | 9.733279 | 2.937253 | 0 | 19 |
| abschluss | 14802 | 2.80381 | 1.301936 | 0 | 7 |
| lpceduc | 14802 | 1.341869 | 1.175674 | -2.404864 | 8.449316 |
| hh_educ | 14802 | 3.48034 | 1.64506 | 0 | 7 |
| location | 14802 | 0.7198352 | 0.4490948 | 0 | 1 |
| hh_agegr | 14802 | 3.391569 | 1.07519 | 1 | 5 |
| lpcfood | 14802 | 4.491306 | 0.4673351 | 2.429832 | 6.747025 |
| hh_sex | 14802 | 0.1801784 | 0.3843489 | 0 | 1 |
| lhh_eink | 14802 | 4.701167 | 2.507664 | 0 | 11.002 |
| ch14 | 14802 | 2.419335 | 1.803692 | 0 | 11 |
| ulevel | 14802 | 0.175179 | 0.380133 | 0 | 1 |
| olevel | 14802 | 0.3351574 | 0.4720614 | 0 | 1 |
| rue | 14802 | 0.1290366 | 0.3352518 | 0 | 1 |
| ruekat | 14802 | 0.2615187 | 0.7142446 | 0 | 3 |
| gesamtremitt3 | 14802 | 0.6582567 | 1.744946 | 0 | 8.848892 |
| hh_psushare | 14337 | 13.10578 | 18.36451 | 0 | 90 |

Table 2 displays that 72 % of the individuals included in our estimation live in rural areas. The average age is 20.2 years. While 40.4 % of these individuals are female, only 18 % of the household heads are female. On average, households surveyed have 2.42 children under 15 years. Almost every second person (49.5 %) has been enrolled in an educational institution during the previous year indicating that the censoring bias is of major importance. Control variables for the educational attainment of household members other than the household head reveal different outcomes. One third of the individuals shares the household with

members having attained more than 11 years of education. In contrast, 17.5 % of those included live with household members other than the household head who achieved less than five years of education and who have not been enrolled in an educational institution during the previous academic year.

Table 3: Profile of Tajik migrants

| migrants, absent from the household at the time of survey | full sample |
|--|-------------|
| number | 1228 |
| female | 7.8% |
| to Russia | 95.8% |
| household with absent members | 14.8% |
| share of persons who do not remit home | 17.9% |
| average monthly wage (in 2007 USD) | 322.5 |
| average amount remitted in cash per month (in 2007 USD) | 225.4 |
| average amount remitted in kind per month (in 2007 USD) | 87.0 |
| average amount remitted per month (in 2007 USD) | 231.7 |
| share of foreign earnings remitted to average monthly wage | 71.8 % |

Table 3 gives a profile of the Tajik migrants. The number of households with absent members amounts to 14.8 % of all households included. This figure has declined from 2007 to 2009. A possible explanation might be that the global economic crisis severely affected Russia, the main destination of Tajik migrants where over 95 % of all absent members go to. In consequence, a part of the migrants returned home as economic conditions worsened in 2009. The share of women who migrated abroad is fairly small, summing up to 8 %. The monthly wage earned by the absent members averages to 322.5 USD while the average amount of remittances sent to Tajikistan by every migrant totals up to 231.7 USD (in 2007 USD, excluding those migrants not remitting at all). Almost all migrants remitted home in cash, while only a small fraction ($\approx 10\%$) sent remittances in kind. During the crisis the composition of remittances sent to Tajikistan changed substantially which is in line with findings from previous studies (Danzer/Ivaschenko, 2010). While remittances sent in cash decreased sharply the proportion of migrants sending remittances in kind and the amount of those remittances grew considerably. This could be due to migrants' attempts to reduce exchange rate fluctuations and to keep a larger share of their income as private savings in case of job loss and the necessity to return home (Danzer/Ivaschenko, 2010, 199f.).

We treat remittances as all transfers in cash or in kind sent to the household by migrant workers who have worked abroad during the previous year. To account for possible measurement error we use three different measures of remittances. The variable *rue* is a dummy equal to 1 if a household has received any remittances during the previous 12 months and 0 otherwise. A second variable, *ruekat*, categorizes the monthly amount of remittances received in cash or in kind per household (*gesamtremit2*) with 0 for “no remittances” received, 1 for “< 78 USD” received, 2 for “78-349 USD” received, up to 3 for “> 349 USD” received (in 2007 USD). The intervals have been chosen as follows: 1 includes the lowest quintile of those receiving remittances, while 3 comprises the highest quintile. All remaining observations receiving remittances are assigned to 2. Our third variable, *gesamtremit3*, represents the logarithm of monthly remittances received in cash or in kind in 2007 USD per household ($gesamtremit3 = \ln(gesamtremit2)$).

Empirical Results

Baseline model

Table 4 presents the results of our baseline regressions with the highest diploma an individual has obtained (*m3bq5*) as our dependent variable. We estimate the baseline regressions with different measures of remittances. All regressions include controls for individual and household characteristics, as well as for the head of the household. In a next step, we account for the discreteness of the dependent variable and apply an ordered probit model.

Table 4: Baseline estimations (*m3bq5* as dep.var.)

| Variables | (1) OLS | (2) OLS | (3) OLS | (4) Ordered Probit | (5) Ordered Probit | (6) Ordered Probit |
|---------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| lpceduc | 0.101*** (0.00706) | 0.101*** (0.00706) | 0.101*** (0.00706) | 0.144*** (0.00921) | 0.144*** (0.00921) | 0.144*** (0.00921) |
| hh_educ | 0.0838*** (0.00498) | 0.0838*** (0.00498) | 0.0838*** (0.00498) | 0.0932*** (0.00650) | 0.0931*** (0.00650) | 0.0931*** (0.00650) |
| age | 0.311*** (0.00549) | 0.311*** (0.00549) | 0.311*** (0.00549) | 0.485*** (0.00783) | 0.485*** (0.00783) | 0.485*** (0.00783) |
| age2 | -0.00420*** (9.57e-05) | -0.00420*** (9.57e-05) | -0.00420*** (9.57e-05) | -0.00681*** (0.000131) | -0.00680*** (0.000131) | -0.00680*** (0.000131) |
| sex | -0.151*** (0.0152) | -0.151*** (0.0152) | -0.151*** (0.0152) | -0.170*** (0.0198) | -0.170*** (0.0198) | -0.170*** (0.0198) |
| location | -0.104*** (0.0169) | -0.105*** (0.0169) | -0.105*** (0.0169) | -0.0915*** (0.0220) | -0.0922*** (0.0220) | -0.0919*** (0.0220) |
| hh_agegr | 0.0349*** (0.00794) | 0.0345*** (0.00793) | 0.0346*** (0.00793) | 0.0219** (0.0105) | 0.0213** (0.0105) | 0.0214** (0.0105) |
| lpcfood | 0.0793*** (0.0164) | 0.0788*** (0.0164) | 0.0791*** (0.0164) | 0.0645*** (0.0213) | 0.0636*** (0.0213) | 0.0641*** (0.0213) |
| hh_sex | 0.0555*** (0.0204) | 0.0554*** (0.0204) | 0.0555*** (0.0204) | 0.0438* (0.0264) | 0.0433 (0.0264) | 0.0436* (0.0264) |
| lhh_eink | 0.0128*** (0.00297) | 0.0131*** (0.00296) | 0.0130*** (0.00297) | 0.0145*** (0.00387) | 0.0150*** (0.00386) | 0.0148*** (0.00387) |
| ch14 | -0.0425*** (0.00433) | -0.0424*** (0.00433) | -0.0425*** (0.00433) | -0.0807*** (0.00567) | -0.0806*** (0.00567) | -0.0807*** (0.00567) |
| m3bq7 | -0.327*** (0.0241) | -0.327*** (0.0241) | -0.327*** (0.0241) | -0.433*** (0.0310) | -0.433*** (0.0310) | -0.433*** (0.0310) |
| rue | -0.0818*** (0.0220) | | | -0.110*** (0.0286) | | |
| ruekat | -0.0346*** (0.0103) | | | -0.0445*** (0.0134) | | |
| gesamt-remit3 | -0.0145*** (0.00422) | | | -0.0192*** (0.00549) | | |
| Constant | -2.533*** (0.111) | -2.531*** (0.111) | -2.532*** (0.111) | | | |
| Observations | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 |
| R-squared | 0.570 | 0.570 | 0.570 | | | |

Standard errors in parentheses; *** p<0.01; ** p<0.05; * p<0.1.

Columns 1-3 present the OLS baseline model results with *rue*, *ruekat*, and *gesamtremitt3* employed as predictors. The estimated coefficients of the different measures of remittances are

negative and significant at the 1 % level.¹ The educational level of individuals from households receiving remittances is 0.082 units lower compared to individuals living in households without remittances (column 1). Using a categorized measure of remittances or *gesamtremit3*, educational attainment of individuals from households receiving remittances is lower than the level of education of individuals from households without remittances (columns 2 and 3). The coefficient, however, decreases the more the remittance variable is subdivided.

Applying an ordered probit specification the coefficients of our variables of interest remain negative and highly significant (columns 4-6). Calculations of the marginal effects show that individuals from households receiving remittances have a significantly lower probability to obtain a secondary general degree than those from households without remittances. These findings are robust to different measures of remittances as well as higher educational degrees. However, for mandatory levels of education ($m3bq5 \leq 2$) the calculations of the marginal effects indicate that remittances increase the probability of obtaining these degrees. The results imply that remittances improve the educational level of household members as long as schooling is mandatory. For higher levels remittances have a negative impact on educational attainment.

In general, we obtain negative and highly significant coefficients for all measures of remittances on educational outcomes in all baseline estimations although educational levels of the absent members are significantly higher than those of the general population. The negative impact of remittances on educational attainment contradicts the hypothesis that remittances are used for investments like education. After completing mandatory levels of education, individuals from households receiving remittances show significantly lower levels of educational attainment than individuals from households without remittances. Both, the dummy variable indicating whether a household receives remittances, as well as the exact amount of remittances received, play a significant role for educational attainment. The results indicate that individuals from households receiving remittances leave educational institutions earlier in order to work.

¹ The estimated coefficients of the control variables show the expected signs. Educational attainment increases with age, and is significantly higher for individuals with higher per capita expenditures on education and food as well as a higher household labor income. On the other hand, women, individuals living in rural areas, and individuals from households with a higher number of children under 15 years have significant lower levels of education. The characteristics of the household head strongly influence the educational success of an individual. The degree attained increases with age of the household head and his level of education. Similar to previous literature educational attainment is higher for individuals with a female household head (Behrman/Wolfe, 1984, 301). The highest diploma attained is significantly lower for those individuals currently enrolled in an educational institution. This could be explained by the fact that these people have not finished their human capital formation, yet. Most coefficients are highly significant at the 1 % level.

Given that nearly 96 % of all labor migrants in our survey head to Russia and average wages in Tajikistan account for only one tenth of those in Russia (IMF, 2005; IMF, 2001), the return to one additional year of education is far exceeded by the return to working abroad. This assumption even holds for the return to several additional years of schooling. Hence, individuals from households receiving remittances tend to quit education earlier as the return to working abroad could hardly be compensated by additional years of education.

Our estimation could be affected by heteroskedasticity leading to biased standard errors which are no longer valid for constructing confidence intervals and t statistics. A White test confirms our assumption of heteroskedasticity. We therefore use heteroskedasticity-robust standard errors in our further estimations.

Censoring

While ordered probit models account for the non-negative restriction and the discreteness of the dependent variable, they fail to account for censored observations (Maitra, 2003, 130). Censoring occurs when an individual is still enrolled in an educational institution at the time of the survey and has not finished his studies yet (King/Lillard, 1987, 169). The final level of education is therefore uncertain. It is equal or greater than the current level of education. Neglecting the censoring bias, OLS and ordered probit estimations produce inconsistent estimators of the coefficients. This bias grows in magnitude with a higher frequency of censored observations. Like previous research on educational attainment we distinguish between currently enrolled individuals and those who have already completed their education. In our data every second individual (49.5 %) was enrolled at the time of the survey. Similar to other studies in the field of the economics of education, we use an ordered probit model which simultaneously accounts for the censoring bias to estimate educational attainment (King/Lillard, 1987; Holmes, 2003; Maitra, 2003; McKenzie/Rapoport, 2011).

There are several possibilities to deal with the problem of censoring. First, estimations could be implemented using only the uncensored observations. This would lead to a significant loss of observations. Moreover, the estimators of the coefficients would be inconsistent since older people and individuals with a low level of education are taken into account more often (Wooldridge, 2009, 601). Another possibility might be the truncation of the data above the age of likely educational completion (Holmes, 2003, 256). However, a truncated regression is intricate as the age of likely educational completion can vary significantly, e.g. 16 or 25 years. The

higher the age limit, the more observations get lost. In any case, many younger observations would get lost (Holmes, 2003, 256). A lower age limit would treat more individuals like uncensored observations although they are still enrolled. Both possibilities do not adequately deal with the censoring problem as they cause a non-random sample selection. Instead, individuals who are still enrolled should be treated as incomplete observations. These individuals will probably attain a higher level of education than they currently have.

Accounting for the censoring bias, we replace *m3bq5* by several newly created dependent variables. First, we assume that an individual being enrolled during the previous academic year will complete this level of education (*abschluss*) (King/Lillard, 1987, 169). Two problems may arise with this dependent variable. Using *abschluss* can lead to biased estimates since not all individuals will complete the educational level currently enrolled in. However, this effect might be offset by other individuals completing further educational levels which we do not account for. This is particularly relevant for younger children with lower educational levels, such as primary school or basic school. *Abschluss* employs the same classification of educational levels as *m3bq5*. Therefore, educational attainment is classified into eight ordered categories, ranging from no education (0) to graduate school (7). When applying *abschluss* as dependent variable, there might be a considerable gap between the actual level of educational attainment and the level assigned by *abschluss*. One might imagine an 11-year-old child with a degree from primary school being enrolled in the 5th grade. Using *abschluss* implies that this child has already completed basic school which is usually finished after the 9th grade. This may lead to a substantial overestimation of future educational attainments of currently enrolled individuals.

In order to diminish this gap we develop years of education (*sy*) as another dependent variable. Variable *m3bq5* is converted into years of education while the number of years usually necessary to complete an educational level is assigned to every individual. Hence, a degree from primary school represents four years of education, whereas a university degree sums up to 16 years of education. As half of the individuals surveyed have not finished education yet, we must account for the censoring bias. Extra years of education are assigned to those individuals being enrolled at the time of survey. We assume that an individual will complete the year of education currently enrolled in. Hence, one year of education is additionally assigned to those enrolled. Although the gap between the actual level of educational attainment and the one assigned is reduced significantly by *sy*, future educational attainments of currently enrolled individuals might now be substantially underestimated. This leads to a significant bias against

younger individuals. To account for this problem, we apply a compromise solution between *abschluss* and *sy*. In addition to *sy*, another year of education is assigned to individuals enrolled at the time of the survey (*sy1*). Thus, five, six or nine years of education are assigned to the 11-year-old child attending the 5th grade depending on whether we use *sy*, *sy1* or *abschluss*. With the help of these three dependent variables we try to capture the impact of the censored observations. Our model specification will be estimated with all dependent variables presented.

As mentioned previously, educational attainment can only be observed as a discrete variable even if it might be continuous (Lillard/King, 1984, 7f.). So, it is necessary to take this into account. Using years of education (*sy*, *sy1*) as dependent variable, the data are additionally characterized by probability spikes at completion levels since educational attainment is the outcome of a series of ordered discrete choices (Maitra, 2003, 130; Glick/Sahn, 2000, 68). The choice to proceed to the next educational level (e.g. secondary school or university) is likely to differ from the choice to continue for an extra year once one has already started secondary school or university (Glick/Sahn, 2000, 68). In order to account for such probability spikes the application of an ordered probit specification seems reasonable since OLS causes biased estimates (Maitra, 2003, 130; Holmes, 2003, 257; McKenzie/Rapoport, 2011, 1341).

Using our newly created dependent variables and excluding individuals below the age of 11, we account for the censoring bias. In addition, another problem may arise since our specification procedure treats every individual as an independent observation. Educational levels of household members are probably not independent of each other and might instead be positively correlated because of common family characteristics and similar attributes (Lillard/King, 1984, 6).² As this correlation will lead to inconsistent estimates, we employ two dummy variables controlling for a low and high level of educational attainment of other household members, respectively (*ulevel/olevel*). The variable *ulevel* is a dummy equal to 1 if there is at least one household member other than the household head who attained less than five years of education and who is currently not enrolled in an educational institution. The variable *olevel* is another dummy which is equal to 1 if there is at least one household member other than the household head who attained more than 11 years of schooling. Since an average household in our sample

² Several reasons for the non-independence between household members were given by Griliches (1979, S38). In literature, the impact of intra-family correlation on educational attainment ranges from remarkable family effects which lead to serious overestimation of the true returns to schooling to negligible effects exerting only little influence on the estimates of the coefficients (Griliches, 1979, S58).

consists of 2.42 children under 15 years, the problem of intra-family correlation is of major importance. By using both dummies we control for this possible correlation.

Table 5 presents results of our ordered probit estimations accounting for the censoring bias, intra-family correlation, and heteroskedasticity. Using our newly created dependent variables (*sy*, *abschluss*, *sy1*), we obtain similar results for all of them. The coefficients of our main variables of interest (*rue*, *ruekat*, *gesamtremitt3*) slightly differ in magnitude and significance.³ Similar to the findings from our baseline estimation, we observe negative and partly significant (at the 5 % level) coefficients for all measures of remittances. Accounting for intra-family correlation, both variables show the expected sign and are highly significant at the 1 % level for all estimations. Thus, an individual's educational attainment is significantly lower if there is a member with an exceptionally low level of educational attainment in the household. In contrast, a household member with more than 11 years of education significantly increases the individual's educational attainment. However, both variables (*ulevel*, *olevel*) take a lot of explanatory power from *hh_educ*.

³ Our controls show the expected signs with the exception of a few variables. In contrast to our baseline results, we now observe a positive and highly significant impact of being enrolled in an educational institution (*m3bq7*) on educational attainment. This could be explained by the fact that we now control for the censoring bias by using newly created dependent variables. Accounting for intra-family correlation, censoring, and heteroskedasticity, the sign of the coefficient of *hh_agegr* changes. Educational attainment now decreases with age of the household head. The result is significant at the 1 % level. Furthermore, we cannot find a higher educational attainment for individuals from households with a female household head any longer. Instead, the coefficient is negative but not statistically significantly different from zero. Moreover, the significance of some coefficients has changed compared to our baseline specification. The impact of the labor income of the household head during the previous month (*lhh_eink*) on educational attainment remains positive but is not statistically significant anymore. The variable *location* differs in sign and significance. Applying *abschluss* as dependent variable, the location of a household in a rural area is associated with lower levels of educational attainment. These findings are no longer valid using *sy* or *sy1* as our dependent variable. One explanation might be that there are no significant differences between urban and rural areas when educational attainment is measured in years completed. Using completed degrees (*m3bq5*, *abschluss*) as measure of educational attainment, however, these differences become relevant.

Table 5: Ordered Probit Estimations accounting for censoring, intra-family correlation, and heteroskedasticity

| Variables | (1) sy | (2) sy | (3) sy | (4) abschluss | (5) abschluss | (6) abschluss | (7) sy1 | (8) sy1 | (9) sy1 |
|---------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| lpceduc | 0.0493*** (0.00961) | 0.0494*** (0.00961) | 0.0494*** (0.00961) | 0.0671*** (0.0100) | 0.0672*** (0.0100) | 0.0671*** (0.0100) | 0.0416*** (0.00964) | 0.0416*** (0.00964) | 0.0416*** (0.00964) |
| hh_educ | 0.0332*** (0.00678) | 0.0331*** (0.00678) | 0.0331*** (0.00678) | 0.0410*** (0.00702) | 0.0409*** (0.00703) | 0.0409*** (0.00703) | 0.0327*** (0.00681) | 0.0326*** (0.00681) | 0.0326*** (0.00681) |
| age | 0.561*** (0.0233) | 0.561*** (0.0233) | 0.561*** (0.0233) | 0.528*** (0.0191) | 0.528*** (0.0191) | 0.528*** (0.0191) | 0.570*** (0.0238) | 0.570*** (0.0238) | 0.570*** (0.0238) |
| age2 | -0.00810*** (0.000437) | -0.00809*** (0.000436) | -0.00809*** (0.000437) | -0.00748*** (0.000356) | -0.00748*** (0.000355) | -0.00748*** (0.000355) | -0.00824*** (0.000447) | -0.00824*** (0.000447) | -0.00824*** (0.000447) |
| sex | -0.156*** (0.0183) | -0.156*** (0.0183) | -0.156*** (0.0183) | -0.203*** (0.0200) | -0.203*** (0.0200) | -0.203*** (0.0200) | -0.153*** (0.0184) | -0.154*** (0.0184) | -0.154*** (0.0184) |
| location | 0.00288 (0.0218) | 0.00184 (0.0219) | 0.00220 (0.0219) | -0.0526** (0.0233) | -0.0533** (0.0233) | -0.0531** (0.0233) | 0.0131 (0.0220) | 0.0122 (0.0220) | 0.0125 (0.0220) |
| hh_agegr | -0.0430*** (0.00998) | -0.0436*** (0.00997) | -0.0434*** (0.00997) | -0.0347*** (0.0109) | -0.0351*** (0.0108) | -0.0351*** (0.0108) | -0.0485*** (0.0101) | -0.0489*** (0.0101) | -0.0488*** (0.0101) |
| lpcfood | 0.0656*** (0.0202) | 0.0647*** (0.0201) | 0.0651*** (0.0202) | 0.0990*** (0.0218) | 0.0984*** (0.0218) | 0.0986*** (0.0218) | 0.0830*** (0.0203) | 0.0822*** (0.0203) | 0.0825*** (0.0203) |
| hh_sex | -0.0328 (0.0260) | -0.0341 (0.0261) | -0.0336 (0.0261) | -0.0281 (0.0276) | -0.0289 (0.0277) | -0.0287 (0.0277) | -0.0248 (0.0263) | -0.0260 (0.0264) | -0.0256 (0.0264) |
| lhh_eink | 0.00211 (0.00356) | 0.00255 (0.00356) | 0.00242 (0.00356) | 0.000409 (0.00382) | 0.000728 (0.00381) | 0.000666 (0.00382) | 0.00261 (0.00359) | 0.00300 (0.00358) | 0.00289 (0.00359) |
| ulevel | -0.569*** (0.0292) | -0.568*** (0.0292) | -0.568*** (0.0292) | -0.582*** (0.0302) | -0.582*** (0.0302) | -0.582*** (0.0302) | -0.552*** (0.0294) | -0.552*** (0.0293) | -0.552*** (0.0293) |
| olevel | 0.733*** (0.0241) | 0.733*** (0.0241) | 0.733*** (0.0241) | 0.786*** (0.0251) | 0.786*** (0.0251) | 0.786*** (0.0251) | 0.712*** (0.0243) | 0.712*** (0.0243) | 0.712*** (0.0243) |
| ch14 | -0.0709*** (0.00593) | -0.0709*** (0.00593) | -0.0709*** (0.00593) | -0.0714*** (0.00604) | -0.0713*** (0.00604) | -0.0713*** (0.00604) | -0.0778*** (0.00598) | -0.0777*** (0.00598) | -0.0777*** (0.00598) |
| m3bq7 | 0.356*** (0.0428) | 0.356*** (0.0428) | 0.356*** (0.0428) | 0.834*** (0.0417) | 0.834*** (0.0417) | 0.834*** (0.0417) | 0.730*** (0.0462) | 0.730*** (0.0462) | 0.730*** (0.0462) |
| rue | -0.0594** (0.0272) | | | -0.0472 (0.0292) | | | -0.0434 (0.0276) | | |
| ruekat | -0.0191 (0.0125) | | | -0.0161 (0.0136) | | | -0.0124 (0.0127) | | |
| gesamt-remit3 | | | -0.00890* (0.00521) | | | -0.00697 (0.00564) | | | -0.00595 (0.00530) |
| Observations | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 |

Robust standard errors in parentheses; *** p<0.01; ** p<0.05; * p<0.1.

Table 6: Marginal Effects

| sy | sy = 0 | sy = 4 | sy = 9 | sy = 11 | sy = 16 |
|------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| rue | 0.000 (1.70)* | 0.001 (2.06)** | 0.008 (2.27)** | -0.020 (2.18)** | -0.001 (2.31)** |
| ruekat | 0.000 (1.39) | 0.000 (1.53) | 0.003 (1.53) | -0.007 (1.53) | -0.000 (1.53) |
| gesamtremi3 | 0.000 (1.51) | 0.000 (1.71)* | 0.001 (1.70)* | -0.003 (1.71)* | -0.000 (1.71)* |
| N | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 |
| abschluss | abschluss = 0 | abschluss = 1 | abschluss = 2 | abschluss = 3 | abschluss = 6 |
| rue | 0.000 (1.33) | 0.002 (1.56) | 0.017 (1.62) | -0.014 (1.60) | -0.002 (1.69)* |
| ruekat | 0.000 (1.10) | 0.001 (1.19) | 0.006 (1.18) | -0.005 (1.18) | -0.001 (1.19) |
| gesamtremi3 | 0.000 (1.13) | 0.000 (1.24) | 0.003 (1.23) | -0.002 (1.23) | -0.000 (1.24) |
| N | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 |
| sy1 | sy1 = 0 | sy1 = 4 | sy1 = 9 | sy1 = 11 | sy1 = 16 |
| rue | 0.000 (1.36) | 0.001 (1.51) | 0.008 (1.59) | -0.014 (1.56) | -0.001 (1.64) |
| ruekat | 0.000 (0.94) | 0.000 (0.98) | 0.002 (0.97) | -0.004 (0.97) | -0.000 (0.98) |
| gesamtremi3 | 0.000 (1.07) | 0.000 (1.12) | 0.001 (1.12) | -0.002 (1.12) | -0.000 (1.13) |
| N | 14,802 | 14,802 | 14,802 | 14,802 | 14,802 |

Z-values in parentheses; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 6 displays the corresponding marginal effects of all remittance variables for different educational outcomes. The results indicate that individuals receiving remittances have a lower probability to obtain higher educational degrees than individuals from households without remittances. In concrete terms, individuals from households receiving remittances are 1.4-2.0 percentage points less likely to complete a secondary general degree or 11 years of education than individuals from households without remittances. The results are significant at the 5 % level applying *sy* as dependent variable while they are statistically not significantly different from zero for *sy1* and *abschluss*. Using more diversified variables of remit-

tances (*ruekat*, *gesamtremitt3*), we still observe a 0.2-0.7 percentage point lower probability of completing a secondary general degree or 11 years of education for individuals from households receiving remittances. These findings are significant at the 10 % level for *sy*. We obtain similar results for attaining a university degree or 16 years of education. The marginal effects of all remittance variables are negative but smaller in magnitude implying an up to 0.2 percentage point lower probability of completing university for individuals from households receiving remittances. The results are significant at the 10 % level only for *sy* and *abschluss*.

For mandatory levels of education, however, the calculations of the marginal effects show a different picture. Thus, individuals from households receiving remittances now have a 0.8-1.7 percentage point higher probability to complete basic school or nine years of education than individuals from households without remittances. The results are significant at the 5 % level for *sy* while they are statistically not significantly different from zero for *sy1* and *abschluss*. Applying *ruekat* and *gesamtremitt3*, the effects remain positive but small in magnitude and significant at the 10 % level only for *sy*. As a consequence, we observe that receiving remittances increases the probability of completing mandatory levels of schooling but hinders the attainment of higher levels of education. This is in line with findings from our baseline regression indicating that remittances are partially spent for investments as long as education is mandatory. Once education becomes voluntary remittances impede the attainment of higher educational levels.

Accounting for the censoring bias, intra-family correlation, and heteroskedasticity, we obtain negative and partly significant coefficients for our main variable of interest for non-mandatory levels of education. The remittance variables show a diminishing impact in magnitude the more diversified they are. Whether a household receives remittances plays a major role for educational outcomes of the members while the concrete amount of remittances received has only little impact on educational attainment.

Thus, we cannot confirm the hypothesis that remittances generally lead to higher investments in education. Our results indicate that this is only true for mandatory levels of education. Instead, for non-mandatory levels of education individuals from households receiving remittances show lower levels of education compared to individuals from households without remittances. These findings imply that households with migrants have stronger prefer-

ences for the present than for the future as they invest less in education as soon as education becomes voluntary.

Instrumental Variable Estimation

Our estimations could be confronted with endogeneity problems and reverse causality between the remittance variable and educational attainment leading to inconsistent estimators. To account for these aspects, we apply an instrumental variable estimation. Using the size of migration networks at the community level (*hh_psushare*), we instrument the different measures of remittances (*rue*, *ruekat*, *gesamtremit3*) which are supposed to be endogenous. We obtain a negative and highly significant effect of our instrument on the remittance variables. The findings imply that a higher proportion of households in a population point having migrants abroad lowers the probability and the amount of remittances sent home. This could be explained with the insurance motive of remittances (Amuedo-Dorantes/Pozo, 2006). A lack of networks generally increases the migrant's income uncertainty since networks serve as a safety net. With the help of remittances labor migrants may insure this income risk in two different ways. They on the one hand might remit for reasons of family-provided insurance as they expect to have a secure place at home when they are in need. The migrants on the other hand might remit to accumulate precautionary savings in order to be prepared for worsening work opportunities in the host country (Amuedo-Dorantes/Pozo, 2006, 244). As a result, the authors found out that increases in income risk raise the propensity to remit and the proportion of earnings sent home as remittances (Amuedo-Dorantes/Pozo, 2006, 243). These results are applicable to our case because households from communities with a large proportion of households having migrants abroad have a lower probability and receive lower amounts of remittances. As these households do not experience a lack of networks, the insurance motive of remittances is of minor importance for them.

In a first step, we have to check whether our instrumented regressors are endogenous at all. Previous research (Maitra, 2003; Adams/Cuecuecha, 2010; Hanson/Woodruff, 2003) has shown that the problem of endogenous regressors is highly relevant for this topic. Comparing the coefficients of our variable of interest points at considerable differences between the baseline estimations and the 2SLS regression. Hence, we suspect endogeneity of our remittance variable. A Durbin-Wu-Hausman test for endogeneity leads to an F statistic of 1.56

using *sy* as dependent variable. Thus, we cannot reject the null hypothesis that the regressors are exogenous. Applying *sy1*, we can reject the null hypothesis at the 10 % level. Our findings indicate that *sy* and *abschluss* are not endogenous while *sy1* seems to be endogenous. As we cannot make a clear distinction whether our remittance variables are endogenous or not running IV estimations appears to be reasonable.

Table 7: Instrumental Variable Estimation

| First-stage regression summary statistics | | | |
|---|-------|--------|-------------|
| endogenous regressor | rue | ruekat | gesamtremi3 |
| R-squared | 0.048 | 0.045 | 0.047 |
| Adj. R-squared | 0.047 | 0.044 | 0.046 |
| Partial R-squared | 0.003 | 0.003 | 0.003 |
| Robust F (1, 14321) | 59.96 | 69.61 | 67.87 |
| p-value | 0.000 | 0.000 | 0.000 |
| Weak instrument test | 2SLS | 2SLS | 2SLS |
| Min. eigenvalue statistic | 35.19 | 38.49 | 38.96 |
| 2SLS Size of nominal 5% Wald test | 16.38 | 16.38 | 16.38 |

All regressions control for per capita expenditures on education, education of the household head, age, age squared, sex, location, *hh_agegr*, per capita expenditures on food, sex of the household head, labor income during the last month, number of children under 15 years, whether somebody has been enrolled during last academic year and a constant term.

In a second step, we test whether our instrument is weak. The correlation between the endogenous regressor (different remittance variables) and the instrument is quite low. Table 7 displays that R^2 and adjusted- R^2 from the first-stage regressions are around 0.05 leading to a considerable efficiency loss using the IV estimation (Cameron/Trivedi, 2010, 198). The partial R^2 , isolating the explanatory power of *hh_psushare* in explaining the endogenous regressor is quite low, suggesting some further need of caution. Nevertheless, the outcomes are not low enough to immediately detect a problem of weak instruments. The F statistics, ranging between 60 and 70, are considerably larger than the rule of thumb value of 10, so *hh_psushare* does not seem to be a weak instrument. Since the model is exactly identified we can only run the second test proposed by Stock and Yogo (2005) which gives a critical Wald test value of 16.38. The theory presumes homoskedastic errors, which is not appropriate in our context. However, the F statistic greatly exceeds this critical value, so rejecting the null hypothesis of weak instruments at the 5 % significance level is acceptable (Cameron/Trivedi, 2010, 198f.).

Table 8: IV-2SLS Estimations with *hh_psushare* as instrument

| | sy | abschluss | sy1 |
|--|----------------------|----------------------|----------------------|
| rue | 1.230 (1.080) | 0.497 (0.478) | 1.705 (1.095) |
| ruekat | 0.550 (0.482) | 0.222 (0.213) | 0.763 (0.487) |
| gesamtremitt3 | 0.224 (0.196) | 0.0907 (0.0870) | 0.311 (0.199) |
| rue (first-stage probit estimation) | -2.365*** (0.179) | -0.808*** (0.185) | -2.454*** (0.171) |
| Observations | 14,337 | 14,337 | 14,337 |

Robust standard errors in parentheses; *** p<0.01; ** p<0.05; * p<0.1.

Table 8 presents results of the 2SLS estimations with *hh_psushare* as instrumental variable for different measures of remittances. In contrast to previous findings, we obtain relatively large standard errors and positive, but insignificant coefficients for our main variable of interest. Therefore, our main implication remains unchanged: remittances do not lead to higher levels of educational attainment even when we account for endogenous regressors through IV regressions. To allow for the binary nature of *rue*, we apply an alternative approach, using a latent-variable model as a first-stage model (Cameron/Trivedi, 2010, 192). In comparison to the IV estimates with OLS as a first-stage model, the effect of the remittance variable has changed significantly. The sign of the coefficient has shifted again. The impact has increased in absolute value while standard errors have dropped significantly to 0.18. A Wald test clearly rejects the null hypothesis that the error correlation is $\rho = 0$, indicating that *rue*, *ruekat*, and *gesamtremitt3* are endogenous regressors.

Table 9: IV Ordered Probit Estimations with *hh_psushare* as instrument

| | sy | abschluss | sy1 |
|---------------|----------------------|----------------------|---------------------|
| rue | -0.0415 (0.0828) | 0.00625 (0.0908) | 0.0250 (0.0838) |
| ruekat | -0.00791 (0.0521) | -0.00524 (0.0506) | 0.0126 (0.0474) |
| gesamtremitt3 | -0.00560 (0.0161) | 0.00587 (0.0175) | 0.00829 (0.0163) |
| Observations | 14,802 | 14,802 | 14,802 |

Robust standard errors in parentheses; *** p<0.01; ** p<0.05; * p<0.1.

We finally account for the discreteness of the dependent variable and run IV ordered probit estimations with *hh_psushare* as instrumental variable. Table 9 displays the results for different measures of remittances. The coefficients of our main variable of interest differ in sign, but they are statistically not significantly different from zero.⁴ This is in line with findings from previous chapters where individuals from households receiving remittances did not show higher levels of educational attainment. The results underline that remittances do not generally lead to higher investments in education although the educational levels of the absent members are significantly higher than those of the general population. Therefore, remittance-receiving households show stronger preferences for the present than the future as additional funds are used for consumption rather than investments in education.

Conclusion

This paper examines the impact of remittances on educational attainment of household members in Tajikistan using data from TLSS 2007 and 2009. Applying an OLS and an ordered probit framework, we obtain negative and highly significant results for our main variable of interest. To allow for differences related to remittances, we employ various measures of remittances. Accounting for censoring, intra-family correlation, and heteroskedasticity, the coefficients of the remittance variables remain negative, but experience a considerable loss of significance. Calculations of the marginal effects show a more subtle impact of remittances on educational outcomes. As long as education is mandatory, remittances are partly used as investments including education. Individuals from households receiving remittances ex-

⁴ A similar picture could be found for the corresponding marginal effects. While most of the control variables show a statistically significant impact on educational attainment, the effects of our remittance variable remain insignificant.

hibit higher educational outcomes than those from households without remittances. For higher, non-mandatory levels of education, however, remittances hinder investments in education, leading to lower levels of educational attainment for individuals from remittance-receiving households. This might be the case since the return to further education is far exceeded by the return to working abroad. Additionally, migration networks increase opportunity costs of staying in school since the entry to foreign labor markets becomes easier. Therefore, individuals from households receiving remittances quit education earlier in order to migrate. Applying instrumental variable estimations, we obtain large standard errors and positive coefficients for our main variable of interest. The results, however, are statistically not significantly different from zero. Hence, our main implication remains unchanged: we cannot find a positive impact of remittances sent to Tajikistan on educational attainment of household members for non-mandatory levels of schooling.

Investments in human capital play an important role in promoting sustainable economic development. In this context, remittances can serve as a private source of funding particularly with regard to the high relevance for the Tajik economy. The present paper attempts to identify the impact of remittances on human capital accumulation. The findings, however, indicate that households rarely use means available through remittances to enhance investments in education of younger household members. Instead, remittances are rather used as a coping strategy to satisfy basic levels of consumption (Clément, 2011). These results suggest that financial constraints are still very high in Tajikistan, forcing households to cover daily needs.

Although many studies find a positive impact of remittances on education, there is still some concern regarding the effects of migration on human capital formation. Therefore, one policy solution would be to increase public expenditures on education. As a result, the quality of the educational system might improve while disincentives of schooling would decrease and returns to education would rise. This could help encouraging households to invest in the education of younger household members.

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