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The Impact of Remittances on Education and Business Formation in Nigerian Households

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Research Questions:

I) What impact do remittances have on the length of education?

II) Do remittances promote business formation?

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1. Introduction

In the past years, the topic of remittances has gained enormous importance in the economic development discussion. Remittances refer to private transfers of money and goods to households by migrant workers, usually family members and other relatives, who typically work abroad or in urban areas where they have better job opportunities than at home. International remittances account for large amounts of GDP in developing countries. For 2014, remittance flows to developing countries are estimated to be as high as 436 billion dollars, an increase of 7.8% compared to the 2013 value and surpassing international development assistance by far.[1] International remittance flows remained relatively resilient to the 2008 financial crisis, increasing the dependency of many developing countries even further.[2]

Because of this trend, literature analyzing the impact on households that receive remittances has grown accordingly. Most studies find that these private transfers can reduce poverty (e.g. Adams, 2006) and increase health status (e.g. Hildebrand and McKenzie, 2005). However, the effect on the economy as a whole is topic of a lively discussion. The view of the impact on economic growth is controversial. Barajas et al. (2009) for instance claim that remittances have no effect on growth at best, mainly because they are not meant for investment into human and physical capital but as a means of social insurance for life's consumption necessities. Such pessimistic conclusions regarding the influence of remittances on GDP growth are the main motivation for me to investigate this topic on a micro-level and take a closer look at the effect on education and entrepreneurship, which both require investment and are closely related to economic growth.

My field of inspection is Nigeria. The number of studies focusing on the impact of remittances on African countries is proportionally very small and as far I know, no efforts were made so far to assess the impact on education and business formation using micro-level data, even though remittances are a large fraction of these economies. I decided to look at Nigeria in particular because it is among the richer countries in Africa, so there is potential that remittances can actually be used for other applications than basic needs. Also, the extent of migration and remittances in Nigeria is particularly high. The system of private transfers

[1] Values on size of remittances obtained from World Bank (2014)
[2] For a more detailed analysis of remittances during the global financial crisis, see Sirkeci et al. (2012)

is established and it can be expected that remittances had the time to have an impact on households.

Most studies focus on the effect of international remittances. I decided to expand my view and include domestic remittances in the research. My intuition is that this way all population stratums are included and not mainly the better-off households that have the resources to send a family member to work in another continent. Also, by omitting domestic remittances much could be lost in such a large and diverse country as Nigeria, where internal migration is an important factor. Remittance receivers in my paper come from all walks of life and all have a good possibility that someone sends them remittances, since moving to a more prosperous area in the same country to work there is related with much lower monetary and intrinsic effort than leaving the country. The effects of domestic remittances on the household are practically the same as the international ones: a relaxation of the household's budget constraint, but there might also be negative effects such as an increase in reservation wage or moral hazard.

In Section 2 I will shortly present some results of papers that focused on the relationship between remittances and education, businesses and the overall economy. I will examine the household survey I use in my thesis more closely in Section 3. Section 4 focuses on the impact of remittances on the length of education, Section 5 will reveal how the relationship between remittances and business formation looks like. Some concluding remarks follow in Section 6.

2. Literature Review

In order to investigate remittances, it can be helpful to know about the motivation of migrants to send them in the first place. A number of empirical studies examine possible incentives. Rapoport and Docquier (2006) find that altruism towards family members, meaning the migrant wants to help out the family at home and possibly insure them against adverse risks, even if he or she will never be personally compensated, is one valid driving force. Typically, this interfamilial altruism is impure. Investment into the family at home can be of interest, so migrants are also interested in sending remittances for selfish reasons, since they expect to gain something in return. They might be more likely to take over the family business when they come back home or they expect to receive a higher family bequest at a later time.

Osili (2007) uses a matched sample of migrants and their origin families from a U.S-Nigeria Migration Study and concludes that both altruism and investment are important motives. Poorer origin families receive larger transfers, but remittances sent to finance investment in the country of origin are positively associated with origin-household resources. Interestingly, skilled migrants send higher amounts of remittances, but their saving rate in the origin country is lower (less investment into origin assets), even though their total saving rate is higher. Origin savings are more likely to flow to rural areas, where the cost of investment is lower. The findings suggest that remittances have the potential to contribute to economic development by reducing poverty and providing savings for capital accumulation.

The findings regarding the effects of remittances on education are somewhat controversial. Lopez-Cordova (2005) uses rainfall patterns and distance to Guadalajara as instrumental variables to analyze health and education in Mexico. International remittances reduce illiteracy for children between 6 and 14 years. However, they also reduce school attendance among 15 to 17 year-old teenagers by more than 7 percentage points.

McKenzie and Rapoport (2006) look at Mexico-to-U.S. migration, using historic state-level rates of migration as instrumental variables they estimate that migration has a negative effect on school attendance and attainment for 12 to 18 year-old boys and 16 to 18 year-old girls. Boys living in international migration households have a 22% lower probability to complete junior high school, girls a 15% lower one to finish high school. This effect is

somewhat mitigated by a positive effect for younger girls with low educated mothers, which is consistent with the finding that remittances can relax credit constraints. However, for the majority family migration depresses educational attainment. According to the authors, the reason for this is that boys in migrant households are more likely to become international migrants themselves and older girls are more likely to do housework rather than schooling or work. The three channels they identify through which migration may negatively affect child schooling are disruption of the household structure, direct substitution of schooling today for migration today (higher potential earnings in the US), and the change in expected future returns to education (returns to schooling may appear higher in Mexico than in the US).

Cox-Edwards and Ureta (2003) find a more favorable impact of migration and international remittances in El Salvador. By using Cox proportional hazard models they estimate the effects on a cross-sectional sample and find that the impact of the amount of remittances on reducing the hazard of leaving school for primary and secondary school is at least 10 times the size of the effect of other income in urban and 2.6 times the size in rural areas. Also, rural households have a systematically lower hazard of dropping out of school even after controlling for the amount of remittances. The authors argue that these differences arise through any channels of remittances other than the budget constraint, mainly a higher appreciation of the migration option, which can lead to an increase in expected returns to schooling.

Yang (2008) examines how international remittances affect household expenditures for investment. He uses Panel household data from the Philippines and migrant exchange rate shocks as an exogenous source of income variation to eliminate time-invariant household characteristics. He finds that a 10% appreciation of the migrant's currency against the Philippine peso leads to an increase in peso remittances by 6% which increases human capital accumulation, migrant's household expenditure on education and child schooling increase. Child labor decreases, hours spent in self-employment increase and households are more likely to start capital-intensive entrepreneurial enterprises.

Chami et al. (2003) argue that altruistically motivated remittances intended to compensate recipients for bad economic outcomes can lead to a moral hazard problem so large that it can be enough to reduce economic activity. Using macroeconomic data for 113 countries from 1970 to 1998 they find that a significant proportion of remittances are indeed compensatory in nature and they estimate a negative impact on the economy. According to

their results, remittances do not behave like other capital flows such as profit driven FDI which are positively associated with economic growth. The findings of Barajas et al. (2009) that investment into human and physical capital will not increase due to remittances are in line with these predictions.

Using data from the Dominican Republic, Amuedo-Dorantes and Pozo (2006) conclude that households have a higher probability to receive remittances when they own a family business. However, remittances have a negative effect on the probability of owning a family business. They argue that this could be due to an increase in the reservation wage of household heads. It is also mentioned that migration can have a positive impact when the migrant returns home with a lump-sum, which would be in line with their finding that households with higher past average US work are more likely to own a business. The authors consider that receiving international remittances and owning a household business are likely to be jointly determined and therefore they use a bivariate Probit model to avert biases that would arise when estimating the models separately.

Woodruff and Zenteno (2007) use an instrumental variables approach with the historic distance to railroads as an instrument to analyze a large survey of small business owners in urban Mexico. They find that a one standard deviation increase in the migration rate from Mexico to the United States, which naturally increases remittances, leads to a 35-40% increase in the level of investment into these businesses and higher capital to output ratios. According to the authors, remittances are needed so that these enterprises can grow and expand. The authors think that migration networks may help overcome liquidity constraints, particularly in capital intense sectors.

3. General Information about the Data and Migration

The data I use in this thesis was obtained from the World Bank's Migration Household Survey 2009.[3] This survey includes data for five migrant-sending countries (Nigeria, Senegal, Uganda, Kenya and Burkina Faso) and one migrant-receiving country (South Africa). I concentrated my thesis on Nigeria, where the data is nationally representative and the volume of remittances is particularly high, the World Bank estimates 21 billion dollars for 2013.[4] Furthermore, according to the information of the household members, high proportions of the remittances were used for education and businesses, which makes for a particular interesting case in investigating whether these declarations can be confirmed using econometrical methods.

The Nigerian dataset contains 2,251 households, consisting of 13,414 individuals. They were asked about personal and household characteristics, whether they received remittances in the last 12 months, both from domestic and international migrants, and if so, how much. Due to some incorrectly filled in and missing information, my statistical models use slightly less than the full range of observations. In my analysis, remittances are the sum of all monetary transfers and the value of food and services sent by migrants, from both people who used to live in the household, mostly children of the household head, and the ones who never did, most commonly siblings and other relatives of the household head.

I decided to incorporate remittances of both international and domestic migrants, since domestic migration is an important factor in the large and diverse Nigeria. Almost 45% of all households in the dataset receive remittances, with both the rich and the poor being among the recipients. The following tables give a good intuition of which households are particularly represented among remittance recipients. A simple model to determine which of these factors affect the probability to get remittances is also presented.

Table 1 shows that remittance receiving households in rural areas are relatively more common among the households where the head has more education, for the urban areas it is the households with the lower educated heads that are more likely to receive remittances. In any case, remittances are highly represented in all household groups.

[3] Data obtained from World Bank (2011)
[4] Estimate obtained from World Bank (2014)

Table 1. Distribution of remittance receiving households among head education groups, in %

	Non-recipient households	Recipient households	Recipiant Median Amount (in Naira)
Rural households			
0-3 years	34.3	29.3	33,750
4-6 years	23.5	25.0	48,150
7-12 years	27.1	23.8	48,000
more than 12 years	15.1	21.8	129,500
Urban households			
0-3 years	11.9	16.5	100,000
4-6 years	9.8	13.9	87,000
7-12 years	41.5	31.5	100,000
more than 12 years	36.8	38.1	100,000

Source: own calculation based on World Bank household survey results

Table 2 reports the fractions of female headed households in urban and rural areas, across remittance recipients and non-recipients. It is not surprising that those with female household heads are overrepresented in the group that receives remittances. Women still play a minor role in the Nigerian labor market and are therefore more likely to be supported from outside the household.

Table 2. Distribution of remittance receiving households among female headed households, in %

	Non-recipient households	Recipient households	Overall
Rural households	7.3	15.2	12.8
Urban household	7.8	16.5	10.6

Source: own calculation based on World Bank household survey results

Table 3 compares whether households that have more children in the schooling age (between 6 and 24 years) are overrepresented in the group of remittance recipients. No significant differences can be found in rural areas except that there are fewer households with three children that receive remittances. In urban areas, households with more children are over-represented among remittance recipients. The median value of remittances does not follow a particular pattern in the rural households. In urban households the median value is quite stable.

Table 3. Distribution of remittance receiving households among number of school-age children, in %

	Non-recipient households	Recipient households	Recipiant Median Amount (in Naira)
Rural households			
No children	17.9	20.2	58,500
1 child	20	21.1	31,500
2 children	17.4	16.7	83,700
3 children	17.4	13.9	44,500
4 or more children	27.6	28.1	60,000
Urban households			
No children	25.8	17.2	103,000
1 child	18.5	19.8	100,000
2 children	22.7	21	100,000
3 children	13.5	18.3	100,000
4 or more children	19.5	23.8	103,250

Source: own calculation based on World Bank household survey results

All in all one can see that households receive remittances from all population stratums, but it is unlikely that migration and money transfers to a household are purely randomly assigned. The impact of remittances can still be a useful measurement. As Cox and Edwards (2003) said regarding this issue: "If migration has been driven primarily by economic reasons and remittances cannot be viewed as the result of random assignment, our study still makes the important contribution of focusing attention on the effect of remittances on human capital formation […]".

In Table 4 I report a Probit model on the probability to receive remittances and the average partial effects. Unfortunately, the dataset does not provide any meaningful variables to instrument for the presence of businesses which is likely to influence the decision of the migrant whether to send remittances or not. I can therefore not control for it. Still, there is no a-priori reason to believe that the omitted variable bias should be so substantial that the coefficients of the covariates in the model would change by very much.

Table 4. Probit Estimation Results for the Probability of a Household to Receive Remittances

Covariate	Coefficient	z-statistic	Average Partial Effect
Female HH head	0.487***	3.64	0.155***
Age HH head	0.0162***	5.55	0.00517***
Size of the HH	0.00333	0.28	0.00106
No electricity in HH	-0.256**	-2.41	-0.0815**
Schooling HH head	0.0058	0.97	0.00185
Number of Returned migrants	0.409***	3.67	0.130***
Ratio of school age people	0.301**	2.15	0.0957**
Ratio Migrated former HH members	0.566***	4.50	0.180***
Owns farmland	0.279***	3.77	0.0887***
State			
Rivers	0.881**	2.21	0.301**
Osun	0.172	0.42	0.0589
Kano	-0.115	-0.26	-0.0381
Imo	0.360	0.88	0.125
Zamfara	-0.125	-0.26	-0.0415
Delta	0.587	1.42	0.204
Ebonyi	0.053	0.13	0.0179
Yobe	0.630	1.50	0.219
Bauchi	-0.496	-1.03	-0.152
Katsina	0.492	1.07	0.171
Abia	0.065	0.16	0.0220
Ethnicity HH head			
Yoruba	0.184	0.83	0.0589
Igbo	0.290	1.26	0.0937
Efik/Ibibio	0.380	0.92	0.123
Ijaw	0.278	1.11	0.0895
Nupe	0.035	0.13	0.0111
Bini/Esan	0.126	0.49	0.0403
Other	0.153	0.84	0.0487
Constant	-1.986***	-4.24	
Log pseudolikelihood	-1195.7976		
Number of households	2143		2143

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Base state is Akwa Ibom, base ethnicity Hausa-Fulani.

Households are 48.7 percentage points more likely to receive remittances when the household head is female, a finding that is not surprising, considering Table 2. The probability also increases when the household head is older (on average by 1.6 percentage points each year). Higher probabilities of receiving remittances when the household head is

married and the household is larger are insignificant. There are also substantial differences across states and ethnicities, but only the coefficient of the state Rivers is statistically significant, people in this state are particularly likely to receive remittances.

Households with no access to electricity are 25.6 percentage points less likely to receive remittances, possibly their ability to migrate is somewhat lower, even when other factors are controlled for, because they live in remote areas and are therefore somewhat sheltered from the outside world, even from the rest of Nigeria. It is also very likely that their channels of receiving remittances are inadequate. The official means are underrepresented and the migrants might also be less likely to visit such remote areas regularly. Families owning farmland are estimated to have a 27.9 percentage points higher probability to receive remittances. A higher ratio of individuals in the school age (from 6 to 24 years) also leads to an increase in the probability to receive remittances. This is also intuitive as households with children are in need of more support. The probability also increases when there are more people in the household that used to be migrants and returned home. These households likely benefited from remittances in the past and therefore value migration higher than others.

Naturally, there are some limitations to the information that can be extracted from the dataset. The household survey only includes information about remittances received by households, but nothing about the amount of remittances households send themselves. This has the potential to bias the estimation results a bit, since it is the net difference of remittances that determines how possible budget constraints might be overcome. Generally it will mostly be urban households that do not receive remittances but send transfers, which are mostly children of the household head living abroad or in urban areas.

The effect on the education of remittance sender's children is probably very small, since most children of the household head (which is the largest group of remittance senders) do not have a family of their own yet. Also, altruistic motives towards the household that receives remittances would have to be quite strong so that it would actually lead to a cut in the length of education of the own children. More likely is the case that the commitment to send remittances back home limits the possibility to set up an own business since less money can be saved for a possible future investment. However, as will be seen in Section 5, in Nigeria there are a lot of micro-businesses. Set-up costs do not seem to be important. Also,

primarily large households were asked in the survey. Those are typically not the ones that send remittances to other households.

Looking at remittances at a specific time period can only be a proxy of its actual long-term value that ultimately determines the impact on children's education and business formation. Some households might have received remittances for a longer time than others, a limitation of the cross-sectional data. Still, even during times of crises the amount of remittances typically remains very constant, which indicates that remittances are quite robust and the cross-sectional value might be a better approximation of its long-term value than it would be the case if income from other sources was looked upon at a specific point in time.

This brings me to one more limitation, no information about family income is provided as in some studies. The economic situation of the household is therefore mostly controlled for by the education of the household head. For instance Cox-Edwards and Ureta (2003) use other income to show that the magnitude of remittances on education is much larger than from other income. One could try to introduce a proxy for income such as household expenditures, but for the same reason why income itself might be problematic, I decided against it: both the decision on how much to work and invest, which determines income and expenditures, are likely to be distorted by remittances. Households receiving remittances could have decided not to work as much anymore or gained possibilities to earn more through investing into businesses, which cannot be accounted for when looking at the data at a specific time point. Income data prior to any remittance decisions or Panel data would be needed to measure changes over time.

4. The Effect on Education

The educational system in Nigeria consists of 6 years of primary school, 6 years of secondary school (split into junior and senior secondary school in the middle) and tertiary school, which is again at least 4 years. Primary education is compulsory and free since September 1999, when the Universal Basic Education (IBE) Programme was introduced by the Federal Government of Nigeria. Through the Free Universal Basic Education Act 2004, junior secondary school education is also free and transition from primary school is automatic, so the entrance examination has been abolished.[5]

In reality, things do not look as bright as this general information might suggest. Parents still have to pay for things like school uniforms or books and lose potential laborers that are needed at home. There are large differences in the quality of education, private schools are too expensive for a large fraction of the population and the returns to education in public schools can be rather small. In a convocation speech, Professor Olugbemiro Jegede, Vice Chancellor, National Open University of Nigeria (NOUN) demanded that education in Nigeria should be declared a disaster area and is far away from achieving any meaningful EFA (Education For All) goals in 2015. [6] The actual school attendance rate is below 100%, especially in rural areas, where the average distances to school are much higher and many people live a nomadic life, even though education is technically compulsory.

Past literature strongly suggests that effects on education across urban and rural areas differ substantially. Including a simple indicator variable for whether a household resides in an urban or rural area would be insufficient, since the influence of remittances, as well as individual and household characteristics are likely to be highly different across these two groups. I use separate models for urban and rural areas since I found the differences in the size of the coefficients to be substantial.

A simple OLS regression on years of education would not be a good method to evaluate the dynamics of the influence of remittances, since many young individuals are not at the end of their education. Therefore I use semi-parametric Cox regressions to estimate the influence on the probability to drop out of school in corresponding years of schooling. This

[5] See Universal Basic Education Commission (2013)
[6] Article from Africa News Service (2009)

practice has the advantage that all available information can be used. I concentrate on the sub-population of 6 to 24 year-olds.

4.1 Descriptive Analysis of Individual Characteristics

The household survey includes a number of characteristics of the household and its individuals that can be used as covariates in the models to determine the effect of remittances on the length of education. An important aspect is choosing control variables that are not influenced by whether a household is a remittance receiver or not. Table 5 gives an overview of the selected variables at the individual level. Both individual and household characteristics are included.

The *amount of remittances* variable is the sum of all remittances received by the individual's household. I found that there are some households in the rural sample with enormous amounts of remittances received. These outliers would influence the estimates of the impact of remittances. Therefore I *censor* the amount of total remittances for the rural sample at 1,500,000 Naira, which was about 7,000€ at the end of 2009[7]. The top 5% of the individuals that received remittances, meaning 72 individuals in the rural sub-sample, live in households where this limit binds. In my regressions, the amount is measured in 1,000 Naira units. The median amount of those who receive remittances is 100,000 Naira in urban and 60,000 Naira in rural households.

In order to capture systematic differences between households that *receive remittances* and the ones that do not, I also include an indicator for the presence of remittances, if necessary, which captures indirect effects of remittances and migration, other than the budget constraint. Families that get remittances might have a different perception of education altogether, independent of the actual amount of remittances. They might value the migration option higher and are therefore willing to invest more into schooling. Alternatively, there is the possibility that the perceived returns to schooling decreases, children or siblings of migrant possibly want to become migrants themselves as fast as possible and remaining in school back home might become less appealing.

[7] I use a conversion rate of 0.00467 Euro/Naira which was approximately the going rate at the end of 2009 according to Yahoo Finance (2014)

Table 5. Descriptive statistics of the covariates for the individuals aged 6 to 24

	Rural			Urban		
Covariate	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Male	3234	0.541	0.4984	2623	0.541	0.4984
HH own farmland	3202	0.886	0.3175	2599	0.503	0.5001
Female HH head	3154	0.083	0.2760	2565	0.091	0.2874
Married HH head	3154	0.910	0.2858	2565	0.929	0.2575
No access to electricity	3207	0.394	0.4887	2615	0.039	0.1927
HH head education	3154	6.574	5.6373	2565	10.40	5.6606
Receives Remittances	3241	0.477	0.4996	2628	0.451	0.4976
Amount remittances	3241	206.1	1148.4	2628	103.15	306.95
Amount remittances >0	1547	431.8	1632.9	1184	229.0	424.72
Remittances censored	3241	105.1	279.34	2628	94.685	226.31
Remittances censored > 0	1547	220.20	371.71	1184	210.2	299.07

Source: own calculation based on World Bank household survey results

The indicator variable *male* equals 1 if the individual is male (54% of the young people between 6 and 24 years in the sample) and consequently 0 if female. The expected impact of the gender differs between countries; boys are often used for hard work at home, but due to discrimination they might also be the ones the parents are more willing to invest in. In Nigeria, many people still believe that education is a privilege for males. I therefore expect males to have more school years.

I take into account that depending on their *age*, individuals might have had better or worse opportunities to visit school. *Ethnicity* of the individual is also controlled for, because due to cultural and political differences, the appreciation of education is likely to differ as well. In the data there are 7 different ethnicity groups (plus one group for other ethnicities). Hausa, Igbo and Yoruba are the largest ones. I also included indicators for 17 *states* that are in the sample. Even when looking at urban and rural areas separately, there might be considerable differences in the availability and acceptance of schools across states.[8]

[8] heterogeneity of values across Nigeria and proposed solutions are discussed in Tuemi and Igwesi (2012)

No electricity is an indicator for a household's lack of electricity (23% of the subpopulation of 6 to 24 year-olds is affected), it can be considered a proxy for local conditions of the household. Usually people living in such remote areas have a higher distance to school, which increases their cost to attend school. *Owned farmland* indicates whether a household has farmland in its possession, possibly due to some assets of past generations. When children are needed for work at home, they probably have a lower level of education. On the other hand, owning farmland can mean that there is at least a certain amount of initial wealth, which could therefore improve the chances that the parents decide to invest more into their children's education. Both of these variables are probably not completely time-invariant, people can move to other areas and buy or sell land, possibly due to remittances. Yet, I argue that they are close to time-invariant. Though internal migration is common, it is usually not the whole family that moves and households that have farmland mostly have had some for several generations and are usually not very likely to completely change their profession due to remittances.

An aspect that is likely to be very important in explaining education is *head education*, which measures the school years of the household head, typically the parent with the highest education. I expect that individuals living in households with high levels of education will have significantly more school years themselves, since these households are typically better off and value education more than poor households that try to get by. This variable not only reflects the household head's own attitude towards education which will affect the children's academic career and the economic situation of the household, but possibly also genetic abilities.

I included indicators for whether the *household head is married* or *female*, since I expect children with single and female household heads having to work earlier and therefore receive less education. Other control variables like whether a household owns land that is not farmland and household expenditures are not included, because they are likely to be highly time-invariant and potentially influenced by remittances.

Naturally, there are limitations to the dataset when it comes to controlling for grade retention and composition of the household. No information is provided when an individual actually starts school and whether he or she was ever retained in grade, which would reduce the returns of schooling. Furthermore, even though I have information about the household composition at the point of the survey, this information is not known for each point in time

when the parents had to make a decision whether the child should continue onto the next cycle of education (for instance from primary to secondary school).

4.2 Survival Analysis

This section focuses on individuals between 6 and 24 years. I chose this subsample because children in Nigeria officially start going to school when they are 6 years old (sometimes they go to pre-school, but then they have an advantage in their later school career), the upper bound of 24 years was chosen because it appears to be a reasonable number where the individuals are still young enough so that remittances could have affected their education, but high enough to assume that not many individuals of this age are still in primary or secondary school. Additionally, it allows for comparisons to the findings in the paper of Cox-Edwards and Ureta (2003).

A good first overview of the educational situation for the generation between 6 and 24 years in the rural and urban areas of Nigeria can be presented by the Kaplan-Meier survival estimates as reported in Figure 1. These unconditional probabilities of surviving past any time t can be simply estimated by:

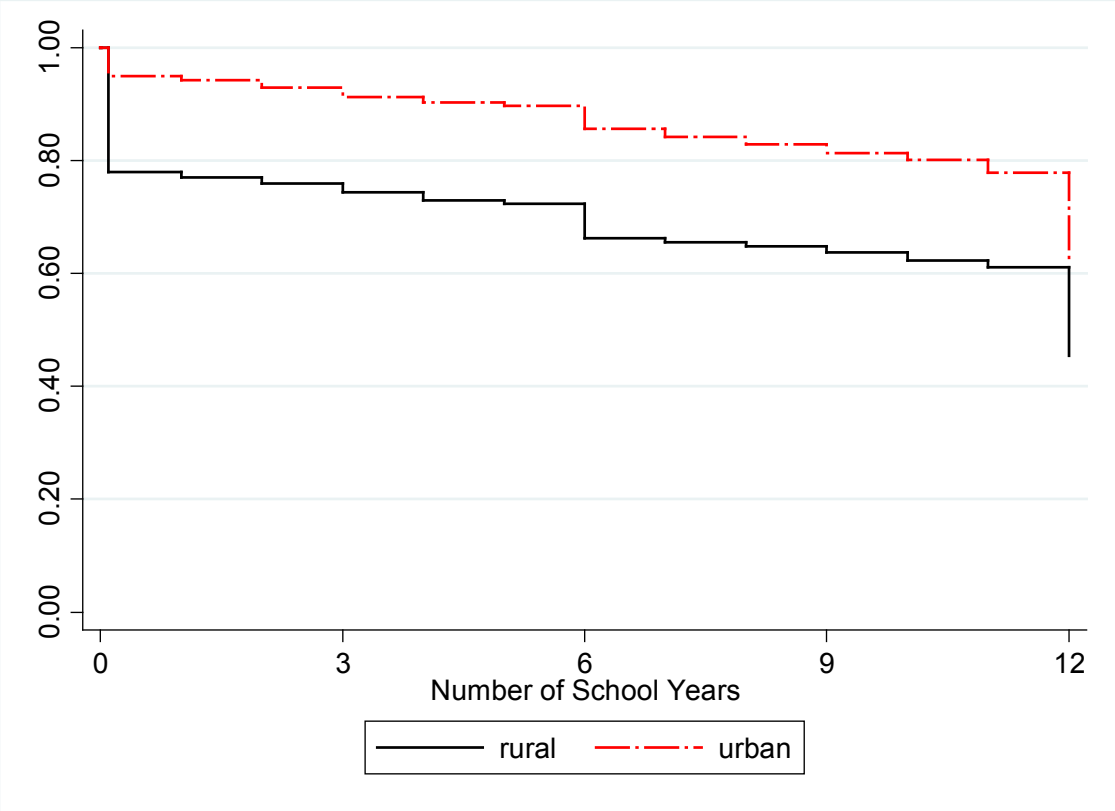
$$S(t) = \prod_{t_i \leq \mathbf{t}} \frac{n_i - d_i}{n_i}$$

For a given time t it is the product of all conditional probabilities of surviving past all times smaller than t. The conditional survival estimate at a point in time is the number of people at risk that do not drop out in that period (n_i - d_i), divided by the number of people that are at risk in the observed period (n_i).

As can be seen, the level of education is much higher in urban areas, 95% start school and about 90% finish primary education. The unconditional probability to reach the end of secondary school is 78%. In the rural sample the survival function is much lower, only 78% start school, 72% finish the 6 years associated with primary education, 61% are estimated to

reach the end of secondary education at 12 years. There is a significant drop of students after finishing primary education in both the urban and rural area. These numbers below the 100% EFA (education for all) goal are in line with UNESCO (2012) reports on the illiteracy rate in Nigeria. The survival estimates within these 2 areas vary vastly across states. However, I found that the effects of the covariates differed substantially only across the urban and rural areas, which is why I use separate regressions for them in the following sections.

Figure 1. Kaplan-Meier survival estimates, by area



In order to investigate the effect that remittances and other covariates have on the hazard of dropping out of school, I use Cox regressions. The hazard of dropping out at a specific point in time t is the following:

$$h(t) = h_0(t) * \exp(x_i'\beta)$$

The Cox model is termed semi-parametric because while the covariates enter the model through a linear predictor $x_i'\beta$, the baseline hazard h_0 (t) can take any form and is left unspecified, by using the method of partial likelihood. These estimates are typically less efficient than maximum-likelihood, however, not having to specify a possibly incorrect form of the baseline hazard more than makes up for that.

As Cox-Edwards and Ureta (2003, p.440) argue, Cox regressions are a particular attractive statistical framework for the given task, since it uses not only information from individuals that dropped out of school at a specific point in time, but also from the ones that are still in school. They are treated as right-censored at their current years of schooling. Due to the fact that I focus on primary and secondary education, individuals with more than 12 years of education are also right-censored. This means that whenever an individual surpasses 12 years of education, the person is treated as if he or she still attends school and has 12 years of education, no matter whether this is the case or the person finished school after 14 or 16 years of education. All individuals without missing information enter the model and if they never enrolled in school, they simply drop out in the first stage.

For all my models, I stratify the regressions on the age of the individuals. This way the coefficients are the same for all individuals, but the underlying hazard function is allowed to change across all ages. The reason for doing this is that individuals might have had better or worse possibilities due to external factors when they were young. Since there could be quite some fluctuations, stratifying on age is more appropriate than putting age into the linear predictor.

An important assumption of the Cox model is proportional hazard, which requires that the effects of the covariates are constant over time. The proportional hazard assumption is not satisfied in the Cox regressions when I do not control for it and simply assume that the

effect of each covariate is the same over the entire hazard. [9] Some covariates, such as the education of the household head might have a different impact on the probability to drop out depending on whether a student is in primary or secondary school. I will therefore relax the proportional hazard assumption by allowing the covariates to have different effects over segments of the baseline. I use global and individual Schoenfeld residuals tests to attain models that are both as simple as possible and fulfill the proportional hazard requirement. I chose 3 segments over which the coefficient of the covariates are allowed to change, they are: never enrolled, 1st through 6th grade (primary school) and 7th through 12th grade (secondary school).

The regression results are presented in the following subsection 4.2.1. To illustrate the practical importance of the most interesting factors when analyzing the length of school attendance, various estimated survival functions are discussed in subsection 4.2.2.

4.2.1 Cox Regression Results

Estimates of the effect of the covariates on the hazard of dropping out of school are presented in Tables 6 (rural areas) and 7 (urban areas). All standard errors are clustered at the household level to allow for a family effect.

The effect of the sex is somewhat different in the two areas. In rural areas, males have a 19% lower hazard of dropping out of school than females over the entire 12 years of schooling. [10] In urban areas, the hazard of never enrolling is 53% lower for males. For primary and secondary education the estimated (exponentiated) coefficients are also somewhat smaller than 1, however, they are statistically insignificant, indicating that there is no strong evidence that females have a different hazard as males once they are in school.

A contrary finding is the influence of living in a household that owns farmland. The effect is not significant when it comes to enrolling in school in both areas. In primary school, the hazard is reduced by 52% for individuals living in rural households, in urban households by 27%, but the effect is not quite significant at the 10% level. Different significant results are obtained when individuals are in secondary school. The hazard of dropping out of school

[9] According to Persson (2001) the estimated hazard ratios are close to the exact average values even under the violation of the proportional hazard assumption in many cases. I report the results where I do not allow for different effects over the hazard in Tables 11 and 12 in Appendix A.
[10] The effect on the hazard can be simply obtained by calculating 1 minus the hazard ratio, here 0.81.

increases by over 50% in rural areas while for individuals living in urban households the hazard decreases by 34%. A possible explanation is that in rural areas the children have reached an age where they are able to help at the farm back home and are therefore more likely to drop out of school, whereas families living in urban areas usually only own the farmland and do not work on it themselves. For those families the possession of farmland typically indicates additional wealth, which can be used for a higher investment into the schooling of the children.

The impact on the education of the children when the household head is female is not statistically significant in either one of the areas. In rural households, the coefficient indicates that the hazard is somewhat lower when the household head is female, in urban areas the hazard of never enrolling is higher, but lower in primary education, no practical significance is found for individuals in secondary school, the segment that is most relevant when estimating the effect on the baseline survival in urban areas.

Table 6. Cox regression estimation results, rural areas

Covariate; segment of the hazard over which the effect applies, if it does not for the entire hazard		Hazard Ratio	Robust S.E.	z-statistic
Male		0.811***	0.0421	-4.03
HH owns farmland;	never enrolled	0.981	0.1806	-0.11
	primary education	0.482***	0.1124	-3.13
	secondary education	1.505*	0.3767	1.63
Female HH head		0.747	0.1456	-1.50
Married HH head		0.729*	0.1380	-1.67
No access to electricity;	never enrolled	1.042	0.1632	0.26
	primary education	1.429*	0.3114	1.64
	secondary education	1.802***	0.3762	2.82
HH head education;	never enrolled	0.936***	0.0121	-5.10
	primary education	0.948***	0.0173	-2.93
	secondary education	1.002	0.0140	0.14
Amount of Remittances		0.99956**	0.0002	-2.03
Log pseudolikelihood		-5177.1446		
Number of subjects		3069		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cox regression is stratified by age, the effects of the state the household resides in and the ethnicity of the individual on each segment of the hazard are controlled for, the amount of remittances is censored at 1,500,000 Naira.

Living in a household where the household head is married decreases the hazard of dropping out of school by 27% in rural areas; the effect is statistically significant at the 10% level. No statistically significant impact was obtained in the urban sample, while living in a household where the household head is married is estimated to reduce the hazard in primary and secondary school as could be expected, the hazard of never enrolling is estimated to increase by 121%. It should be kept in mind that the underlying baseline hazard of never enrolling is very low in urban areas and the standard error for the coefficient is substantial, so this finding is not particularly interesting or troublesome.

Table 7. Cox regression estimation results, urban areas

Covariate; segment of the hazard over which the effect applies, if it does not for the entire hazard		Hazard ratio	Robust S.E.	z-statistic
Male;	never enrolled	0.466***	0.0881	-4.04
	primary education	0.912	0.1238	-0.68
	secondary education	0.944	0.1216	-0.45
HH owns farmland;	never enrolled	1.295	0.3503	0.96
	primary education	0.730	0.1556	-1.48
	secondary education	0.663**	0.1084	-2.52
Female HH head;	never enrolled	1.925	0.9581	1.32
	primary education	0.473	0.3462	-1.02
	secondary education	1.028	0.3181	0.09
Married HH head;	never enrolled	2.213	1.4135	1.24
	primary education	0.574	0.3990	-0.80
	secondary education	0.751	0.2174	-0.99
No access to electricity;	never enrolled	0.747	0.3832	-0.57
	primary education	0.938	0.2563	-0.23
	secondary education	1.484	0.4704	1.25
HH head education;	never enrolled	0.961**	0.0184	-2.05
	primary education	0.974	0.0173	-1.50
	secondary education	0.959***	0.0134	-3.02
Amount of remittances		0.9991**	0.0004	-2.11
Receives Remittances;	never enrolled	0.443**	0.1440	-2.51
	primary education	0.633*	0.1553	-1.86
	secondary education	0.870	0.1490	-0.81
Log pseudolikelihood		-2310.96		
Number of subjects		2527		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cox regression is stratified by age, the effects of the state the household resides in and the effect of ethnicity on each segment of the hazard are controlled for.

The lack of access to electricity in the household the individual lives in is also only statistically significant in rural areas. While there is no impact on the probability of never enrolling, children in rural households have a 43% higher hazard of dropping out of school when in primary school and 80% once in secondary school. In urban areas, the coefficient is highly insignificant in the first two segments never enrolled and primary education, children in secondary education are estimated to be 48% more likely to drop out of school, but the effect is statistically insignificant too. It comes as no big surprise that no significant results could be obtained as only about 4% of the people in the urban sample have no access to electricity at their home.

As could be expected, a particular significant determinant of the length of education is the education of the household head. In the rural sample, the individual's hazard of dropping out is lowered by 33% when the household head has 6 years of education, which is the rural median amount of head education, compared to no household head education at all. [11] The effect of parental schooling on the hazard of dropping out of school decreases with higher school levels. While the hazard of dropping out in primary school is decreased by 27% when the household head has 6 years of education, there is no effect whatsoever once the individual is in secondary school.

In urban areas, the median amount of household head education is 12 years. An individual living with a household head that has 12 years rather than no education has a 38% lower hazard of never enrolling. In primary school, the hazard is reduced by 27%, but the coefficient is not quite significant at a 10% level. The largest effect is on individuals in secondary school, the hazard is reduced by over 39%; the coefficient is highly statistically significant again.

Coming back to the main interest of this section, namely whether remittances influence the length of education and if so, in which way, the results indicate that remittances have a positive, statistically significant impact over the entire hazard in both rural and urban areas. In the rural sample, the median amount of remittance received, which are 60,000 Naira within the group of remittance receivers, decreases the hazard by around 3%, the 75th percentile amount of remittances (200,000 Naira) decreases the hazard of dropping out by over 8%. There is a lot of variation in the amounts of remittances in the rural

[11] The hazard ratio for 6 years can be calculated by taking the natural logarithm of the hazard ratio for 1 year, multiplying this by the amount of 6 years and then taking the expenditure function of that product.

sample, the 75th percentile is far below the average amount of remittances sent. The 90th percentile amount of 777,000 Naira reduces the hazard by 29%. In the rural group there are no systematic differences in the length of education whatsoever across households that receive remittances and those that do not, after the amount of remittances is controlled for, therefore the indicator for the presence of remittances in the household was dropped from the model.

In urban areas, the urban median amount of the remittances receivers (100,000 Naira) decreases the hazard by 9%, 240,000 Naira, which is the urban 75th percentile amount, decreases the hazard by over 19%. The presence of remittances has a large, statistically significant effect on the hazard of dropping out of school, even after controlling for the actual amount. The hazard of never enrolling is by 53% lower, in primary school the hazard is 37% lower, in secondary school the estimate is not statistically significant anymore. This finding is similar to the one in Cox-Edward and Ureta (2003) for El Salvador, only for them the rural rather than urban remittance receiving households differed systematically. This will be mostly due to a higher appreciation of education, since they profited from the migration option in the past, which usually goes in hand with higher education. The role of sending remittances themselves will only play a minor part as for the reasons I mentioned in Section 3 (p. 12).

I also controlled for the state the household resides in and the ethnicity of the individual. In order to maintain the reading flow of the thesis, I kept the estimates of the 17 states and 8 ethnicity groups out of Tables 5 and 6. The full tables can be found in Appendix A (Tables 13 and 14). Estimates of the states and ethnicities are often enormous, obviously there are large differences across these groups. Differences across states are typically particularly large. However, one should keep in mind that the standard errors are very big in most cases, which is related to the problem that variation of the ethnicities is quite limited. Some ethnicities only live in a couple of states, which makes the correct assessment of the actual impact of each state and ethnicity somewhat difficult. Lagos, the state with the largest population by far, is the only one where each ethnicity is represented in the sample. It might be that there was at least some self-selection; higher motivated people might have migrated to better-off states, no matter what their ethnicity was. This would lead to higher estimates regarding differences in states and only small ones in ethnicities.

4.2.2 Survival Estimates

In order to assess the practical impact of remittances and other covariates on the survival estimates, I present the results of a number of survival functions (they can be found in Appendix B) in this section. I look at the strata of 18 year olds and compare the states Lagos, which is the largest one and has by far the biggest city in it, and Kano, which has Nigeria's second largest city in it, also named Kano. For the baseline hazard I set the education of the household head to the median amount, which is 6 years in rural and 12 years in urban areas, generally the representative individual's ethnicity is Hausa-Fulani. All other covariates are set to zero, meaning I look at the hazard for females that own no farmland, where the household head is male and unmarried, the household has access to electricity and receives no remittances. One of these variables is altered in each graph.

The graphs in Figure 2 illustrate the impact of remittances in rural households. The median amount of the remittances of those whose household received remittances (60,000 Naira which were about 280€ a year) has only a rather small impact on the survival estimates, particularly in Lagos, where the baseline hazard is on a higher level. One has to take into account that the 60,000 Naira is a rather small number and the average amount of the remittances sent is much higher than that. For the 75th percentile amount of 200,000 Naira (around 934€) there is a noticeable increase in the survival estimates, the probability to start school in Lagos rises from 80% to 82%, reaching the end of secondary education rises from 72% to more than 74%. Using the 90th percentile amount of 777,000 Naira, a substantial increase to 86% probability to start school and 80% to finish secondary school can be observed. In Kano, the probability to start school rises from 66% to 69%, the survival estimate of finishing 12 years associated with the end of secondary school rises from 27% to 33%. Note that the 200,000 Naira is still substantially below the average amount of remittances, even when using a cap at 1,500,000 Naira, the average amount is almost 250,000 Naira. 777,000 Naira increase the probability to start school to 76% in this state, finishing secondary school is reached with a probability of 49%. It is mostly the relatively "few" households that receive large amount of remittances where the benefit for school attendance has a practically large impact.

The urban survival estimates in Figure 3 show that the survival estimates are close to 1 when starting school and during primary education for the given strata and covariates in both Lagos and Kano, so there is hardly any room for remittances to further increase the results. However, during secondary education there is a substantial drop in the survival

estimate and households that receive remittances are considerably better off. Even the households that "only" receive the urban median amount of 100,000 Naira (460€) have a much larger estimate due to the fact that households receiving remittances systematically differ from those households that do not, even after controlling for the amount of remittances. In Lagos, the individual's survival estimate to finish secondary education rises from 73% to 80% when the household receives 100,000 Naira and to 82% when 240,000 Naira (the 75th percentile) of remittances are received by the household. For Kano, the probability to finish the 12 years rises from 49% to 61% with 100,000 Naira and to 64% with 240,000 Naira. The estimates in this figure should be treated with caution, since the systematic differences across the households are not statistically significant in secondary school. The fact that the amount of remittances has an impact and that the household budget constraint is therefore binding in urban households too, remains.

A factor found particularly important for the length of a child's schooling is the education of the household head. Figure 4 shows the rural survival estimates for an individual, when the household head has no, 6 years or 12 years of education. In Lagos, the survival estimate for 12 years of head education is 79%, for 6 years and no head education the estimates are 72% and 63%, respectively. In Kano where the baseline hazard is larger, the impact of head education is even more pronounced, 12 years of household education are associated with a 76% survival estimate to start school, for 6 years it is 66% and when the head has no formal education, the probability to start school is estimated to be only about 55%. The probability to finish secondary education is 38% when the household head has reached 12 years himself, when the household head has 6 years of education, the estimate is 27%, when the household head has no education the survival estimate is only 17%.

The impact of the household head's education is also evident in urban areas, but the magnitude is not quite as large as in the rural households. When the household head has no education, the individual's survival probability of finishing secondary education in Lagos is 62%, when the household head has 6 years of education the estimate is 68%, with the median amount of 12 years of household head education the estimate increases to 73%. In Kano, with 12 years of household education, the estimate of finishing secondary school is 49% for the representative individual. With only 6 years of household head education, the estimate drops to 42%, there is merely a 34% probability to finish secondary school when the household head has no education.

Figures 6 and 7 present estimates of the distribution on how much the ethnic background and how much regional differences play a role when it comes to explaining the length of schooling. It should be kept in mind that through the rather limited size of the survey there is not too much variation between ethnicities and states. Figure 6 shows the survival functions in urban and rural Lagos, depending on the ethnicity of the individual. I only use Lagos as it is the only state where each of the 4 largest ethnicity groups is featured in the household survey. Yoruba and Igbo are by far the largest ethnicity groups in this state. For rural households, a Yoruba is estimated to have a survival function close to 1. Igbo on the other hand have rather low survival estimates, the probability to start school is 82% and to finish secondary school only 58%. The estimates for Ijaw and Hausa-Fulani, which are not highly represented in this state, lie in between. If the individual is Hausa-Fulani, the estimate to start school is only 80%, completing the 12 years of education has a probability of 72%. The survival estimate is 90% for Ijaw when starting school, 78% is the probability to finish secondary school.

In urban Lagos the differences across most ethnicities is rather small, all estimates are close to 1 up until the end of primary education and drop to around 80% at the end of secondary school. The exception is Hausa-Fulani, the estimate of finishing the 12 years is only 73%. The standard errors are quite large and none of the coefficients of the ethnicities is statistically significant in urban areas and in most cases in the rural areas.

Comparisons between Lagos and Kano already implied that large differences in the amount of school attendance can be accounted for by the state the individual lives in. The survival functions of Figure 7 confirm this. In rural areas, the representative individual's survival probability when starting school is a mere 48% in Yobe, but close to 1 when living in Akwa Ibom, a state that is rich in mineral resources. As we have already seen, Lagos has an estimate of 80%, in Kano it is 66%. The survival estimate in Akwa Ibom remains close to 1 over the entire baseline, in Yobe the survival function is at only 13% by the end of 12 years of schooling. For Lagos the survival estimate is 72% and for Kano only 27% at the end of secondary education. In urban regions, the survival estimate for Akwa Ibom is again relatively close to 1, in Oyo the estimate of reaching the end of secondary school is 84%. The survival estimate in Lagos is 73% after 12 years. Kano is in the rear with a probability of only 49% to reach the end of the 12 school years associated with finishing secondary education.

5. The Effect on Business Formation

Self-employment is very wide-spread in Nigeria. About 50% of all households in all population stratums have at least one member that owns a micro-business, indicating that there is not a big monetary obstacle to open up a shop in this country and self-employment can be rather seen as an alternative to working a job and farming. Remittances are unlikely to make a self-employed person take a job or go into agriculture, but there is the possibility that people will stop working altogether as their reservation wage goes up. Alternatively, some people might become self-employed since they did not have the necessary capital for the sort of business they had in mind.

A big concern with measuring the impact of remittances on business formation is to account for reverse causality. People could be more likely to send remittances when there is a business at home they can invest into. They might want to get in on the business when they return home or they hope to get a big share once there is something to inherit. On the other hand, maybe migrants think that families owning a business do not need remittances. The resulting models are:

$$Business_i = \alpha_1 Remittances_i + \alpha_2' \, other\ covariates_i + \varepsilon_i$$

$$Remittances_i = \delta_1 Business_i + \delta_2' \, other\ covariates_i + \delta_3 \, migration\ ratio_i + \vartheta_i$$

When business formation and remittance sending both influence each other simultaneously, estimating them separately will result in biased estimates. To account for this, I will contrast the Probit results of Business Formation with a Two-Stage-Least-Squares approach and show how the results change.[12]

[12] I considered looking at the Two Stage Least Squares estimates for whether a household gets remittances and at a Three Stage Least Squares model. Amuedo-Dorantes and Pozo (2006) use a Simultaneous Probit Model and argue that the "average previous business and US Work of household members" has no effect on the "likelihood of receiving remittances". They therefore drop it from the equation that determines the probability to receive remittances and get an identified set of equations. Following this logic, I could use a similar variable, the number of household members that used to be migrants, as an instrument for the probability of having a business. However, as can be seen in Table 4 and the IV results in Table 10, the number of returned migrants is very likely to influence the

5.1 Descriptive Analysis of Household Characteristics

In this section, I use data at the household level since the question of interest is whether a household as a whole is more likely to have a business (or store) when remittances are received. Both characteristics of the household itself and the household head are included to investigate the impact of remittances on business formation. When there is at least one person in the household who is self-employed (with the exceptions of agriculture and elementary occupations that are not businesses in the strict sense) I consider the household to be a business owner.

Families with *female* household heads might be less likely to own a business due to the subordinate role of women in the Nigerian working environment. Younger families might have less acquired capital and experience to work as self-employed, but could be more motivated. Larger households have potentially more people to help with running a business; therefore I include the household *size*.

Table 8. Descriptive statistics of the covariates for the households

	Education ≤ 6			**Education > 6**		
Covariate	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Receives Remittances	926	0.479	0.4998	1319	0.434	0.4959
Female HH head	926	0.150	0.3573	1265	0.093	0.2909
Age HH head	922	53.33	14.374	1258	46.52	12.447
Size of the HH	926	6.567	3.7479	1319	5.542	2.9285
Married HH head	926	0.877	0.3287	1265	0.887	0.3158
No access to electricity	918	0.377	0.4849	1308	0.093	0.2899
HH head education	926	2.663	2.9033	1265	13.37	2.6233
Number returned migrants	926	0.046	0.2731	1319	0.062	0.3746

Source: own calculation based on World Bank household survey results

probability to receive remittances. These households and the remittance sender might have had more past experience with remittances and rate them higher than households that did not come into contact with them earlier.

Households with *married* household heads might also be more likely to have a business, since they have a partner that they can share some of the burden with. A dummy for whether the household has access to *electricity* controls for regional conditions inside a state. *Head education* might play a big role since I expect that educated families will have better opportunities to find good jobs, working as self-employed might be less attractive to them because of higher risk. On the other hand, they might have more knowledge on how to run a successful business. [13] Another factor are the *migrants who returned* home, since they could bring in knowledge they acquired elsewhere to help start up a business. It is also more likely that a household with returned migrants gained from remittances in the past or brought a lump-sum back home.

Ethnicity of the household head and the *state* the household is located in are also controlled for, since there could be different attitudes towards self-employment. I expected *urban* households to be less likely to own a business, but the effect proved to be highly insignificant once I controlled for differences between states.

In order to control for reverse causality I use the *migration ratio*, the rate of family members now living elsewhere to the number of members still living in the household. I consider it to be an appropriate instrument. Households with more absent family members are more likely to receive remittances. However, the number of absent family members should not have a significant impact on the probability of owning a business other than through remittances.

5.2 Estimation Results of the Impact on the Probability of Business Ownership

I use robust standard errors in all my regressions. Table 9.1 shows the average partial effects of the Probit model, which would be the appropriate model if there was no simultaneity. Here, the presence of remittances in the household has no effect on the probability to own a household business whatsoever. In order to take endogeneity due to simultaneity into account, I instrument remittances on the migration rate and use the Two Stage Least Square

[13] I did not use education attainment as in Amuedo-Dorantes and Pozo (2006), which measures how much of its potential education a family uses, since the results in Section 4 suggest that remittances have an effect on education of the children, education attainment would therefore be endogenous.

procedure (Table 9.2). The presence of remittances still has no statistically significant impact on the probability to own a business. However, the coefficient of a 9.6 percentage point lower probability of owning a business is not small. The "problem" might be that at least for some people, remittances are an incentive to start up a business and this has to lead to a large standard error. A larger household sample might have been needed. Another explanation is that certain households are affected in their choice to be self-employed by remittances, while others are not. This will be confirmed in Table 10.

The average partial effects after Probit are mostly similar to the coefficients in the IV estimation, except for the presence of remittances. Statistical significances also change somewhat, the number of returned migrants living in the household and whether a household head is married are marginally significant with the Two Stage Least Squares procedure only. Households with female household heads are 7 or 7.8 percentage points less likely to own a business (only significant in Probit model), depending on the model.

On average the probability of owning a business decreases around 0.4 percentage points with every year the household head gets older. For every additional person in the household, the probability to own a business increases around 1.6 percentage points. Households with no electricity are 10 or 11 percentage points less likely to be business owners, depending on the model. The number of returned migrants is marginally significant in the IV model, with an increase of 6.6 percentage points in the probability to own a family business for each additional returned migrant. There are enormous differences in the probabilities of owning a business across states, people living in Yobe State are much less likely to be self-employed than those living in Bauchi, all other things held constant. Ethnicity plays no significant role for the overall population. Only the Ijaw are statistically significantly less likely to be business owners than Hausa-Fulani. Again, the same concerns regarding separating the effect of state and ethnicity apply as in Section 4.

An interesting result is that households with higher educated household heads are less likely to own a business, which gives the intuition that there are better alternatives than being self-employed in Nigeria. The reason for this result is probably that there are many households with little years of schooling that run a very small business since they have no attractive job alternatives.

Table 9. The impact on the probability that a household owns a business, by Probit and 2SLS (IV).

Covariate	(1) Average Partial Effect after Probit	z-statistic	(2) 2SLS Coefficient	z-statistic
Receives Remittances	-0.00299	-0.15	-0.1062	-0.88
Female HH head	-0.0768**	-2.03	-0.0709	-1.54
Age HH head	-0.00437***	-5.51	-0.0039***	-3.16
Size of the HH	0.0162***	4.95	0.0156***	4.72
Married HH head	0.0567	1.50	0.0693*	1.66
No access to electricity	-0.0976***	-3.13	-0.1079***	-3.26
HH head education	-0.0122***	-6.76	-0.0127***	-6.62
Number returned migrants	0.0458	1.44	0.0662*	1.86
State				
Niger	-0.265**	-2.05	-0.254**	-1.97
Lagos	0.0845	0.78	0.0798	0.73
Oyo	-0.0254	-0.21	0.0238	0.19
Edo	-0.352***	-2.73	-0.336***	-2.66
Ondo	-0.536***	-4.77	-0.533***	-4.74
Rivers	-0.0968	-0.82	-0.0783	-0.63
Osun	-0.360***	-3.07	-0.357***	-3.11
Kano	-0.528***	-4.39	-0.525***	-4.16
Imo	0.159	1.40	0.190	1.59
Zamfara	-0.652***	-5.76	-0.681***	-5.34
Delta	-0.0651	-0.52	-0.0348	-0.27
Ebonyi	-0.201	-1.59	-0.209*	-1.70
Yobe	-0.665***	-6.27	-0.685***	-5.68
Bauchi	0.198	1.63	0.154	1.23
Katsina	-0.518***	-4.08	-0.504***	-3.71
Abia	-0.222	-1.74	-0.231*	-1.88
Ethnicity HH head				
Yoruba	-0.0201	-0.32	0.00467	0.08
Igbo	-0.0484	-0.70	-0.0168	-0.26
Efik/Ibibio	-0.0395	-0.35	-0.000750	-0.01
Ijaw	-0.148*	-1.91	-0.146*	-1.89
Nupe	-0.103	-1.37	-0.103	-1.23
Bini/Esan	0.0783	0.98	0.108	1.46
Other	-0.0500	-0.79	-0.0269	-0.58
Constant			0.934***	7.14
Wald chi2(31)	529.37		1626.23	
Number of households	2166		2166	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. In 2SLS approach "Receives Remittances" instrumented by "Migration Ratio of the household". Base state is Akwa Ibom, base ethnicity Hausa-Fulani.

Splitting up the population shows that households in which the education level is low (maximum of 6 school years of the household head) become less likely to be business owners when they receive remittances: the probability drops by 25.4 percentage points, the coefficient is significant at the 10% level. This is in line with findings that remittances increase the reservation wage of the households. At least for the less educated people in Nigeria, which largely consists of the poorer population stratum, this effect seems to apply. For higher educated people, remittances have no effect on the probability to have a family business whatsoever.

The results of Table 10 indicate that the number of businesses does not increase due to remittances, for the poorer population they actually decrease the probability of being self-employed. Remittances could still be an important boost for businesses. Even if there is no significant change in the number of businesses or even a decrease through remittances, businesses could still be positively affected, through capital deepening. According to Nigerian household's statements, 11.1 percentage of the domestic remittances, 21.7 percentage of remittances outside Africa and 20.1 percentage of the remittances sent from within another African country were used for businesses, which is an enormous amount, especially compared to the other countries in the survey.

However, there is also the possibility that these remittances were mostly substitutes for other income, which would have been used if there had not been any remittance inflows. Unfortunately, there is no data available on how much the households invested into their businesses in the last year which would have been necessary to test for this. These quantitative aspects might be an interesting area to investigate in the future.

There are large differences of the impact of the other covariates across the two groups as well. For the less-educated households, there is an increase of 17.6 percentage points when the household is married and 17.2 percentage points for every migrant that returns home, the probability of owning a business decreases by 1 percentage point with every additional household member. For higher educated households, the probability of owning a business decreases with age (0.4 percentage points a year), additional education of the household head (4.3 percentage points for each year) and when the head is female (11.1 percentage points), there is an increase in the probability of 2% for every additional household member. States are significant in both cases, ethnicities only among the group of the less-educated.

Table 10. The impact on the probability that a household owns a business across subgroups, by 2SLS.

Covariate	(1) 2SLS Coefficient subgroup 6 years of HH education or less	z-statistic	(2) 2SLS Coefficient subgroup over 6 years of HH education	z-statistic
Receives Remittances	-0.255*	-1.65	-0.0117	-0.07
Female HH head	0.0339	0.54	-0.111*	-1.73
Age HH head	-0.00009	-0.52	-0.00417**	-2.23
Size of the HH	-0.0115***	2.44	0.0196***	4.01
Married HH head	0.176***	2.63	-0.00396	-0.08
No access to electricity	-0.155***	-3.76	-0.0228	-0.43
HH head education	0.00887	1.43	-0.0434***	-7.67
Number returned migrants	0.172***	3.01	0.00243	0.05
State				
Niger	-1.082***	-4.99	-0.0906	-0.66
Lagos	-0.565***	-3.13	0.193*	1.79
Oyo	-0.573***	-3.21	0.0819	0.57
Edo	-1.086***	-5.57	-0.238*	-1.70
Ondo	-1.437***	-6.37	-0.353***	-3.16
Rivers	-0.902***	-5.29	0.129	0.96
Osun	-0.950***	-5.35	-0.264**	-2.23
Kano	-1.298***	-6.27	-0.425***	-2.96
Imo	-0.569***	-2.96	0.320**	2.45
Zamfara	-1.580***	-7.70	-0.392**	-2.31
Delta	-0.726***	-3.86	0.0715	0.50
Ebonyi	-0.928***	-4.76	-0.00621	-0.04
Yobe	-1.426***	-7.90	-0.673***	-4.82
Bauchi	-0.670***	-3.21	0.180	1.19
Katsina	-1.262***	-6.35	-0.349	-0.87
Abia	-0.942***	-4.91	-0.110	-0.81
Ethnicity HH head				
Yoruba	-0.168*	-1.76	0.0623	0.72
Igbo	-0.184*	-1.68	0.0372	0.40
Efik/Ibibio	-0.778***	-4.31	0.121	0.87
Ijaw	-0.311**	-2.50	-0.0555	-0.53
Nupe	-0.101	-0.63	-0.0571	-0.52
Bini/Esan	0.0702	0.59	0.143	1.35
Other	-0.159**	-2.05	0.0342	0.45
Constant	1.554***	7.21	1.200***	6.99
Wald chi2(31)	973.62		884.94	
Number of households	914		1252	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. "Receives Remittances" is instrumented by the migration Ratio of the household. Base state is Akwa Ibom, base ethnicity Hausa-Fulani.

6. Conclusions & Outlook

This thesis focused on the questions what impact remittances have on the education of the children and on business formation in the households back home. The results might help explain the reasons behind the lack of notable economic growth due to remittances in the past.

I found that there is a statistically significant positive impact of remittances on the length of education. However, it is only practically relevant when there is sufficient space for remittances to have an impact and when the amount of remittances is sufficiently large. Many households receive at least some small amount of transfers when accounting for both domestic and international remittances. For individuals in a household that receives the median remittance sending, not much will change. However, there is large variation in the amount of remittances and in the households that receive far larger amounts the effect is substantial. This finding implies that the household budget constraint is binding, indicating that the government could somewhat increase school attendance through increases in direct subsidies to the household in less-developed states.

Household head education is a key determinant for the education of the child, but the largest differences are across states. The ethnicity of the individuals is also controlled for and can have implications for education, but separating the effect from the regional differences is difficult since there is only small variation and the possibility to migrate into another state due to differences in motivation.

Remittances have a negative effect on the probability of owning a business for households with little head education, probably because the reservation wage rises. This decline in work force is likely a main reason why many macroeconomic papers find no increase in economic growth due to remittances. Large differences in business ownerships are found across states, significant varieties between ethnicities are only found for the group in which the household head has little education. Again, the small variation and the possibility to migrate could somewhat distort the results.

Of course this is not the end of the line when it comes to the role of remittances in education and businesses. In Nigeria, not only the quantity, but also the quality of the education is of big concern. Returns to education in Nigeria are typically much larger in private than in the public schools. However, the cost for the parents is much higher too.

Tertiary education has not been further analyzed either. Also, capital deepening for the existing businesses due to remittances could be a big boost for the economy. Household surveys that are highly adapted to these questions in hand would be required.

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Appendix A: Additional Cox Regression Tables

Table 11. Cox regression estimation results when covariates are applied over entire hazard, rural areas

Covariate	Hazard ratio	Robust S.E.	z-statistic
Male	0.822***	0.0438	-3.67
HH owns farmland	0.854	0.111	-1.21
Female HH head	0.846	0.169	-0.84
Married HH head	0.821	0.152	-1.06
No access to electricity	1.317**	0.151	2.40
HH head education	0.958***	0.00844	-4.92
Amount of remittances	0.99956*	0.000247	-1.79
State			
Niger	3.524**	2.242	1.98
Lagos	2.660*	1.381	1.88
Oyo	13.13***	11.19	3.02
Edo	0.945	0.592	-0.09
Ondo	7.090**	5.708	2.43
Rivers	15.30***	8.131	5.14
Osun	3.624**	1.836	2.54
Kano	32.62***	16.47	6.90
Imo	11.99***	5.282	5.64
Zamfara	3.481**	1.692	2.57
Delta	20.99***	10.17	6.28
Ebonyi	22.47***	11.43	6.12
Yobe	16.65***	8.628	5.43
Bauchi	5.873***	2.444	4.25
Ethnicity			
Yoruba	0.267**	0.170	-2.07
Igbo	0.673	0.391	-0.68
Efik/Ibibio	4.163***	1.940	3.06
Ijaw	0.718	0.191	-1.25
Nupe	9.86e-17***	1.16e-16	-31.37
Bini/Esan	0.590	0.255	-1.22
Other	0.833	0.143	-1.06
Log pseudolikelihood	-5310.1065		
Number of subjects	3069		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cox regression is stratified by age. Base state is Akwa Ibom, base ethnicity Hausa-Fulani. Proportionality assumption does not hold for this specification.

Table 12. Cox regression estimation results when covariates are applied over entire hazard, urban areas

Covariate	Hazard ratio	Robust S.E.	z-statistic
Male	0.797***	0.0653	-2.78
HH owns farmland	0.801*	0.108	-1.65
Female HH head	0.982	0.298	-0.06
Married HH head	0.800	0.243	-0.74
No access to electricity	1.002	0.193	0.01
HH head education	0.964***	0.0113	-3.13
Receives Remittances	0.691**	0.104	-2.46
Amount of Remittances	0.9992**	0.000384	-2.12
State			
Niger	2.031	1.211	1.19
Lagos	2.831*	1.514	1.95
Oyo	1.201	0.744	0.30
Edo	0.808	0.623	-0.28
Ondo	1.964	1.118	1.19
Rivers	4.270***	2.329	2.66
Osun	1.714	1.075	0.86
Kano	6.935***	4.538	2.96
Imo	1.547	1.117	0.60
Zamfara	5.522**	3.788	2.49
Ethnicity			
Yoruba	0.734	0.388	-0.58
Igbo	0.647	0.339	-0.83
Efik/Ibibio	1.863	1.133	1.02
Ijaw	0.657	0.391	-0.70
Nupe	0.972	0.427	-0.06
Bini/Esan	0.836	0.564	-0.27
Other	0.627	0.313	-0.94
Log pseudolikelihood	-2338.6369		
Number of subjects	2527		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cox regression is stratified by age. Base state is Akwa Ibom, base ethnicity Hausa-Fulani. Proportionality assumption does not hold for this specification.

Table 13. Cox regression estimation results full table, rural areas

Covariate; segment of the hazard over which the effect applies, if it does not for the entire hazard		Hazard Ratio	Robust S.E.	z-statistics
Male		0.811***	0.0421	-4.03
HH owns farmland;	never enrolled	0.981	0.1806	-0.11
	primary education	0.482***	0.1124	-3.13
	secondary education	1.505*	0.3767	1.63
Female HH head		0.747	0.1456	-1.50
Married HH head		0.729*	0.1380	-1.67
No access to electricity;	never enrolled	1.042	0.1632	0.26
	primary education	1.429*	0.3114	1.64
	secondary education	1.802***	0.3762	2.82
HH head education;	never enrolled	0.936***	0.0121	-5.10
	primary education	0.948***	0.0173	-2.93
	secondary education	1.002	0.0140	0.14
Amount of Remittances		0.99956**	0.0002	-2.03
State				
Lagos;	never enrolled	16.61**	20.47	2.28
	primary education	6.927	8.388	1.60
	secondary education	2.122	2.027	0.79
Edo;	never enrolled	5.110	5.928	1.41
	primary education	4.989	4.924	1.63
	secondary education	3.777	3.401	1.48
Ondo;	never enrolled	43.61**	68.53	2.40
	primary education	67.25***	89.26	3.17
	secondary education	2.04e-16***	2.15e-16	-34.31
Rivers;	never enrolled	8.98e-16***	1.15e-15	-27.10
	primary education	1.15e-16***	9.59e-17	-44.13
	secondary education	12.31***	7.667	4.03
Osun;	never enrolled	24.73***	30.04	2.64
	primary education	27.94**	39.11	2.38
	secondary education	2.074	1.944	0.78
Kano;	never enrolled	30.48***	33.81	3.08
	primary education	75.76***	76.96	4.26
	secondary education	6.847*	7.380	1.79
Imo;	never enrolled	2.435	3.476	0.62
	primary education	2.521	2.206	1.06
	secondary education	11.69***	6.927	4.15
Zamfara;	never enrolled	79.96***	87.22	4.02
	primary education	167.2***	168.0	5.09
	secondary education	5.641*	5.214	1.87
Delta;	never enrolled	66.70***	70.46	3.98
	primary education	13.50***	9.390	3.74
	secondary education	6.734**	5.551	2.31

Ebonyi;	never enrolled	1.980	2.624	0.52
	primary education	3.241	2.719	1.40
	secondary education	10.59***	5.568	4.49
Yobe;	never enrolled	53.93***	58.07	3.70
	primary education	96.39***	94.03	4.68
	secondary education	19.13***	16.76	3.37
Bauchi;	never enrolled	53.07***	57.81	3.65
	primary education	183.7***	188.5	5.08
	secondary education	6.438	10.86	1.10
Katsina;	never enrolled	42.85***	46.86	3.44
	primary education	53.79***	57.20	3.75
	secondary education	16.81***	17.96	2.64
Abia;	never enrolled	3.784	5.146	0.98
	primary education	3.211	2.462	1.52
	secondary education	22.27	9.878	6.99
Ethnicity				
Yoruba;	never enrolled	5.95e-17***	3.50e-17	-63.57
	primary education	0.486	0.494	-0.71
	secondary education	0.441	0.323	-1.12
Igbo;	never enrolled	0.919	0.687	-0.11
	primary education	4.610	4.743	1.49
	secondary education	0.125***	0.0970	-2.68
Efik/Ibibio;	never enrolled	0.820	0.386	-0.42
	primary education	19.75***	18.72	3.15
	secondary education	2.662	2.431	1.07
Ijaw;	never enrolled	0.460**	0.160	-2.23
	primary education	1.753	1.375	0.72
	secondary education	0.632	0.298	-0.97
Nupe;	never enrolled	5.84e-17***	7.61e-17	-28.66
	primary education	7.75e-17***	1.05e-16	-27.49
	secondary education	7.50e-17***	9.54e-17	-29.20
Bini/Esan;	never enrolled	0.514	0.452	-0.76
	primary education	0.581	0.622	-0.51
	secondary education	0.416	0.252	-1.45
Other;	never enrolled	0.960	0.187	-0.21
	primary education	0.543*	0.199	-1.67
	secondary education	0.422**	0.176	-2.07
Log pseudolikelihood		-5177.1446		
Number of subjects		3069		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cox regression is stratified by the individual's age, the amount of remittances is censored at 150,000 Naira. Base state is Akwa Ibom, base ethnicity Hausa/Fulani.

Table 14. Cox regression estimation results full table, urban areas

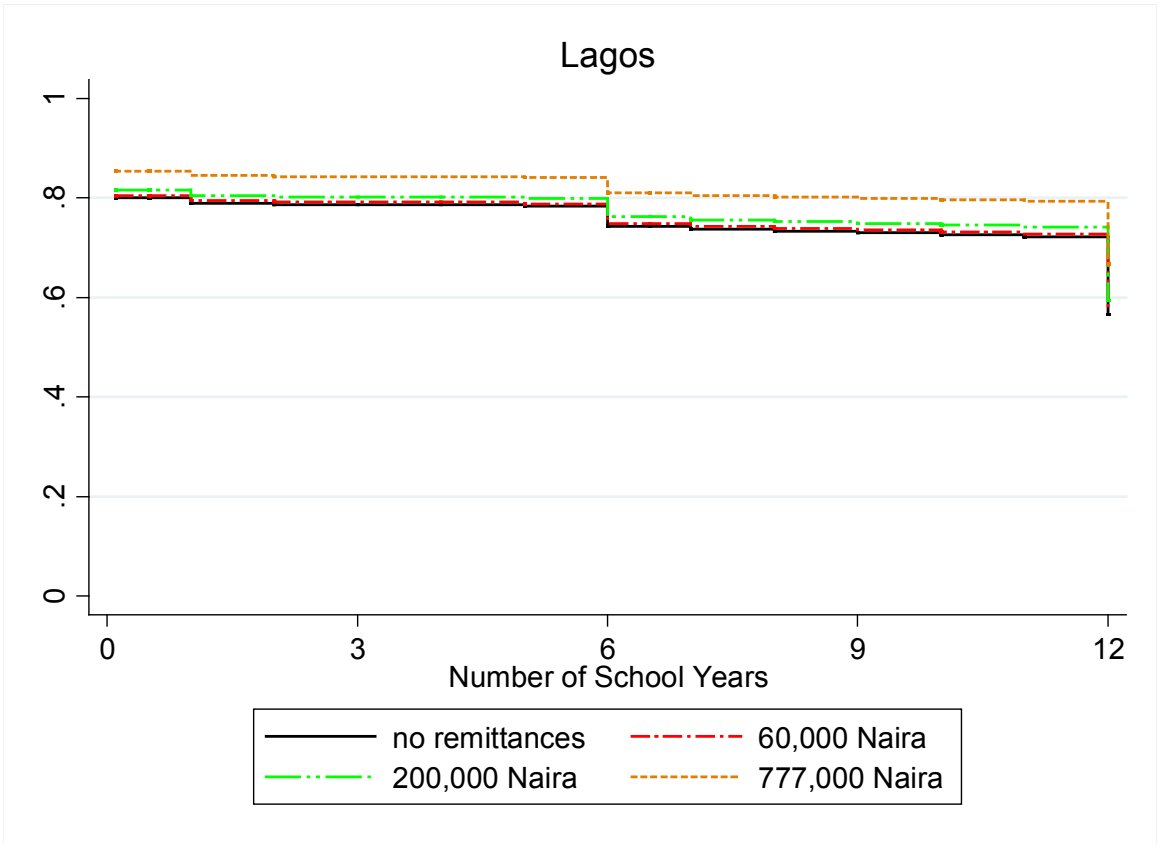
Covariate; segment of the hazard over which the effect applies, if it does not for the entire hazard		Hazard ratio	Robust S.E.	z-statistic
Male;	never enrolled	0.466***	0.0881	-4.04
	primary education	0.912	0.1238	-0.68
	secondary education	0.944	0.1216	-0.45
HH owns farmland;	never enrolled	1.295	0.3503	0.96
	primary education	0.730	0.1556	-1.48
	secondary education	0.663**	0.1084	-2.52
Female HH head;	never enrolled	1.925	0.9581	1.32
	primary education	0.473	0.3462	-1.02
	secondary education	1.028	0.3181	0.09
Married HH head;	never enrolled	2.213	1.4135	1.24
	primary education	0.574	0.3990	-0.80
	secondary education	0.751	0.2174	-0.99
No access to electricity;	never enrolled	0.747	0.3832	-0.57
	primary education	0.938	0.2563	-0.23
	secondary education	1.484	0.4704	1.25
HH head education;	never enrolled	0.961**	0.0184	-2.05
	primary education	0.974	0.0173	-1.50
	secondary education	0.959***	0.0134	-3.02
Amount of remittances		0.9991**	0.0004	-2.11
Receives Remittances;	never enrolled	0.443**	0.1440	-2.51
	primary education	0.633*	0.1553	-1.86
	secondary education	0.870	0.1490	-0.81
State				
Niger;	never enrolled	6.389**	5.432	2.18
	primary education	2.003	1.699	0.82
	secondary education	1.489	0.902	0.66
Lagos;	never enrolled	3.126	2.695	1.32
	primary education	4.910**	3.794	2.06
	secondary education	2.492*	1.320	1.72
Oyo;	never enrolled	2.595	2.534	0.98
	primary education	1.506	1.409	0.44
	secondary education	1.164	0.703	0.25
Edo;	never enrolled	6.64e-20	.	.
	primary education	1.175	1.243	0.15
	secondary education	0.833	0.622	-0.24
Ondo;	never enrolled	7.312**	6.267	2.32
	primary education	3.259	2.788	1.38
	secondary education	1.352	0.845	0.48

Rivers;	never enrolled	10.84**	10.37	2.49
	primary education	3.953	3.322	1.64
	secondary education	4.532***	2.413	2.84
Osun;	never enrolled	5.253	5.664	1.54
	primary education	4.223	3.794	1.60
	secondary education	0.799	0.609	-0.30
Kano;	never enrolled	10.82***	9.634	2.67
	primary education	12.87***	11.21	2.93
	secondary education	4.333**	3.097	2.05
Imo;	never enrolled	1.57e-19	.	.
	primary education	2.334	2.791	0.71
	secondary education	1.590	1.160	0.63
Zamfara;	never enrolled	3.352	4.279	0.95
	primary education	6.003*	5.912	1.82
	secondary education	6.652**	5.062	2.49
Ethnicity				
Yoruba		0.723	0.400	-0.59
Igbo		0.628	0.341	-0.86
Efik/Ibibio		1.999	1.298	1.07
Ijaw		0.662	0.405	-0.67
Nupe		0.995	0.427	-0.01
Bini/Esan		0.870	0.602	-0.20
Other		0.615	0.314	-0.95
Log pseudolikelihood		-2310.96		
Number of subjects		2527		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cox regression is stratified by age. Base state is Akwa Ibom, base ethnicity Hausa-Fulani.

Appendix B: Survival Functions

Figure 2. Rural Survival Estimates, by Remittances



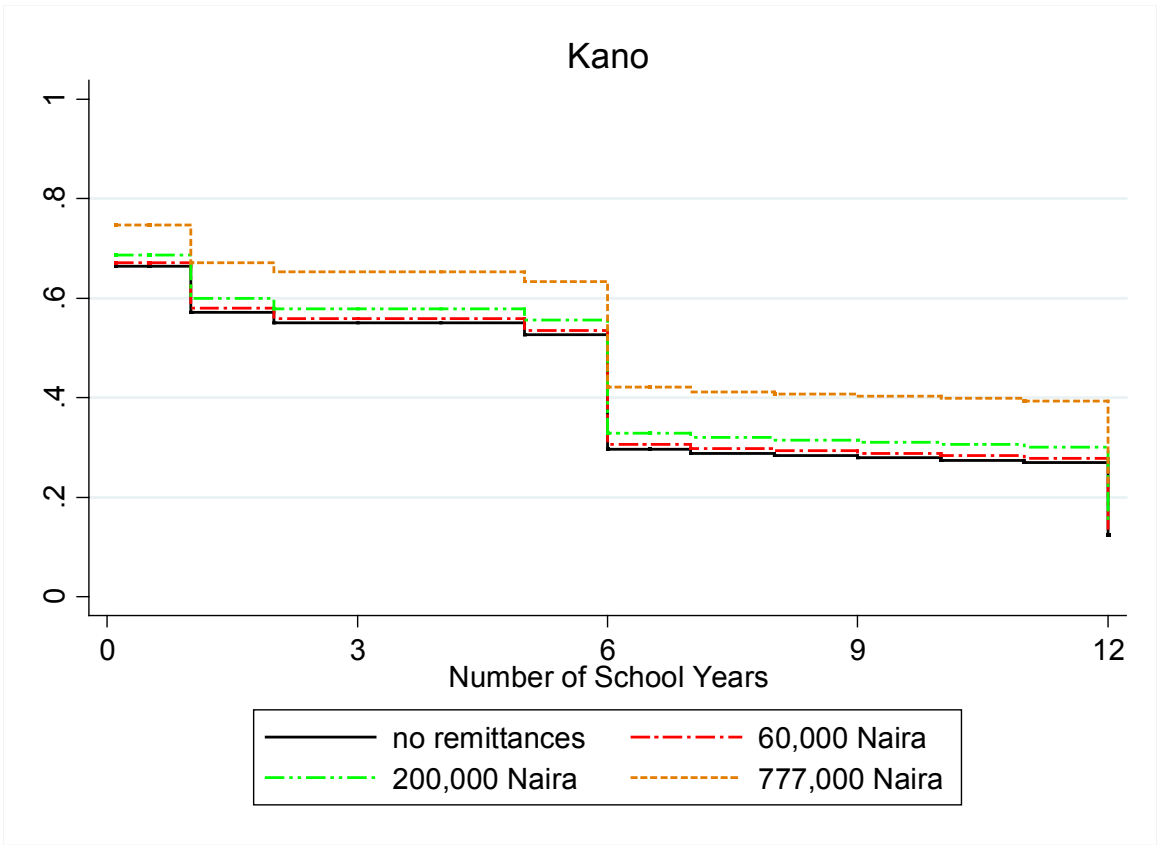
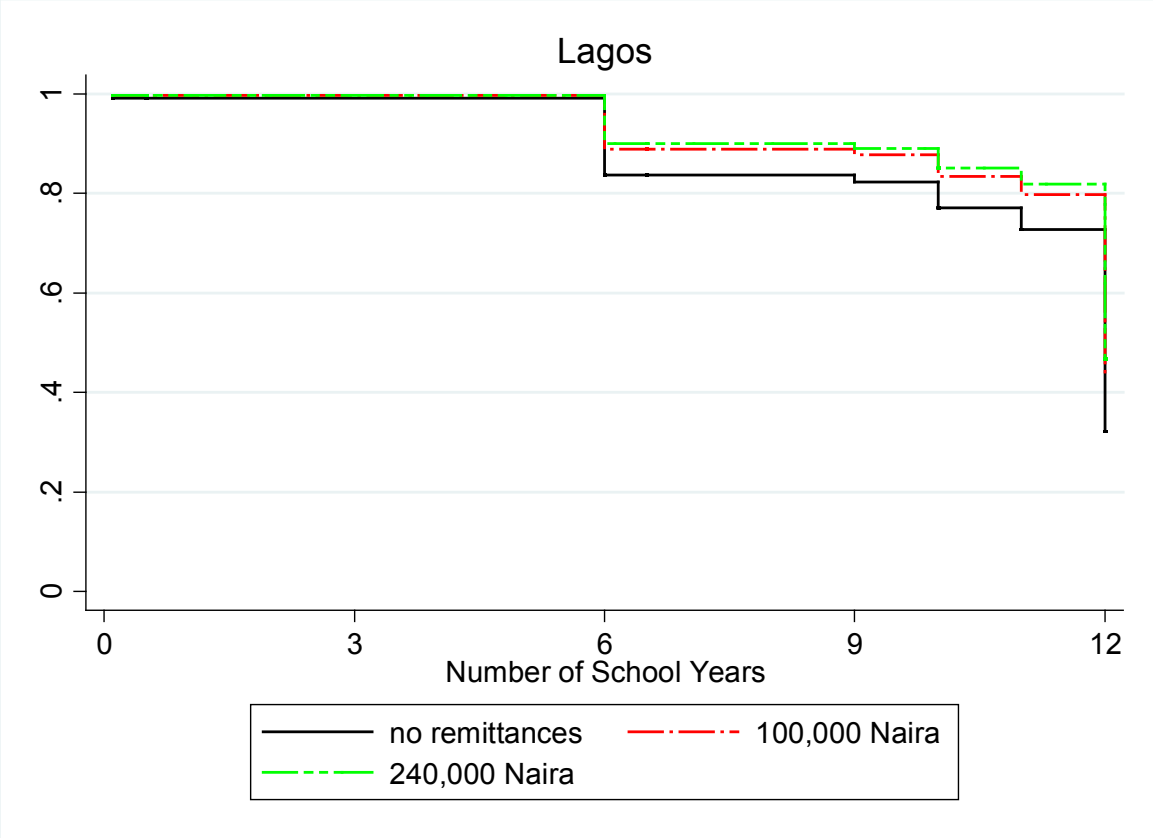
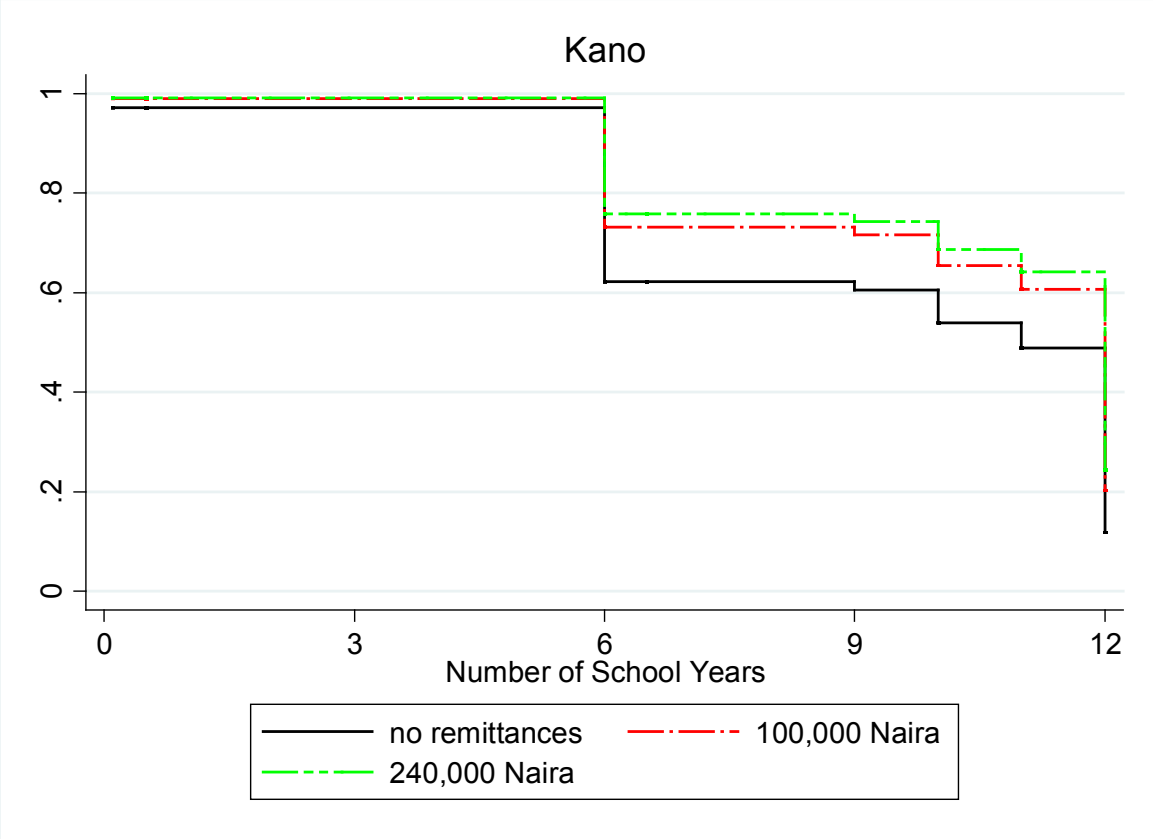


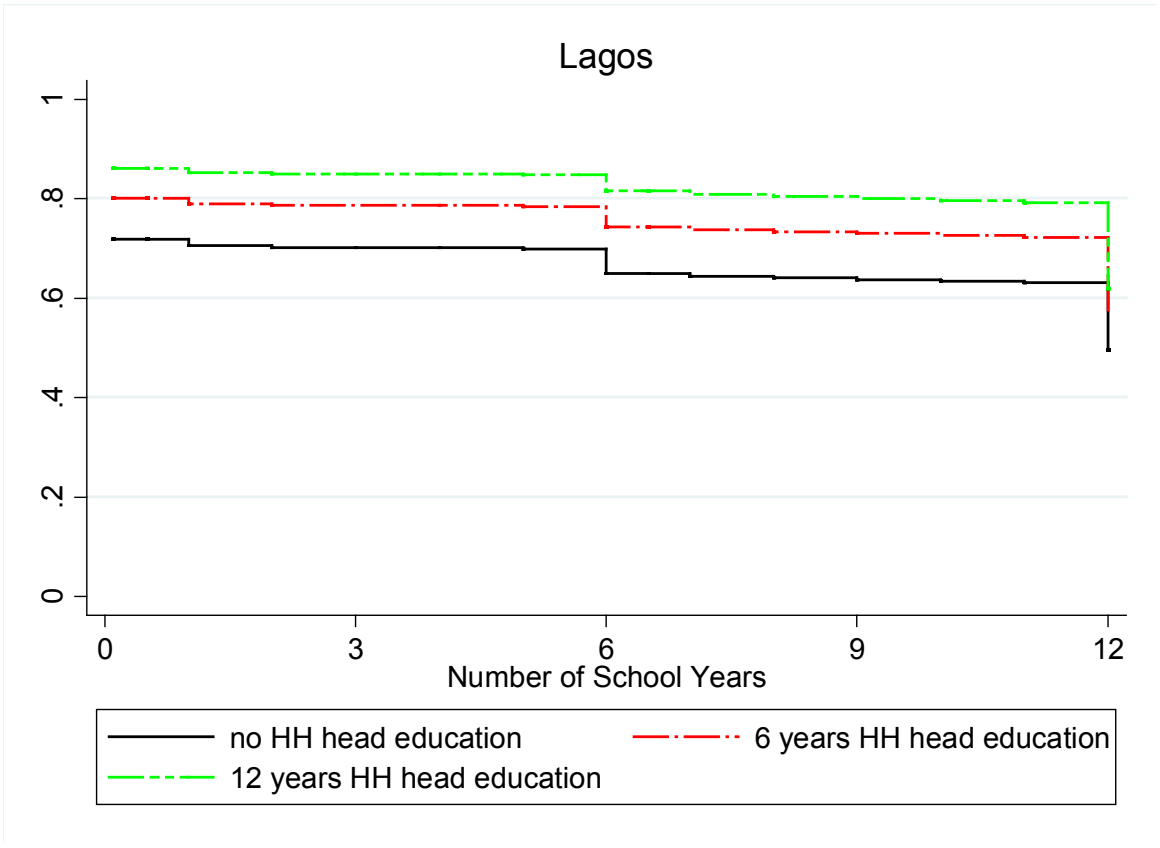
Figure 3. Urban Survival Estimates, by Remittances





Note: remittances dummy insignificant in segment secondary education.

Figure 4. Rural Survival Estimates, by Household Head Education



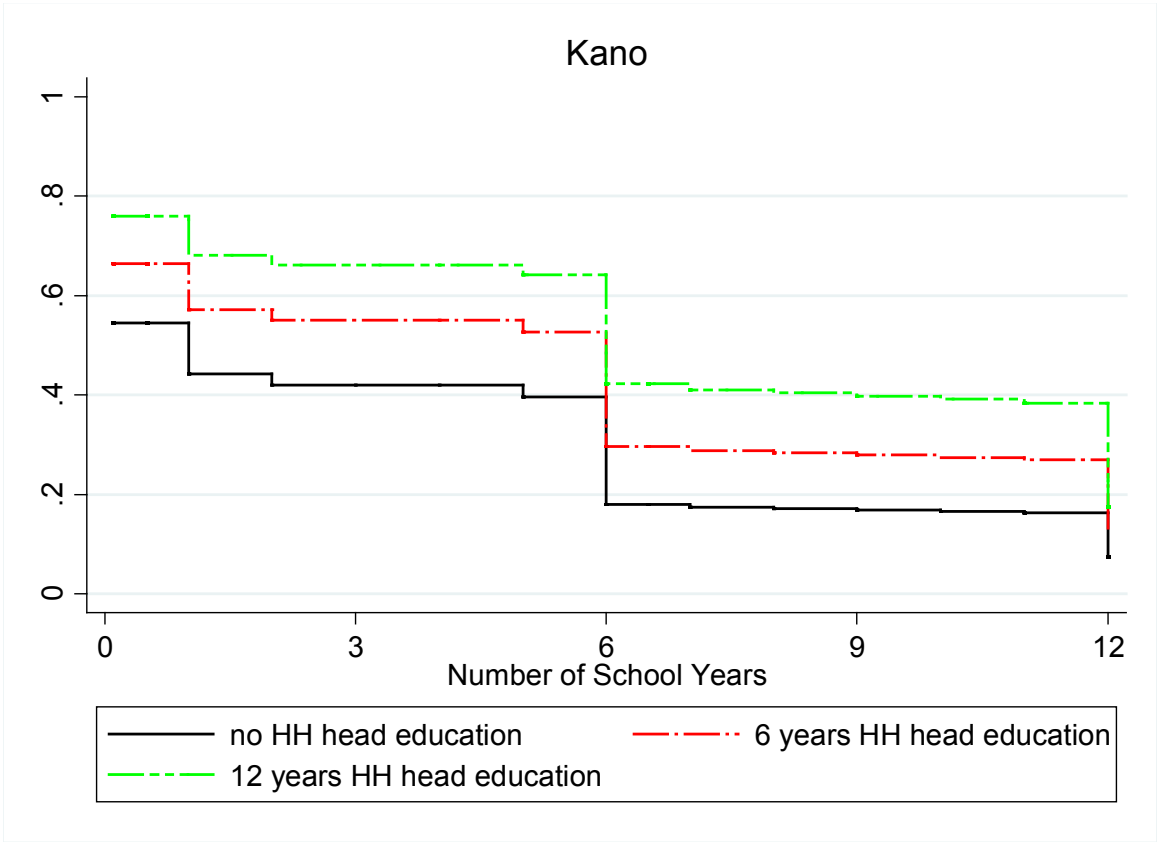
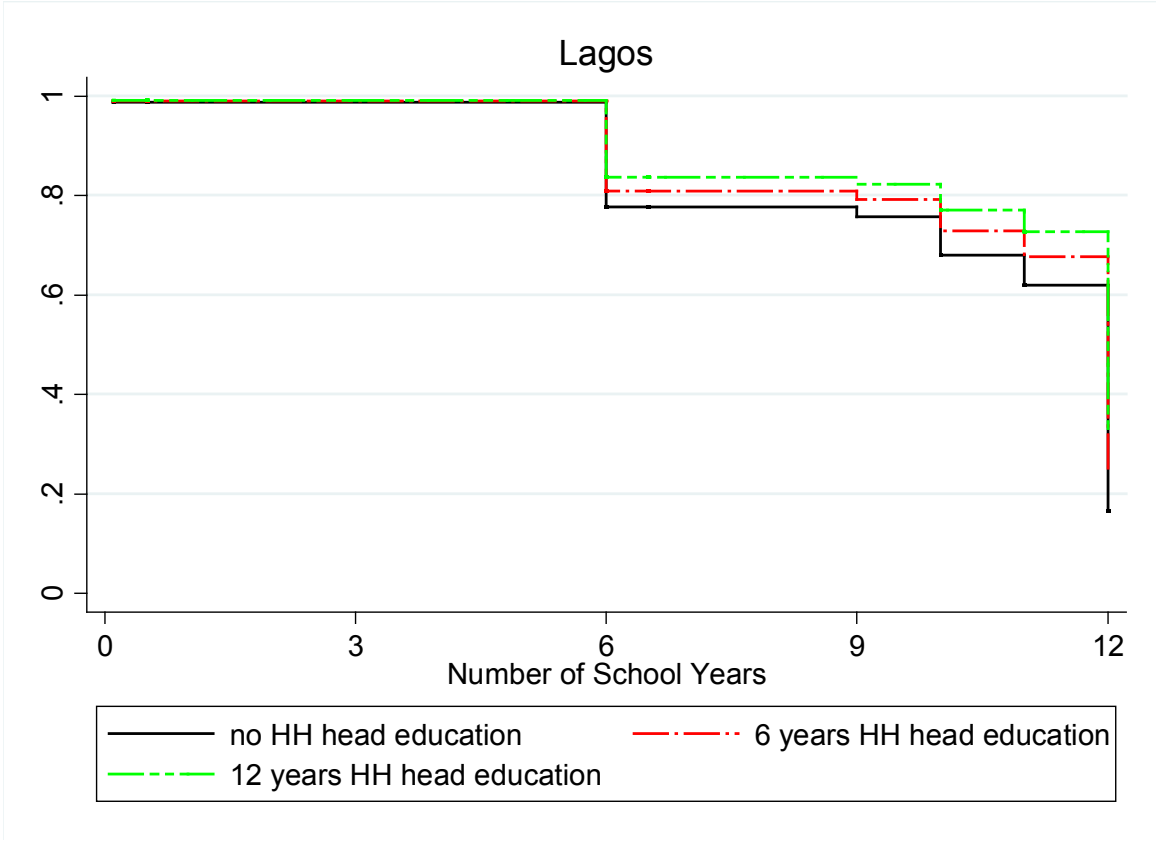


Figure 5. Urban Survival Estimates, by Household Head Education



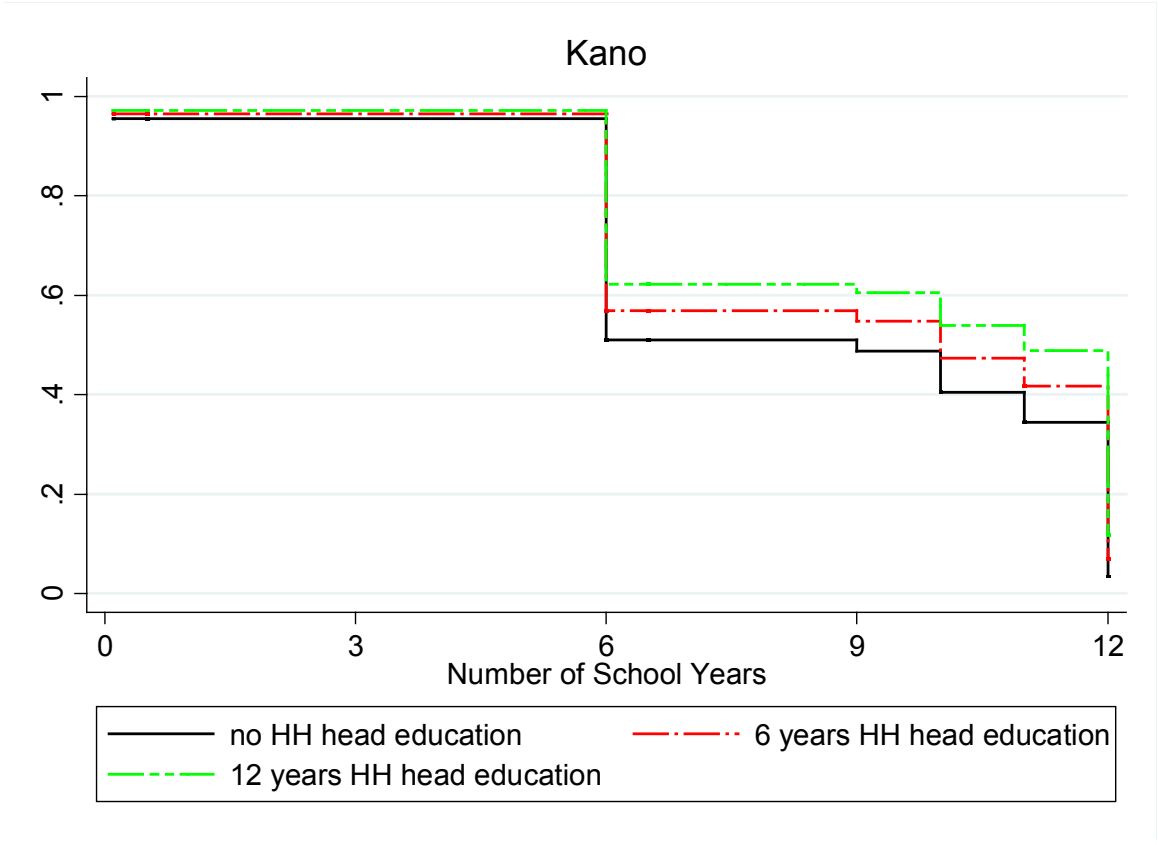
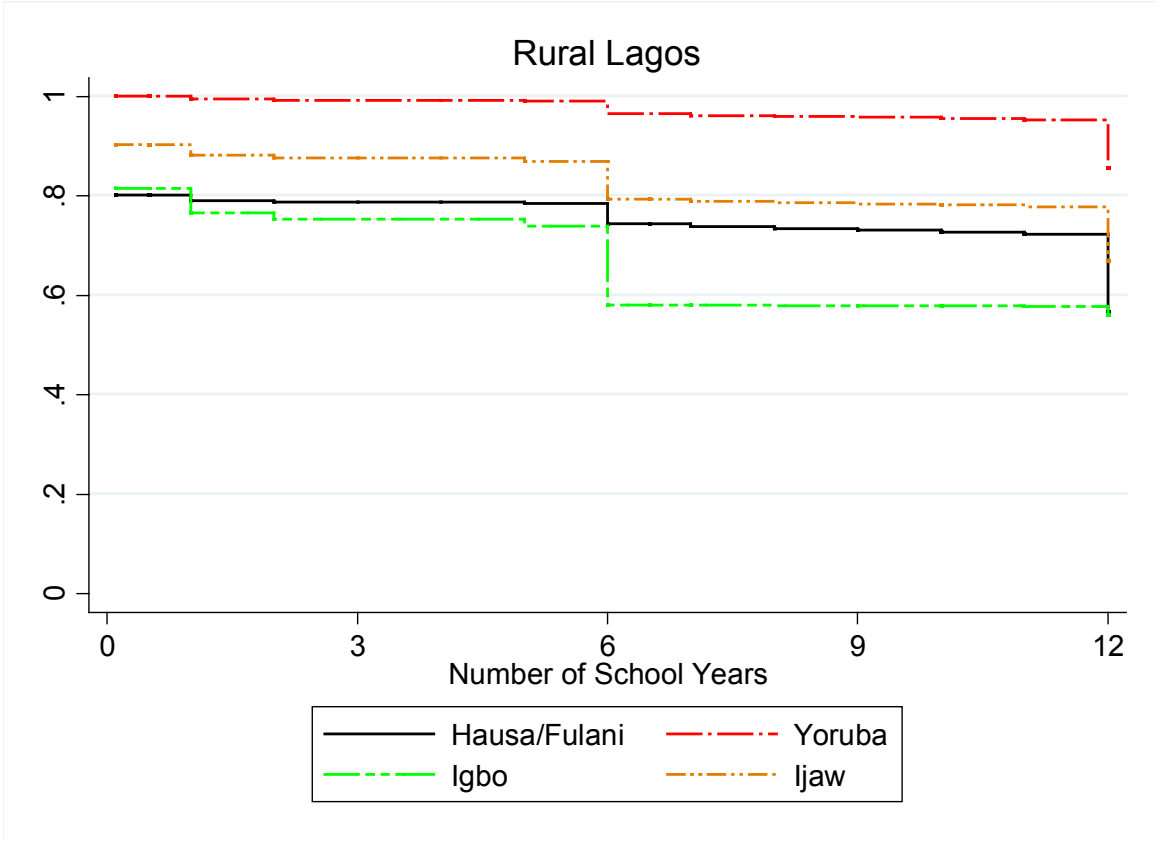
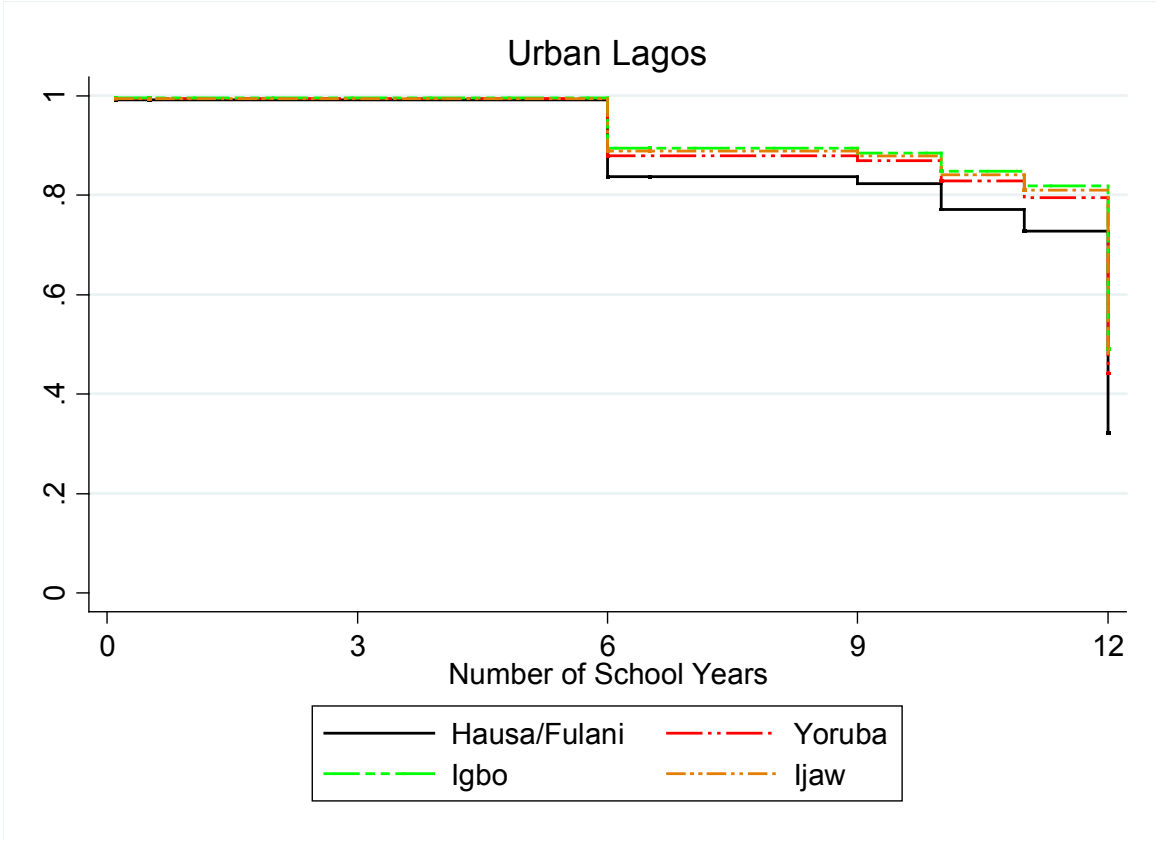


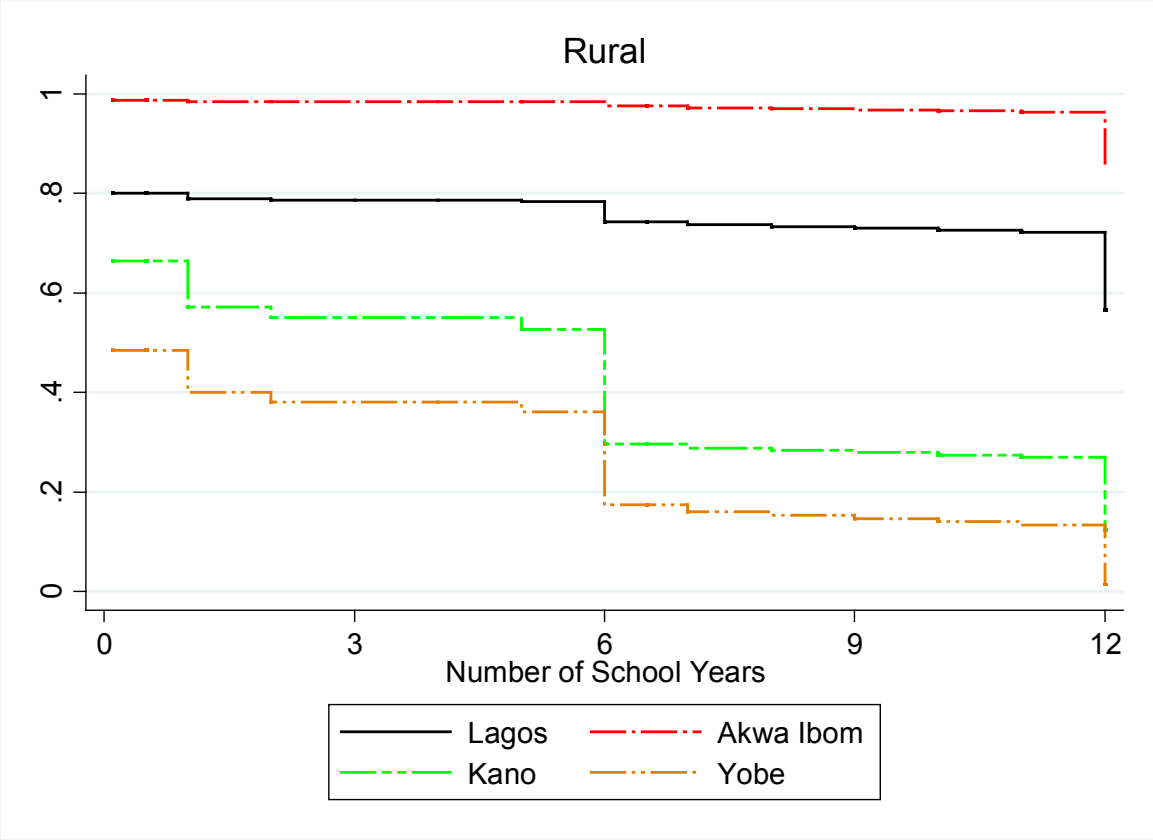
Figure 6. Survival Estimates, by Ethnicity

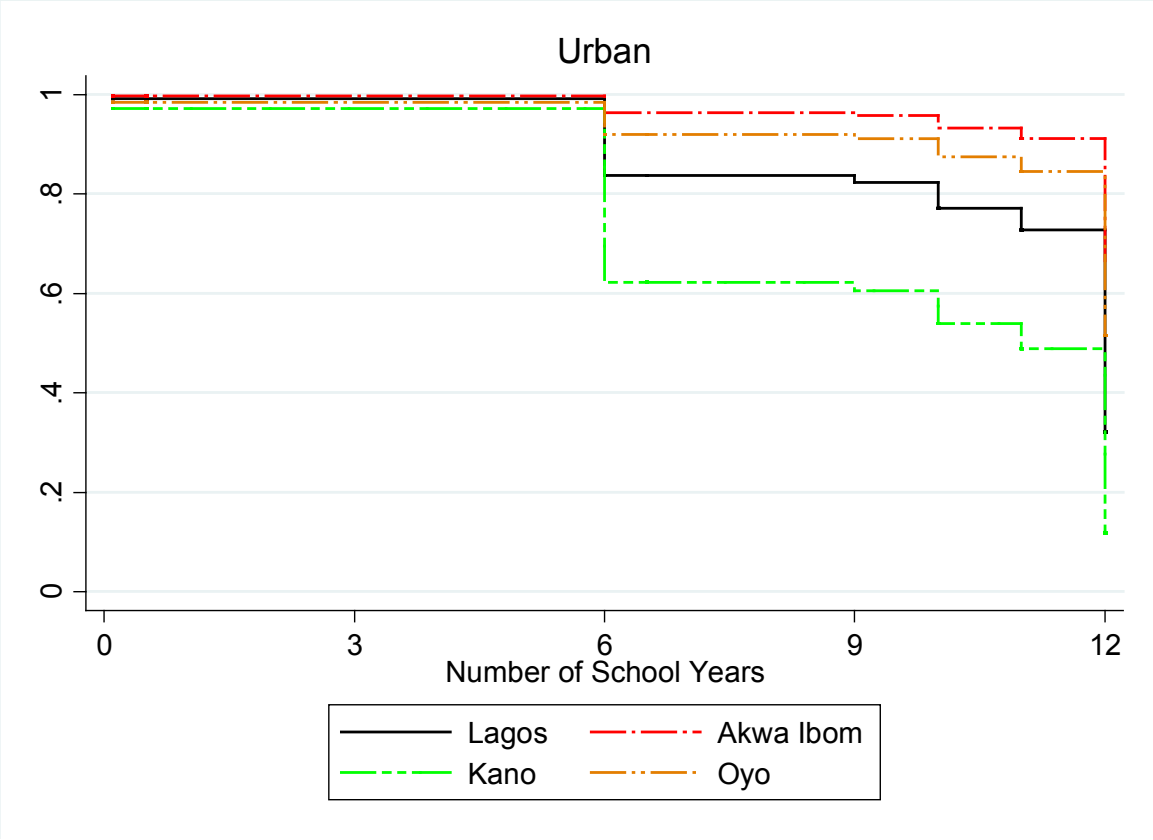




Note: urban ethnicities statistically all insignificant, most rural segments too

Figure 7. Survival Estimates, by States





Appendix C: Abstract

Abstract (English):

This paper analyses the impact of domestic and international transfers (remittances) sent from relatives and acquaintances on schooling decisions and business formation (self-employment) in Nigerian households. These are both controversial topics that gained attention due to the vast increase in international remittances in the last years. Using Cox regression models I find that the amount of remittances has a positive, statistically significant impact on the length of education in both urban and rural areas. The effect is practically important for people in households that receive relatively large amounts of transfer payments. Remittances are found to decrease the probability to be self-employed for households with low educated household heads, likely a result of an increase in the reservation wage.

Abstract (German):

Dieses Paper analysiert die Auswirkungen von inländischen und internationalen Überweisungen (Remissen), gesendet von Verwandten und Angehörigen, auf Entscheidungen bezüglich Schulbildung und Unternehmensgründungen (berufliche Selbstständigkeit) in nigerianischen Haushalten. Dies sind beides kontroverse Themen die durch den enormen Anstieg von internationalen Remissen in den letzten Jahren an Aufmerksamkeit hinzugewonnen haben. Durch Nutzung von Cox Regressionsmodellen stelle ich fest, dass die Menge an Remissen einen positiven, statistisch signifikanten Einfluss auf die Länge der Schulbildung haben, sowohl in urbanen, als auch in ländlichen Gebieten. Der Effekt ist von praktischer Bedeutung für Personen in Hauhalten, welche relativ große Mengen an Transferzahlungen erhalten. Remissen verringern die Wahrscheinlichkeit selbsttändig zu arbeiten für Haushalte, in denen der Haushaltsvorstand eine niedrige Bildung hat, voraussichtlich ein Resultat eines Anstiegs des Reservationslohns.

Appendix D: Curriculum Vitae

Christoph Burgstaller

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Studium

07/2014	voraussichtlicher Abschluss Magister-Studiengang Volkswirtschaftslehre Universität Wien
10/2012 – heute	Magister-Studiengang Volkswirtschaftslehre Universität Wien, Thema der Magisterarbeit: Mikroökonometrische Analyse der Auswirkungen von Remittances (Überweisungen von Angehörigen) auf Ausbildung und Unternehmensgründungen in nigerianischen Haushalten
10/2009 – 07/2012	Bachelor-Studiengang Wirtschaftswissenschaften Johannes Kepler Universität Linz, Schwerpunkt Volkswirtschaftslehre, gewichteter Notenschnitt der Lehrveranstaltungenangerechnet für Bachelorzeugnis 1,74 Thema der Bachelorarbeit: Fiskalpolitik in der Eurozone, Alternativen und Reformen für den Stabilitäts- und Wachstumspakt

Schule und Wehrdienst

01/2009 - 07/2009	Grundwehrdienst in der Zehner-Kaserne Ried im Innkreis
10/2008	Matura HTL Ried im Innkreis, Notenschnitt 2,8
09/2003– 05/2008	HTL Ried im Innkreis, Zweig Maschinenbautechnik, Notenschnitt Jahreszeugnis 5. Klasse 1,87

Zusatzqualifikationen

EDV-Kenntnisse:	Textverarbeitung, Tabellenkalkulation und PräsentationenMicrosoft Office Paket (ständig in Anwendung), Openoffice (sehr gut), LaTeX (Grundkenntnisse), Statistiksoftware Stata (ständig in Anwendung), SPSS (Grundkenntnisse), Datenbanksprache SQL (gut), Datenbanksystem Lotus Notes (gut), Systemmodellierung UML (gut); Webseitenerstellung CMS Joomla (sehr gut), SFTP/FTP Client WinSCP (gut); Toolbox für ökonomische Experimente zTree (sehr gut)
Fremdsprache:	Englisch (sehr gut, u.a. 2008 Teilnehmer der HTL Ried am Oberösterreichischen Fremdsprachenwettbewerb)