

Working paper

# Report on Uganda's Return to Schooling

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March 2012

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# **IGC Rapid Response Project: Report on Uganda's Returns to Schooling**

March 2012

Nuarpear Warn Lekfuangfu, Stephen Machin and Imran Rasul

## Background and Project Description

The Ugandan Ministry of Finance's Department of Economic Development Policy and Research is currently involved in the evaluation of employment strategies of the government and have asked IGC to help them on certain specific pieces of the entire project.

This specific project covers the following area:

**The returns to education.** The education system is the Government's biggest intervention in the labour market. Existing studies which have attempted to estimate the private economic returns to education in Uganda will be synthesised, and the more recent UNPS data used to estimate educational wage differentials. The UNPS data also allow us to examine the relationship between educational attainment and the productivity and profits of entrepreneurial activities. How returns to education (primary, secondary, tertiary and vocational) vary over time, space and socioeconomic characteristics will provide valuable insights into the functioning of the labour market.

## Introduction

This report evaluates the returns to education for individuals and households for Uganda using microdata from two recent time periods, 2005/2006 and 2009/2010.

The report is organised into the following sections:

- Brief Synthesis of Existing Work
- Data Description
- Earnings Returns to Education
- Productivity, Profits and Education
- Extensions
- Summary and Conclusions

## Brief Synthesis of Existing Work

Many studies have provided some evidence of the rate of returns to education in Uganda, as well as in Sub-Saharan Africa in general (Psacharopoulos 1994, Appleton 1996).

Most existing studies estimate wage returns to education from different waves of the Uganda National Household Survey (UNHS).

The most similar existing research to our study is Cuaresma and Ragg (2011). Using UNHS 2002/03 and UNHS 2005/06, they investigated possible converging patterns of the returns to education at sub-national level, for waged employment activities. Their findings suggest a convergent dynamics of the returns in urban areas, but not in Northern Uganda. For 2005/06, estimated returns to education are 5.8 percent when total years of education are used as the measure of education. In addition, at a more disaggregated level, a year of tertiary education gives an increase of 15 percent, relative to a similar person without any education, whilst only 3.5 percent from an additional year of primary education. Geographically, rural residents gain a significantly higher return from an identical education than their urban counterparts do. Similar results are offered in Kagundu and Pavlova (2007) who used data from the UNHS 2002/03.

Appleton (2001) looked more closely at other income generating sectors, using the UNHS 1999/2000 and the 1992 Integrated Household survey. He found, on average, a 15 percent rate of return to primary school education across most activities. At the UNHS 1999/2000, university-level human capital, measured in term of the proportion of household members with university attendance, gave a 100 percent increase in farm production value (compared to 43 percent in 1992). Overall, the findings in the paper do not seem to be particularly robust, but they can be used to form a useful backdrop to the findings we report in this project from using more recent data.

## Data Description

The data sources we use in our analysis of the wage, productivity and profit returns to education come from the Uganda National Household Survey 2005/06 (UNHS) and the Uganda National Panel Survey 2009/10 (UNPS).

UNHS 2005/06 is a nationally representative sample of households across Uganda, conducted by the Uganda Bureau of Statistics. In this round, the survey contains a special agricultural module, which was previously conducted the last time in 1999/2000. A two stage sampling design was used to draw the sample, which resulted in a total of 783 Enumeration Areas (EAs) being selected. These EAs represented both the general household population and displaced population (UBOS 2005). The UNHS comprises of 5 modules: Socio-economic, Agriculture, Community, Price and the Qualitative modules. In detail: for Agricultural Module, the households were surveyed in 2 crop seasons. In total, the survey covered about 7,246 households.<sup>1</sup>

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<sup>1</sup> <http://www.ubos.org/onlinefiles/uploads/ubos/pdf%20documents/UNHSReport20052006.pdf>.

UNPS 2009/10 is the first of the panel-structured survey series to be carried out annually. It is a nationally representative sample of households, which aims to track and re-interview 3,123 households that were distributed over 322 enumeration areas and that were randomly selected out of 7,246 households that had been interviewed by the UNHS 2005/06. The UNPS comprises of Household Module, Woman Module, Agriculture Module and Community and Market Module.

The sample size we use varies according to the three activities we analyse: wage employment; farm production; and household enterprise. For farm production activities, we make use of the full household sample from UNHS 2005/06. There were 5,604 households with agricultural activities. In the analysis for wage employment and household enterprise, we instead focus only on the households with a panel-data structure. Therefore, we restrict our sample to the total of 3,123 households, which appeared in both the UNHS 2005/06 and UNPS 2009/10. This also accounts for about 17,000 individuals in the survey and 1,707 household enterprises.

Our analysis focuses on the working age population, of age 15 to 60 years old. As shown in [Table 1](#), their shares were 48.3 percent (2005/06) and 47.8 percent (2009/10). Moreover, the proportions are similar among male and female.

A key characteristic of the Ugandan labour force is the relatively low participation rate in the wage employment sector. Of the active labour force pool, approximately only 1 in 3 participated in the sector (see [Table 2](#)). This rises from 23 percent in 2005/06 to 28 percent by 2009/10.

In the UNPS surveys, earnings are calculated from household members of working ages who indicated non-zero earnings in the survey and had worked more than 1 hour. We converted all indicated earnings, which are actual wage and in-kinds receipts, to a monthly level income at individual level, and we use the log-converted monthly level in all our analysis.

Farming households can earn from crop production activities and other activities (for example, raising livestock or cattle). In our analysis, we focus solely on crop production outputs. Each household can hold multiple land plots and parcels for the cultivation. In addition, there are two potential crop seasons in a year, which were both covered in the 2005/06 Survey. Therefore, we calculate the aggregate value of crop production of all parcels belonging to the household, across two crop season. The monetary value of the total production was calculated from the value reported subjectively by each household. Similarly, many households run their own enterprises. Additionally, it is possible that some households run multiple enterprises. Therefore, the values of enterprise earnings used in our analysis are the household-level aggregated net profit, for both 2005/06 and 2009/10 Surveys.

[Figures 1 to 3](#) show earnings distributions across individuals and household earnings from each of the three main activities we study.

In the wage employment analysis, we use two measurements of an individual's education attainment: total years of schooling; and levels of highest qualification achieved (primary, vocational, secondary and university).

For the crop production activity, we take the level of the manager of all the plots in the household who had the highest education attainment.<sup>2</sup> Then education attainment is measured the same way as in the wage employment sector.

Similarly, in the household enterprise activities, we take the education of the manager with the highest education attainment, comparing among other enterprise manager in the household. Education attainment used in this analysis is measured as above.

**Table 3** shows the proportion of highest education attainments across individuals in the working age population.

### Earnings Returns to Education

As with many other studies of wage returns to education, our starting point is the Mincer earnings equation which relates log earnings to an individual's stock of human capital. In this approach, the conventional specification relates log earnings to education levels and to other determinants of earnings capacity as follows:

$$\ln E_i = \alpha + \beta f(ED_i) + \gamma X_i + \varepsilon_i \quad (1)$$

where  $i$  indexes individuals,  $E$  is earnings,  $ED$  is education,  $X$  is other (to be specified) determinants of earnings and  $\varepsilon$  is an error term.

In equation (1), we have specified a flexible functional form for education  $f(\cdot)$  because we look at different measures, including a linear years of education variable, but also dummy variables for highest qualification.<sup>3</sup>

We also consider heterogeneous returns to education by carrying out separate analyses for males and females, as well as for people in urban and rural areas. We restrict our sample of interest to those of working age (aged 15-60 years old) in both 2005/06 and 2009/10. All regression estimates are reported with standard errors clustered at commune level.

We first consider education returns in Uganda for conventional wage employment activities. The basic specifications include controls (the  $X$ 's in equation (1)) for individual, household, industry and occupation characteristics. Age and age-squared

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<sup>2</sup> Note that each parcel had its own designated crop manager(s) and there could be multiple crop managers in the household.

<sup>3</sup> In the Appendix, we also look at another non-linear measure of education attainment, in term of years of schooling at each qualification level (primary school, secondary school and university).

variables are proxies for years of experience, which usually take a concave functional form.<sup>4</sup>

Tables 4a and 4b show the returns to education of both survey waves from two main function forms of education attainment: total years and qualification level. Table 4a shows that one additional year of education is found to raise log earnings of male wage earners, in both urban and rural residences, by 5.1-5.5 percent in 2005/06.<sup>5</sup> Table 4b shows these estimated returns were slightly larger in 2009/10 at 5.9-6.3 percent.

By contrast, there seems to be no significant effect of an additional year of education for female workers in 2005/06 and magnitudes are much smaller at 3.3 percent in urban areas and 1.9 percent in rural areas. However, in 2009/10, the rate was at 8.7 percent for urban areas and 5.7 percent in rural areas.

When restricting the birth cohorts to only those who appear in both survey waves, the estimated rate of returns are mostly comparable (see Table 5).

The non-linear specification of the education variable - reflecting highest qualification achieved - does however reveal that the estimated contributions from each qualification level are not at all uniform. For example, university qualification is estimated to convey far higher returns than other education. An individual with a university qualification would gain an additional of over 100 percent points, compared to an identical individual with no qualification.<sup>6</sup> This convex pattern of education attainment levels is also found in a number of other Africa countries (Bennell 1996, Appleton 2001, Soderbom 2006, Cuaresma and Raggi 2011).

Overall, the regression results in Tables 4a, 4b and 5 very clearly reveal evidence of earnings differentials rising significantly with education in Uganda.

As noted earlier, participation in wage employment activities in Uganda are much lower than in developed economies, accounting for around 27 percent of the entire labour force population in the country. This raises a possible concern of endogeneity between the decisions of participate in the sector and the unobserved characteristics of individuals as well as households, which make those who participated in the sector differ significantly from those who did not (Roy 1951 Heckman, 1979). This may arise from differences in individual abilities as well as household resource constraints. As a result, the naïve OLS specifications may suffer from the omitted variable bias or more specifically the selection bias, as the estimation will fail to account for non-participants' potential earnings.

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<sup>4</sup> We first ran separate regression for each survey wave (as in Table 4a and 4b), and focussed on the age group of 15 to 60 years old. Subsequently, we restricted the birth cohorts to only those who not only appeared in both waves, but also were in the working-age populations. Therefore, the analysis (in Table 5) then focussed solely on the birth cohorts of age between 15 to 55 years old in the 2005/2006 survey (so they aged to 20 to 60 years old in the 2009/10 data).

<sup>5</sup> Our findings are similar to Cuaresma and Raggi (2011) who used the same UNHS 2005/06.

<sup>6</sup> See the Appendix for results using another non-linear form of education attainment.

Therefore, we address this sample selection problem by explicitly estimating the probability of participating in the wage employment activities. The analysis employs the Heckman two-stage estimation, with a model of selection decision as the first step (Heckman 1976). We borrow various determinants of participation from many previous studies in Uganda and developing countries, given the data availability in the surveys. Individual decisions whether or not to participate in waged employment depend on household resources and asset constraints (Duraisamy 2007) and household demographic structure (i.e. ratio of breadwinners and dependents) (Kagunda and Pavlova 2007).

**Table 6** displays the revised analysis of the returns of education for the wage employment sector with an explicit selection decision model. The rate of return of education becomes rather consistent across the two periods at 5 percent for urban male workers. The results show no statistically significant effect of years of education for rural workers in 2005/06. The findings from 2009/10 suggest that the linear rate of returns to education is higher for rural male than urban male workers, while it is the opposite for female workers. Overall, however, the results remain robust.

We also undertook some preliminary analysis trying to see if potential endogeneity concerns could be allayed by trying to use the Universal Primary Education reform that was introduced in 1997. The reform abolished tuition fees at primary school level to all Ugandan children at primary school ages. Initially, it was offered to up to four children in a family but this restriction was later relaxed. This reform gave rise to an enrolment rate of 68 percent in 1998. (Government of Uganda 1998, Grogan 2009) Moreover, empirical studies of the UPE reform found positive effects in a rise in attendance of girls aged 6 to 8 years, a 60 percent reduction in household education expenditure on primary schooling (Deininger 2003) and a decrease in delayed enrolment (Nishimura et al. 2008).

One of the core implications of the UPE was dramatic changes in education infrastructure that varied across the country. Rather like Duflo's (2001) work on school construction programmes in Indonesia, we therefore tried to use the infrastructure investment expansion in a two-stage least squares setting. The approach needs a lot more refinement as it needs a considerable amount of data work doing that is not possible under the tight schedule of this project. However, the preliminary analysis we were able to do in the time revealed, if anything, larger returns to education than the analysis covered in Tables 4 through 6.

All of this therefore leads us to conclude that there do seem to be significant wage returns to education in most settings in Uganda.

### Productivity, Profits and Education

We now investigate the roles of human capital stock in the household enterprises as well as farm production activities. Household enterprise activities account for just fewer than 50 percent of all households in both surveys. Similarly, around 50 percent of the households indicate a positive income from farm production, with 30 percent of the

households who possessed their own cultivated land. [Table 7](#) shows the share of household enterprises by the year of establishment and most household enterprises were recently set up within the last 2 decades.

For both of these income generating sectors, we will model the role of education attainment as an input (i.e. effective labour) in the production or profit function of farms or household enterprises. To do so we utilise an equation of the form for farm/household enterprise  $j$ :

$$\ln Q_j = \alpha_{HC} HC_j + \beta_{lab} Lab_j + \gamma_X X_j + \omega_j \quad (2)$$

where  $Q$  is agricultural production for farms and profits for household enterprises,  $HC$  is human capital (i.e. highest educational attainment) of the manager,  $Lab$  is the labour input,  $X$  is other control variables and  $\omega$  is an error term

In equation (2), again in the human capital stock of effective labour is hypothesised to raise directly the level of marginal productivity. However, this may depend on the complementarity between the particular production activity and the effective labour considered. In both farm production and household enterprise sectors, we consider many variations of effective labour inputs. However, we will focus on the results from where education attainment of the manager of the activity, within a household, is the proxy of effective labour input.<sup>7</sup> Usually, managers are responsible for decision making in the production, and we believe that it is where human capital plays an important role.

We use the 2005/06 to estimate the returns to education for farm production. We focus solely of crop production activities. Note that a household can hold multiple land plots and parcels for cultivation. Therefore, the outcome of interest in this specification is the net total profit of all lands within a household. The estimations control for other production inputs, in particular total labour hours, farming capital and land used. [Figure 4](#) shows the household earnings distribution in crop production activities, comparing across manager's education levels. The profit distribution from crop production in more highly educated households displays a first order stochastic dominance, indicating a statistically superior earning outcome than the counterparts

The regional heterogeneity of land conditions and climate are also taking into account. Separate estimations are computed for all four main regions in Uganda. The statistic summary at the end of [Table 8](#) shows that farm managers in the Central regions have, on average, a marginally higher level of formal education. And the households in the region hold a significantly more land than the rest. At the full sample, a year of education gives 6.8 percent rate of returns and university degree raises the rate by almost 10 percent. In the regional-specific estimation, we find no effect from the linear form of education input, apart from in the Western region. Nevertheless, university degree is complementary to crop production in the Northern region. Again, we suspect that the

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<sup>7</sup> In any cases where there are more than one manager in the household, we take the maximum level among them.



regional specific estimations may suffer from the small sample size problems, with the large standard deviation incurred.

At the household enterprise sector, the outcome of interest is the net total profit of the enterprises within a household.<sup>8</sup> It is possible that a household can have more than one enterprise. As in the farm production, we take the manager's education attainment as the effective labour input, for the same reasoning. **Figure 5** shows the profit distribution among managers with different education attainment in 2009/10. Similar to the crop value distribution, more highly educated households displays a first order stochastic dominance to the less educated ones. The urban enterprises, on average, had managers with more education, and they tend to generate higher total profit than the rural ones. The estimations control for other production inputs and particularly the interacted determinants of effective labour and other inputs. **Table 8** shows the separate results from the 2005/06 and 2009/10. The returns to education in household enterprise are found, on average, at 9 to 10 percent across managers of different traits. By education level, the rate of returns from having a university degree or secondary qualification are estimated at over 100 percent, compare to the enterprises in the rural area with uneducated managers.

As with the individual worker wage-education analysis, the empirical results in this section therefore also show education matters for raising agricultural productivity and household enterprise profits.

### Extensions

We have also considered two further extensions that look beyond direct impacts of education, to do with inequality within and across generations:

#### i) Education and earnings inequality

Earnings inequality is an important factor for the evaluation of the state of socio-economic welfare in the country. Recent literature has focussed on understanding the changes in earnings inequality over time at various different point of the earning distribution of a well defined population. Given the cross-sectional structure of the UNHS and UNPS, we follow the inequality proxies as in the literature and construct a measurement of earnings inequality in Uganda at a point in time. The difference in log earnings at the 90<sup>th</sup> percentile and the 10<sup>th</sup> percentile is a standard indicator of the earnings gap between the top and the bottom earners. The size of the difference suggests directly a story of earnings inequality overall. Additionally, the difference between the 90<sup>th</sup> percentile and the 50<sup>th</sup> percentile tells a level of dispersion at the top end of earnings distribution (upper tail inequality) whilst the difference between the 50<sup>th</sup> percentile and the 10<sup>th</sup> percentile suggests the scale of dispersion at the bottom half of the distribution (lower tail inequality).

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<sup>8</sup> In the Appendix, the enterprise model is also estimated with net total revenue as the outcome.

Table 10 shows earnings inequality measurements across different groups of individuals from the UNHS 2005/06.<sup>9</sup> Given that participants in wage employment selected themselves into the sector, earnings inequality (measured in term of 90/10 difference) is found to be smaller among individuals with primary school qualification, for both men and women. On the one hand, the finding may lead to an interpretation that education attainment worsened economic inequality condition. On the other hand, the comparison of 90/50 and 50/10 ratios reveals that the overall inequality arose from a large dispersion at the bottom half of the cross-sectional distribution. And the levels are stronger for the low education group. Therefore, one role in which human capital accumulation may interplay with economic inequality in Uganda is that it made the reward system fairer among high earners of the distribution.

## ii) Education and intergenerational mobility

Human capital or education can be an effective instrument for socio-economic mobility (Solon, 1999), especially in developing countries. In the literature, the role of education as a welfare improvement can be found in various aspects. Directly, education raises labour productivity, therefore a higher individual income as well as household earnings. Furthermore, individuals with higher education are found to be more physically healthy, less likely to commit crime and more likely to have a better quality partner (Lochner, 2011). Most importantly, as a dynamic welfare effect, higher educated parents are more likely to provide higher education to their offspring.

We investigated a potential role of parental education on their children's education attainment, in particular the probability of staying in school of primary school age children in Uganda. Using the UNHS 2005/06, the analysis is able to focus on the birth cohorts who would benefit from the 1997 reform of free primary school education. Therefore, the problem arisen from household's financial constraint was significantly reduced. Due to the nature of the information in the Survey, there is a problem of missing data on parental education. Instead, we take the head of household's education as the proxy and we then compute a Probit analysis on the probability of current school attendance among children aged 7 to 14 years old in 2005.

Table 11 shows the estimated findings, supporting that parental education has a significant role in determining school attendance of young children. Children from more highly educated household are more likely to stay in primary school. One could argue that less educated households are more likely to earn less income, therefore are faced with worse financial constraint. However, under UPE, this constraint should be considerably diminished. If education investment is an outcome of an optimised decision of household utility, then arguably, without the constraint, the difference in the optimal level of education investment in their children is more likely to arise from the difference in household's taste for education in general. Debatably, more highly educated parents may have a higher preference for education than their counterparts. As a result, it could

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<sup>9</sup> We also looked at 2009/10 and look similar and no changes over this time, so decide to report only the 2005/06 year.

be argued investment in education will encourage additional preference for education, and that is a role of education attainment in welfare improvement.

### Summary and Concluding Remarks

Based upon new analysis of data from the 2005/6 Uganda National Household Survey and the 2009/10 Uganda National Panel Survey 2009/10, the findings of this report are:

- i) Higher education levels - measured by years of schooling, or by highest level of education - significantly raise wages thereby showing a significant average rate of return to education in both years.
- ii) There are variations in educational wage differentials around this average rate of return, linked to gender and to urban/rural location.
- iii) Agricultural productivity is higher where farm managers have higher education levels, so there is evidence of returns to education for farm production.
- iv) Profits of household enterprises are higher where managers have higher education levels, revealing a rate of return to education in the household enterprise sector.
- v) Education levels are linked to patterns of wage inequality and the extent of intergenerational mobility in education in Uganda.

Overall, therefore, we conclude that educational investments in Uganda deliver a significant return in the wage employment, the agricultural and the household enterprise sectors of the economy.

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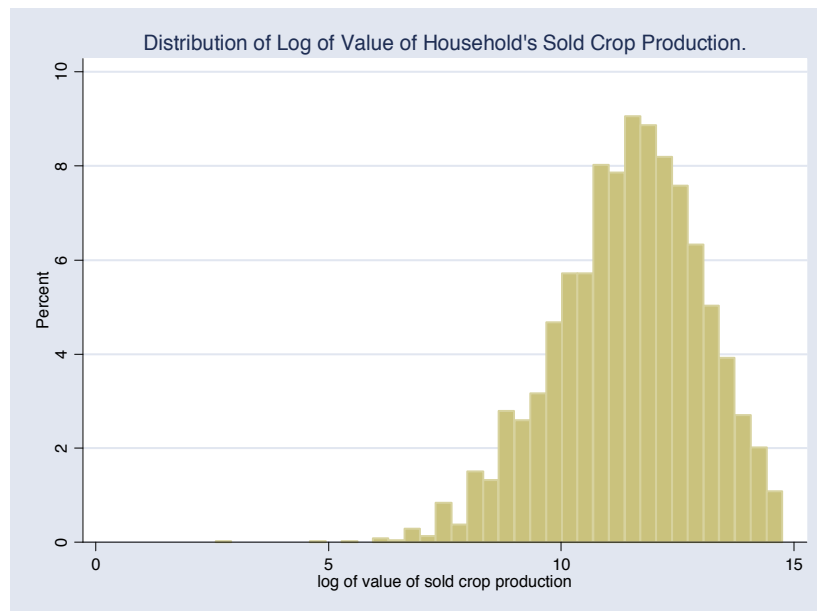
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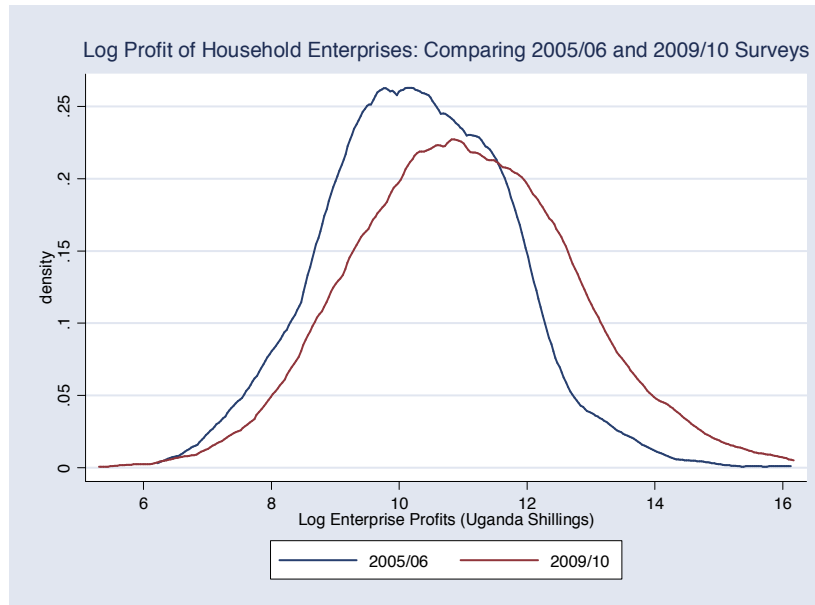
**Figure 1: Wage Employment Distributions**



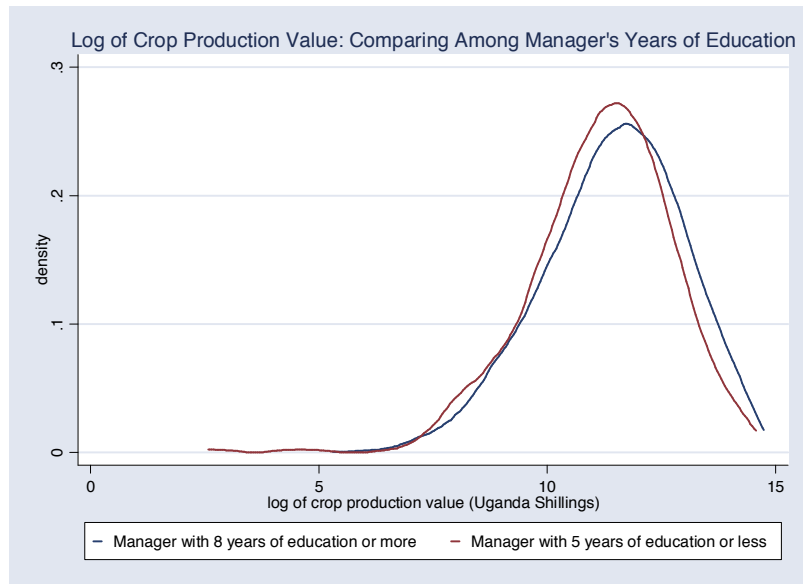
**Figure 2: Distribution of Crop Production Sale Values (log Uganda Shillings)**



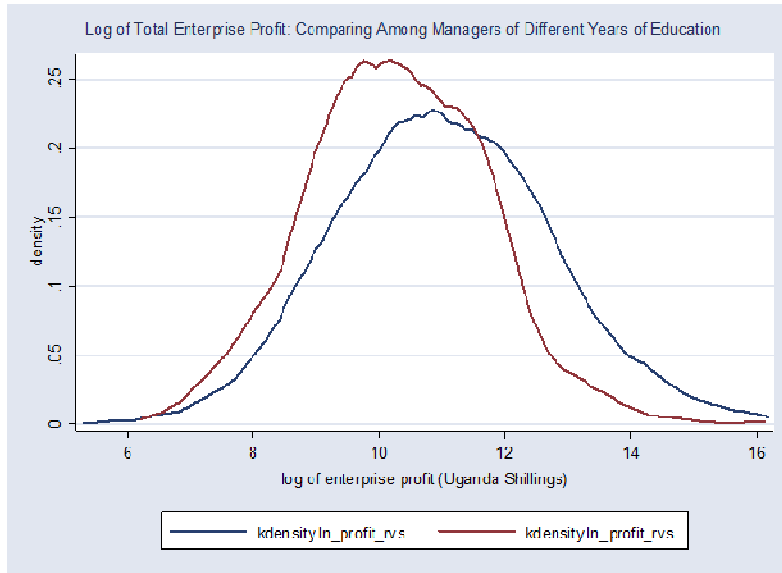
**Figure 3: Distribution of Enterprise Profit Values (log Uganda Shillings)**



**Figure 4: Agricultural Production by Education**



**Figure 5: Household Enterprise Profits by Education**





**Table 1: Share of Age Cohorts in the Surveys**

| <b>Age Group (years)</b> | <b>2005/06</b> |               |            | <b>2009/10</b> |               |            |
|--------------------------|----------------|---------------|------------|----------------|---------------|------------|
|                          | <b>Male</b>    | <b>Female</b> | <b>All</b> | <b>Male</b>    | <b>Female</b> | <b>All</b> |
| Under 15                 | 49.4           | 47.3          | 48.3       | 48.8           | 46.6          | 47.7       |
| 15-60                    | 46.8           | 48.8          | 48.3       | 46.8           | 48.8          | 47.8       |
| Over 60                  | 3.8            | 4.0           | 3.4        | 4.3            | 4.5           | 4.5        |

**Table 2: Participation and Wage Earning in the Labour Market**

| <b>Wage Earning Activities</b> | <b>Labour Market Participation</b> |            |                |            |
|--------------------------------|------------------------------------|------------|----------------|------------|
|                                | <b>2005/06</b>                     |            | <b>2009/10</b> |            |
|                                | <b>No</b>                          | <b>Yes</b> | <b>No</b>      | <b>Yes</b> |
| No                             | 21                                 | 56         | 13             | 58         |
| Yes                            | 0                                  | 23         | 0              | 28         |

**Table 3: Educational Attainment (Individuals aged 15 to 60)**

**Education Attainments: Proportion in the Surveys**

| <b>Years of Education</b> | <b>2005/06</b> |               | <b>2009/10</b> |               |
|---------------------------|----------------|---------------|----------------|---------------|
|                           | <b>Male</b>    | <b>Female</b> | <b>Male</b>    | <b>Female</b> |
| <b>0-7 years</b>          | 68             | 74            | 68             | 74            |
| <b>8-13 years</b>         | 19             | 17            | 18             | 17            |
| <b>14 and above</b>       | 12             | 8             | 14             | 9             |

Note: The pool of working age population

**Table 4a: Wage Returns to Education, 2005/6**

**WAVE 2005**

| SAMPLES:                                  | MALE                |                     |                    |                    | FEMALE           |                   |                  |                     |
|---|---------------------|---------------------|--------------------|--------------------|------------------|-------------------|------------------|---------------------|
|   | URBAN               |                     | RURAL              |                    | URBAN            |                   | RURAL            |                     |
|   | <u>1</u>            | <u>2</u>            | <u>3</u>           | <u>4</u>           | <u>5</u>         | <u>6</u>          | <u>7</u>         | <u>8</u>            |
| <b>Total years of schooling</b>           | 0.055***<br>[0.018] |                     | 0.051**<br>[0.022] |                    | 0.033<br>[0.024] |                   | 0.019<br>[0.033] |                     |
| <b>Primary School Qualification</b>       |                     | 0.699**<br>[0.290]  |                    | -0.202<br>[0.155]  |                  | 0.773<br>[0.528]  |                  | 0.418**<br>[0.186]  |
| <b>Vocational Qualification</b>           |                     | 0.226<br>[0.817]    |                    | 0.119<br>[0.470]   |                  |                   |                  |                     |
| <b>Secondary School Qualification</b>     |                     | 1.170***<br>[0.318] |                    | 0.305<br>[0.235]   |                  | 0.937<br>[0.587]  |                  | 1.242***<br>[0.426] |
| <b>College Qualification</b>              |                     | 1.534***<br>[0.352] |                    | 0.718**<br>[0.282] |                  | 1.068*<br>[0.605] |                  | 1.281***<br>[0.489] |
| <b>CONTROLS:</b>                          |                     |                     |                    |                    |                  |                   |                  |                     |
| <b>INDUSTRY</b>                           | YES                 | YES                 | YES                | YES                | YES              | YES               | YES              | YES                 |
| <b>OCCUPATION</b>                         | YES                 | YES                 | YES                | YES                | YES              | YES               | YES              | YES                 |
| <b>Observations:</b>                      | 408                 | 415                 | 676                | 752                | 207              | 217               | 272              | 398                 |
| <b>ADJUSTED R-SQUARED</b>                 | 0.358               | 0.371               | 0.307              | 0.297              | 0.377            | 0.489             | 0.476            | 0.416               |
| <b>SUMMARY STATISTICS:</b>                |                     |                     |                    |                    |                  |                   |                  |                     |
| <b>Total schooling (years)</b>            | 9.25<br>[4.13]      |                     | 6.81<br>[3.54]     |                    | 8.65<br>[3.99]   |                   | 5.83<br>[3.34]   |                     |
| <b>Primary School Qualification (%)</b>   | 44.46               |                     | 62.81              |                    | 41.24            |                   | 54.15            |                     |
| <b>Vocational Qualification (%)</b>       | 1.16                |                     | 0.64               |                    | 0.9              |                   | 0.21             |                     |
| <b>Secondary School Qualification (%)</b> | 37.63               |                     | 19.75              |                    | 35.93            |                   | 11.12            |                     |
| <b>College School Qualification (%)</b>   | 13.53               |                     | 3.23               |                    | 8.93             |                   | 1.16             |                     |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log monthly earnings, including wage and in-kinds at individual level. The figures refer to the percentage returns of education. Qualifications are dummies of where 1 indicates individuals with the qualification and zero otherwise. Years of schoolings are measured as total. In this table, if not indicate otherwise, education indicators are each individual's highest education attainment. Individuals are at age 15-60 years old in 2005. All specifications control for age age-squared. Standard Errors are clustered at community level. In the summary statistics, the average levels are as presented, with corresponding standard deviation given in the parentheses.

**Table 4b: Wage Returns to Education, 2009/10**

| <b>WAVE 2009</b>                          |                     |                     |                     |          |                     |                      |                    |          |  |
|---|---------------------|---------------------|---------------------|----------|---------------------|----------------------|--------------------|----------|--|
| <b>SAMPLES:</b>                           | <b>MALE</b>         |                     |                     |          | <b>FEMALE</b>       |                      |                    |          |  |
|   | <b>URBAN</b>        | <b>RURAL</b>        |                     |          | <b>URBAN</b>        | <b>RURAL</b>         |                    |          |  |
|   | <u>1</u>            | <u>2</u>            | <u>3</u>            | <u>4</u> | <u>5</u>            | <u>6</u>             | <u>7</u>           | <u>8</u> |  |
| <b>Total years of schooling</b>           | 0.063***<br>[0.019] | 0.059***<br>[0.018] |                     |          | 0.087***<br>[0.031] | 0.057**<br>[0.024]   |                    |          |  |
| <b>Primary School Qualification</b>       |                     | -0.468*<br>[0.268]  | 0.096<br>[0.180]    |          |                     | -1.474***<br>[0.377] | -0.38<br>[0.486]   |          |  |
| <b>Vocational Qualification</b>           |                     |                     |                     |          |                     |                      | 0.655<br>[0.582]   |          |  |
| <b>Secondary School Qualification</b>     |                     | 0.002<br>[0.292]    | 0.488**<br>[0.215]  |          |                     | -0.472<br>[0.284]    | 0.385<br>[0.517]   |          |  |
| <b>College Qualification</b>              |                     | 0.401<br>[0.381]    | 1.142***<br>[0.217] |          |                     |                      | 1.175**<br>[0.552] |          |  |
| <b>CONTROLS:</b>                          |                     |                     |                     |          |                     |                      |                    |          |  |
| <b>INDUSTRY</b>                           | YES                 | YES                 | YES                 | YES      | YES                 | YES                  | YES                | YES      |  |
| <b>OCCUPATION</b>                         | YES                 | YES                 | YES                 | YES      | YES                 | YES                  | YES                | YES      |  |
| <b>Observations:</b>                      | 246                 | 246                 | 539                 | 539      | 157                 | 157                  | 310                | 310      |  |
| <b>ADJUSTED R-SQUARED</b>                 | 0.355               | 0.358               | 0.295               | 0.299    | 0.412               | 0.442                | 0.341              | 0.372    |  |
| <b>SUMMARY STATISTICS:</b>                |                     |                     |                     |          |                     |                      |                    |          |  |
| <b>Total schooling (years)</b>            | 9.13<br>[4.31]      | 6.87<br>[3.77]      |                     |          | 8.48<br>[4.32]      | 5.78<br>[3.54]       |                    |          |  |
| <b>Primary School Qualification (%)</b>   | 46.96               | 71.75               |                     |          | 50.85               | 79.97                |                    |          |  |
| <b>Vocational Qualification (%)</b>       | 0.74                | 0.32                |                     |          | 0.33                | 0.25                 |                    |          |  |
| <b>Secondary School Qualification (%)</b> | 36.65               | 22.9                |                     |          | 36.11               | 16.26                |                    |          |  |
| <b>College School Qualification (%)</b>   | 15.65               | 4.4                 |                     |          | 12.58               | 1.88                 |                    |          |  |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log monthly earnings, including wage and in-kinds at individual level. The figures refer to the percentage returns of education. Qualifications are dummies of where 1 indicates individuals with the qualification and zero otherwise. Years of schoolings are measured as total. In this table, if not indicate otherwise, education indicators are each individual's highest education attainment. Individuals are at age 15-60 years old in 2009. All specifications control for age age-squared. Standard Errors are clustered at community level. (a) In Column 9-12, *Cohorts Before* refers to individuals aged between 27-35, who were just older than primary school ages in 1997, the time when the national policy on free primary school was implemented. And *Cohorts After* refers to individuals aged between 15-26 years old, who were in their primary school ages in 1997. In the summary statistics, the average levels are as presented, with corresponding standard deviation given in the parentheses.

**Table 5: Wage Returns to Education, Panel Sample**

| RESTRICTED COHORT ANALYSIS:               | WAVE 2005           |                    |                  |                  | WAVE 2009           |                     |                    |                    |
|---|---------------------|--------------------|------------------|------------------|---------------------|---------------------|--------------------|--------------------|
|   | MALE                |                    | FEMALE           |                  | MALE                |                     | FEMALE             |                    |
|   | URBAN               | RURAL              | URBAN            | RURAL            | URBAN               | RURAL               | URBAN              | RURAL              |
| SAMPLES:                                  | 1                   | 2                  | 3                | 4                | 5                   | 6                   | 7                  | 8                  |
| <b>Total years of schooling</b>           | 0.054***<br>[0.018] | 0.053**<br>[0.022] | 0.005<br>[0.023] | 0.021<br>[0.033] | 0.065***<br>[0.019] | 0.065***<br>[0.018] | 0.083**<br>[0.032] | 0.060**<br>[0.024] |
| <b>CONTROLS:</b>                          |                     |                    |                  |                  |                     |                     |                    |                    |
| <b>INDUSTRY</b>                           | YES                 | YES                | YES              | YES              | YES                 | YES                 | YES                | YES                |
| <b>OCCUPATION</b>                         | YES                 | YES                | YES              | YES              | YES                 | YES                 | YES                | YES                |
| <b>Observations:</b>                      | 404                 | 662                | 205              | 267              | 237                 | 510                 | 142                | 291                |
| <b>ADJUSTED R-SQUARED</b>                 | 0.354               | 0.301              | 0.488            | 0.47             | 0.343               | 0.293               | 0.356              | 0.351              |
| <b>SUMMARY STATISTICS:</b>                |                     |                    |                  |                  |                     |                     |                    |                    |
| <b>Total schooling (Years)</b>            | 9.25<br>[4.13]      | 6.84<br>[3.54]     | 8.65<br>[3.99]   | 5.83<br>[3.34]   | 9.45<br>[4.33]      | 7.05<br>[3.76]      | 8.67<br>[4.28]     | 5.92<br>[3.63]     |
| <b>Primary School Qualification (%)</b>   | 44.88               | 63.28              | 41.29            | 55.11            | 43.22               | 68.96               | 47.96              | 77.98              |
| <b>Vocational Qualification (%)</b>       | 0.66                | 0.36               | 0.58             | 0.17             | 0.9                 | 1.07                | 0.28               | 0.36               |
| <b>Secondary School Qualification (%)</b> | 37.93               | 20.01              | 36.45            | 11.46            | 39.76               | 24.57               | 38.26              | 17.73              |
| <b>College School Qualification (%)</b>   | 13.39               | 3.25               | 9                | 1.21             | 16.11               | 4.81                | 13.5               | 2.13               |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log monthly earnings, including wage and in-kinds at individual level. The figures refer to the percentage returns of education. Years of schoolings are measured as total. In this table, if not indicate otherwise, education indicators are each individual's highest education attainment. Individuals are at age 15-56 years old in 2005 therefore at age 19-60 in 2009. These individuals in the analysis are members of the households which existed in the sample of both Wave 2005 and Wave 2009. All specifications control for age age-squared. Standard Errors are clustered at community level. In the summary statistics, the average levels are as presented, with corresponding standard deviation given in the parentheses.

**Table 6: Wage Returns to Education, With Participation Selection**

| LOG EARNINGS WITH SELECTION DECISION          |                      |                      |                      |                      |                      |                     |                      |                     |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------|----------------------|---------------------|
| SAMPLE:                                       | WAVE 2005/06         |                      |                      |                      | WAVE 2009/10         |                     |                      |                     |
|   | MALE                 |                      | FEMALE               |                      | MALE                 |                     | FEMALE               |                     |
|   | URBAN<br><u>1</u>    | RURAL<br><u>2</u>    | URBAN<br><u>3</u>    | RURAL<br><u>4</u>    | URBAN<br><u>5</u>    | RURAL<br><u>6</u>   | URBAN<br><u>7</u>    | RURAL<br><u>8</u>   |
| <i>PANEL I: TWO-STEP RETURNS TO EDUCATION</i> |                      |                      |                      |                      |                      |                     |                      |                     |
| Total years of schooling                      | 0.054***<br>[0.018]  | 0.004<br>[0.024]     | 0.045**<br>[0.019]   | 0.013<br>[0.027]     | 0.055***<br>[0.015]  | 0.093***<br>[0.025] | 0.066***<br>[0.015]  | 0.056**<br>[0.022]  |
| Lambda <sup>⊠</sup>                           | -0.544<br>[0.569]    | -0.102<br>[0.427]    | -1.442***<br>[0.377] | -0.662*<br>[0.379]   | -0.466<br>[0.408]    | -0.697<br>[0.920]   | -0.648*<br>[0.331]   | 0.004<br>[1.183]    |
| <b>CONTROLS:</b>                              |                      |                      |                      |                      |                      |                     |                      |                     |
| INDUSTRY                                      | YES                  | YES                  | YES                  | YES                  | YES                  | YES                 | YES                  | YES                 |
| OCCUPATION                                    | YES                  | YES                  | YES                  | YES                  | YES                  | YES                 | YES                  | YES                 |
| <i>PANEL II: SELECTION MODEL</i>              |                      |                      |                      |                      |                      |                     |                      |                     |
| at household with under 5 years old           | -0.163*<br>[0.093]   | -0.008<br>[0.105]    | -0.094<br>[0.064]    | -0.035<br>[0.080]    | -0.079<br>[0.094]    | -0.028<br>[0.100]   | -0.256***<br>[0.062] | 0.044<br>[0.070]    |
| at household with 65 and over years old       | 0.077<br>[0.188]     | -0.122<br>[0.194]    | -0.033<br>[0.102]    | -0.042<br>[0.110]    | 0.095<br>[0.101]     | -0.031<br>[0.107]   | 0.038<br>[0.062]     | -0.004<br>[0.066]   |
| Single Status                                 | -0.206**<br>[0.101]  | 0.381***<br>[0.105]  | -0.356***<br>[0.065] | -0.124<br>[0.081]    | -0.547***<br>[0.094] | 0.287***<br>[0.100] | -0.646***<br>[0.060] | -0.164**<br>[0.065] |
| HH with agricultural land                     | -0.329***<br>[0.101] | -0.482***<br>[0.117] | -0.443***<br>[0.068] | -0.569***<br>[0.079] |                      |                     |                      |                     |
| Proportion with non-zero wage (%)             | 52                   | 33                   | 30                   | 16                   | 45                   | 29                  | 30                   | 19                  |
| Observations                                  | 797                  | 725                  | 2216                 | 2395                 | 809                  | 788                 | 2497                 | 2605                |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log monthly earnings, including wage and in-kinds at individual level. The figures refer to the percentage returns of education. Qualifications are dummies of where 1 indicates individuals with the qualification and zero otherwise. Years of schoolings are measured as total. In this table, if not indicate otherwise, education indicators are each individual's highest education attainment. For 2005/06, individuals are at age 15-60 years old. And in 2009/10, they are at age 15-60 years old. All specifications control for age age-squared. Selection model is a probit regression of the probability of being a wage earner on individual characteristics, which determined the participation decision. <sup>⊠</sup> Lambda is the inversed Mills ratio, calculated from the Selection model.

**Table 7: Share of Household Enterprises by Year of Establishment**

| <b>Established Year</b> | <b>2005/06</b> | <b>2009/10</b> |
|-------------------------|----------------|----------------|
| <b>after 2000</b>       | 55.69          | 68.86          |
| <b>1991-2000</b>        | 29.32          | 19.51          |
| <b>1981-1990</b>        | 10.49          | 7.14           |
| <b>1971-1980</b>        | 3.08           | 2.64           |
| <b>1961-1970</b>        | 1.07           | 1.63           |
| <b>before 1961</b>      | 0.36           | 0.22           |

**Table 8: Agricultural Productivity and Education**

**WAVE 2005: AGRICULTURAL PRODUCTION**

| SAMPLE:                                   | ALL REGIONS         |          | CENTRAL           |          | EASTERN          |          | NORTHERN            |          | WESTERN             |           |
|---|---------------------|----------|-------------------|----------|------------------|----------|---------------------|----------|---------------------|-----------|
|   | <u>1</u>            | <u>2</u> | <u>3</u>          | <u>4</u> | <u>5</u>         | <u>6</u> | <u>7</u>            | <u>8</u> | <u>9</u>            | <u>10</u> |
| <b>Total years of schooling</b>           | 0.068***<br>[0.018] |          | 0.001<br>[0.036]  |          | 0.036<br>[0.030] |          | 0.055<br>[0.037]    |          | 0.131***<br>[0.034] |           |
| <b>Primary School Qualification</b>       | 0.401<br>[0.272]    |          | 0.556<br>[0.445]  |          | 0.318<br>[0.469] |          | 0.624<br>[0.553]    |          | 0.464<br>[0.480]    |           |
| <b>Vocational Qualification</b>           | 0.411<br>[0.496]    |          | -0.674<br>[0.733] |          | 0.105<br>[0.970] |          | 1.686***<br>[0.553] |          | 0.548<br>[1.301]    |           |
| <b>Secondary School Qualification</b>     | 0.793***<br>[0.304] |          | 0.553<br>[0.572]  |          | 0.574<br>[0.490] |          | 0.889<br>[0.592]    |          | 1.350**<br>[0.600]  |           |
| <b>College Qualification</b>              | 0.978***<br>[0.365] |          | 0.9<br>[0.662]    |          | 0.717<br>[0.535] |          | 1.446**<br>[0.696]  |          | 1.002<br>[0.893]    |           |
| <b>Observations:</b>                      | 581                 | 581      | 152               | 152      | 176              | 176      | 101                 | 101      | 152                 | 152       |
| <b>ADJUSTED R-SQUARED</b>                 | 0.232               | 0.23     | 0.325             | 0.346    | 0.359            | 0.363    | 0.28                | 0.308    | 0.189               | 0.162     |
| <b>SUMMARY STATISTICS:</b>                |                     |          |                   |          |                  |          |                     |          |                     |           |
| <b>Total schooling (years)</b>            | 6.79<br>[3.59]      |          | 7.12<br>[3.73]    |          | 6.81<br>[3.58]   |          | 6.44<br>[3.58]      |          | 6.68<br>[3.58]      |           |
| <b>Primary School Qualification (%)</b>   | 67.01               |          | 63.26             |          | 65.89            |          | 69.23               |          | 70.54               |           |
| <b>Vocational Qualification (%)</b>       | 2.35                |          | 1.39              |          | 2.92             |          | 3.42                |          | 2.08                |           |
| <b>Secondary School Qualification (%)</b> | 22.49               |          | 27.07             |          | 22.45            |          | 20.94               |          | 18.75               |           |
| <b>College School Qualification (%)</b>   | 3.61                |          | 3.87              |          | 4.66             |          | 2.56                |          | 2.98                |           |
| <b>Total cultivated land (acres)</b>      | 5.55<br>[53.87]     |          | 17.3<br>[175]     |          | 3.63<br>[6.51]   |          | 7.64<br>[56.74]     |          | 5.07<br>[18.74]     |           |
| <b>Total labour (hours in a season)</b>   | 10692<br>[10692]    |          | 7819<br>[15274]   |          | 13443<br>[41306] |          | 6301<br>[12131]     |          | 14418<br>[20523]    |           |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log value of outputs from plantation (excluding livestock), aggregated at household level. Qualifications are dummies of where 1 indicates individuals with the qualification and zero otherwise. Years of schoolings are measured as total, and separately at each level of highest education. In this table, if not indicate otherwise, education indicators are taken from the maximum level of education attained among all managers of the plots within the household. The figures refer to the percentage returns of education. Labour quantity is calculated from the number of hours of total labour indicated to work for the household's plots. Each household indicate the number of labourers worked for each plot in a day, as well as estimated hours for each type of labourers. All specifications control for maximum age of all plot managers within household, the age-squared, total labour hours for each type (men, women and children). Mean years of schooling is average years of schooling for all individuals age above 15 years old indicated to work for the household's agricultural plots. Standard Errors are clustered at community level. In the summary statistics, the average levels are as presented, with corresponding standard deviations given in the parentheses.

**Table 9: Household Enterprise Profits and Education**

DEPENDENT VARIABLE: LOG (PROFIT)

| SAMPLES:                                   | WAVE 2005/06        |                     |                     |                     |                     |                     |                     |                     | WAVE 2009/10        |                     |                      |                     |                      |                     |                     |                     |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|---------------------|----------------------|---------------------|---------------------|---------------------|
|  | MALE                |                     |                     |                     | FEMALE              |                     |                     |                     | MALE                |                     |                      |                     | FEMALE               |                     |                     |                     |
|  | RURAL               |                     | URBAN               |                     | RURAL               |                     | URBAN               |                     | RURAL               |                     | URBAN                |                     | RURAL                |                     | URBAN               |                     |
|  | 1                   | 2                   | 3                   | 4                   | 5                   | 6                   | 7                   | 8                   | 9                   | 10                  | 11                   | 12                  | 13                   | 14                  | 15                  | 16                  |
| Total years of schooling                   | 0.093***<br>[0.018] |                     | 0.090***<br>[0.022] |                     | 0.090***<br>[0.022] |                     | 0.132***<br>[0.033] |                     | 0.061***<br>[0.019] |                     | 0.090***<br>[0.026]  |                     | 0.083***<br>[0.023]  |                     | 0.083***<br>[0.029] |                     |
| Primary School Qualification               |                     | 0.709**<br>[0.284]  |                     | -0.635<br>[0.567]   |                     | 0.246<br>[0.203]    |                     | 1.072***<br>[0.268] |                     | 0.881***<br>[0.211] |                      | 0.59<br>[0.806]     |                      | -0.116<br>[0.434]   |                     | -0.179<br>[0.290]   |
| Vocational Qualification                   |                     | 1.040*<br>[0.542]   |                     | 0.209<br>[0.656]    |                     | 0.251<br>[0.793]    |                     | 1.633***<br>[0.376] |                     | 0.931**<br>[0.452]  |                      |                     |                      | -0.18<br>[0.444]    |                     | 0.514<br>[0.733]    |
| Secondary School Qualification             |                     | 1.325***<br>[0.298] |                     | -0.063<br>[0.576]   |                     | 0.922***<br>[0.249] |                     | 1.467***<br>[0.269] |                     | 1.346***<br>[0.243] |                      | 0.62<br>[0.901]     |                      | 0.663<br>[0.469]    |                     | 0.667*<br>[0.368]   |
| College Qualification                      |                     | 1.168***<br>[0.426] |                     | 0.378<br>[0.589]    |                     | 2.474***<br>[0.517] |                     | 1.938***<br>[0.311] |                     | 1.626***<br>[0.374] |                      | 0.7<br>[0.894]      |                      | 0.618<br>[0.702]    |                     | 0.675<br>[0.498]    |
| log(labour persons)                        | 0.980***<br>[0.163] | 1.070***<br>[0.139] | 0.668***<br>[0.178] | 0.630***<br>[0.174] | 0.887***<br>[0.234] | 0.514**<br>[0.235]  | 0.406<br>[0.249]    | 0.750***<br>[0.185] | 1.033***<br>[0.147] | 1.024***<br>[0.147] | 0.832***<br>[0.213]  | 0.817***<br>[0.206] | 0.660***<br>[0.188]  | 0.626***<br>[0.191] | 1.333***<br>[0.289] | 1.262***<br>[0.304] |
| <b>CONTROLS:</b>                           |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |                      |                     |                      |                     |                     |                     |
| Industry                                   | YES                 | YES                 | YES                 | YES                 | YES                 | YES                 | YES                 | YES                 | YES                 | YES                 | YES                  | YES                 | YES                  | YES                 | YES                 | YES                 |
| Observation                                | 446                 | 497                 | 201                 | 224                 | 255                 | 380                 | 173                 | 221                 | 446                 | 497                 | 201                  | 224                 | 255                  | 380                 | 173                 | 221                 |
| Adjusted R-Squared                         | 0.254               | 0.31                | 0.24                | 0.228               | 0.239               | 0.203               | 0.294               | 0.347               | 0.254               | 0.31                | 0.24                 | 0.228               | 0.239                | 0.203               | 0.294               | 0.347               |
| <b>SUMMARY STATISTICS:</b>                 |                     |                     |                     |                     |                     |                     |                     |                     |                     |                     |                      |                     |                      |                     |                     |                     |
| Total schooling (years)                    | 7.2<br>[3.6]        |                     | 9.3<br>[4.1]        |                     | 5.9<br>[3.38]       |                     | 8.5<br>[4.2]        |                     | 7.3<br>[3.8]        |                     | 9.2<br>[4.2]         |                     | 9.2<br>[4.2]         |                     | 8.3<br>[4.4]        |                     |
| Average profit (UGX)                       | 146519<br>[550771]  |                     | 216196<br>[573431]  |                     | 45652.7<br>[103833] |                     | 254301<br>[996121]  |                     | 153686<br>[635189]  |                     | 522461<br>[1636605]  |                     | 522461<br>[1636605]  |                     | 119558<br>[520446]  |                     |
| Average revenue (UGX)                      | 292476<br>[565356]  |                     | 578563<br>[837905]  |                     | 103428<br>[212390]  |                     | 366745<br>[543327]  |                     | 534381<br>[1911247] |                     | 1490725<br>[3236269] |                     | 1490725<br>[3236269] |                     | 496060<br>[1577692] |                     |
| Average cost of hired labour (UGX)         | 12357<br>[36288]    |                     | 28457<br>[58654]    |                     | 2710.63<br>[20607]  |                     | 13852.1<br>[45121]  |                     | 18017.5<br>[60609]  |                     | 47653.1<br>[104976]  |                     | 47653.1<br>[104976]  |                     | 23053.8<br>[77545]  |                     |
| Average costs of raw material& other costs | 152414<br>[341610]  |                     | 298659<br>[526965]  |                     | 51650<br>[132995]   |                     | 210857<br>[339715]  |                     | 243250<br>[811133]  |                     | 744863<br>[1877115]  |                     | 744863<br>[1877115]  |                     | 356281<br>[1276535] |                     |
| Average labour (persons)                   | 0.7<br>[1.6]        |                     | 1.1<br>[2.98]       |                     | 0.2<br>[0.8]        |                     | 0.4<br>[1.2]        |                     | 3.3<br>[3.4]        |                     | 4.4<br>[8.4]         |                     | 4.4<br>[8.4]         |                     | 3.0<br>[1.5]        |                     |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log profit of an enterprise. Profit is calculated from reported revenue of each enterprise, net all costs of hired labour and stated costs of inputs from the survey. The reported figures refer to the percentage returns of education. Qualifications are dummies of where 1 indicates individuals with the qualification and zero otherwise. Years of schoolings are measured as total level of highest education. In this table, if not indicate otherwise, education indicators are taken from the level of education attained among by the main manager of the enterprise. Labour quantity is calculated from the number of people indicated to work for the enterprise, including managers, own household workers and hired workers. All specifications control for age of the main manager, the age-squared, average age of the enterprise at household level and its age-squared. Standard Errors are clustered at community level. In the summary statistics, the average levels are as presented, with corresponding standard deviation given in the parentheses.



**Table 10: Education and Earnings Inequality**

**Earning Differential: 2005/06**

| Log Earnings Differential |                | 90/10 | 90/50 | 50/10 | % Wage Dispersion<br>from Below |
|---------------------------|----------------|-------|-------|-------|---------------------------------|
| Full Sample               | All            | 4.76  | 2.22  | 2.53  | 53.27                           |
|                           | Low Education  | 4.27  | 2.02  | 2.24  | 52.58                           |
|                           | High Education | 4.62  | 1.44  | 3.18  | 68.81                           |
| Men                       | All            | 4.55  | 1.90  | 2.65  | 58.27                           |
|                           | Low Education  | 4.44  | 1.93  | 2.51  | 56.63                           |
|                           | High Education | 4.61  | 1.39  | 3.22  | 69.90                           |
| Women                     | All            | 4.84  | 2.53  | 2.32  | 47.84                           |
|                           | Low Education  | 3.30  | 1.79  | 1.50  | 45.64                           |
|                           | High Education | 4.61  | 1.53  | 3.08  | 66.87                           |

Note: The numbers depict the differences between the different percentile levels of log monthly earnings from individuals in wage employment. The sample comes from the 2005/06 survey and is restricted to working age population (15-60 years old). Low education is defined as individuals with highest education attainment of primary school qualification. High education is defined as those who had secondary school qualification or university degrees. Percentage of wage dispersion from below is defined as the proportion of the 90/10 earnings inequality that come from the 50/10 value.

**Table 11: Education and Intergenerational Mobility**

**Probability of Staying in school for primary school ages (2005/06)**

| SAMPLES:                              | All                 | Men               |                     | Women             |                     |
|---------------------------------------|---------------------|-------------------|---------------------|-------------------|---------------------|
|                                       |                     | Urban             | Rural               | Urban             | Rural               |
| <i>PANEL I</i>                        |                     |                   |                     |                   |                     |
| <b>Total years of schooling</b>       | 0.005***<br>[0.001] | 0.002<br>[0.002]  | 0.005**<br>[0.002]  | 0.00<br>[0.003]   | 0.011***<br>[0.003] |
| Observations                          | 3318                | 410               | 1248                | 416               | 1244                |
| Pseudo R-squared                      | 0.0122              | 0.0029            | 0.0095              | 0.0013            | 0.037               |
| <i>PANEL II</i>                       |                     |                   |                     |                   |                     |
| <b>Primary School Qualification</b>   | 0.108***<br>[0.027] | 0.014<br>[0.033]  | 0.144***<br>[0.036] | -0.019<br>[0.047] | 0.114***<br>[0.035] |
| <b>Secondary School Qualification</b> | 0.104***<br>[0.016] | 0.023<br>[0.031]  | 0.114***<br>[0.018] | -0.028<br>[0.044] | 0.128***<br>[0.020] |
| <b>College Qualification</b>          | 0.081***<br>[0.011] | 0.037*<br>[0.022] | 0.088***<br>[0.013] | 0.011<br>[0.039]  | 0.079***<br>[0.019] |
| Observations                          | 3932                | 439               | 1526                | 451               | 1516                |
| Pseudo R-squared                      | 0.0734              | 0.0080            | 0.0927              | 0.0073            | 0.0868              |

Note: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is current status of school attendance, equal to 1 if currently at school and zero otherwise. The figures refer to the marginal probability of being at school. Each panel and column is a separate Probit estimation. Education variables are the education of the head of household or his spouse if not indicated. Panel 1 uses linear form of education, as total years and Panel 2 uses qualification level, with no qualification as the control level. Individuals are from Wave 2005 at age 7-14 years old, which are the primary school ages in Uganda.

## Appendix A: Further Checks

We run further specifications of the functional form for education in all three activities. We analysed an additional non-linear functional form where we considered years at each qualification level. Previously, the returns on education for a qualification can be interpreted as an average return from the specific level. In these additional estimations, the rate of returns is at the marginal level for each additional year in that qualification. [Table A.1](#) shows the returns of education in the wage employment sector. [Table A.2](#) shows the returns in the crop production and [Table A.3](#) shows the returns in the household enterprise production.

**Table A.1**

| SAMPLES:                   | WAVE 2005           |                  |                  |                     | WAVE 2009          |                     |                     |                    |
|----------------------------|---------------------|------------------|------------------|---------------------|--------------------|---------------------|---------------------|--------------------|
|                            | MALE                |                  | FEMALE           |                     | MALE               |                     | FEMALE              |                    |
|                            | URBAN               | RURAL            | URBAN            | RURAL               | URBAN              | RURAL               | URBAN               | RURAL              |
|                            | <u>1</u>            | <u>2</u>         | <u>3</u>         | <u>4</u>            | <u>5</u>           | <u>6</u>            | <u>7</u>            | <u>8</u>           |
| Years of primary school    | 0.034<br>[0.041]    | 0.005<br>[0.026] | 0.048<br>[0.072] | 0.097***<br>[0.035] | 0.06<br>[0.064]    | 0.055<br>[0.041]    | 0.203**<br>[0.082]  | 0.042<br>[0.043]   |
| Years of secondary school  | 0.070***<br>[0.025] | 0.044<br>[0.031] | 0.01<br>[0.033]  | 0.01<br>[0.048]     | 0.052*<br>[0.029]  | 0.049*<br>[0.028]   | 0.004<br>[0.044]    | 0.064<br>[0.043]   |
| Years of college           | 0.199<br>[0.133]    | 0.244<br>[0.181] | 0.081<br>[0.136] | 0.206<br>[0.234]    | 0.243**<br>[0.121] | 0.466***<br>[0.116] | 0.463***<br>[0.124] | 0.375**<br>[0.172] |
| <b>CONTROLS:</b>           |                     |                  |                  |                     |                    |                     |                     |                    |
| INDUSTRY                   | YES                 | YES              | YES              | YES                 | YES                | YES                 | YES                 | YES                |
| OCCUPATION                 | YES                 | YES              | YES              | YES                 | YES                | YES                 | YES                 | YES                |
| Observations:              | 415                 | 752              | 217              | 398                 | 246                | 539                 | 157                 | 310                |
| ADJUSTED R-SQUARED         | 0.367               | 0.29             | 0.477            | 0.41                | 0.363              | 0.304               | 0.442               | 0.351              |
| <b>SUMMARY STATISTICS:</b> |                     |                  |                  |                     |                    |                     |                     |                    |
| Primary School (years)     | 6.1<br>[1.70]       | 4.9<br>[2.46]    | 5.4<br>[2.48]    | 3.44<br>[2.84]      | 6.21<br>[1.40]     | 5.48<br>[1.81]      | 5.92<br>[1.71]      | 4.89<br>[2.05]     |
| Secondary School (years)   | 2.96<br>[3.21]      | 1.18<br>[2.42]   | 2.35<br>[3.01]   | 0.62<br>[1.81]      | 2.99<br>[3.33]     | 1.47<br>[2.68]      | 2.68<br>[3.15]      | 0.92<br>[2.15]     |
| College (Years)            | 0.24<br>[0.71]      | 0.04<br>[0.26]   | 0.14<br>[0.51]   | 0.01<br>[0.15]      | 0.29<br>[0.78]     | 0.09<br>[0.32]      | 0.21<br>[0.64]      | 0.03<br>[0.25]     |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log monthly earnings, including wage and in-kinds at individual level. The figures refer to the percentage returns of education. Years of schoolings are separately measured at each level of highest education. In this table, if not indicate otherwise, education indicators are each individual's highest education attainment. Individuals from Wave 2005 are at age 15-60 years old in 2005 and those from Wave 2009 are between age 15-60 years old in 2009. All specifications control for age age-squared. Standard Errors are clustered at community level. In the summary statistics, the average levels are as presented, with corresponding standard deviation given in the parentheses.

**Table A.2**

**WAVE 2005: AGRICULTURAL PRODUCTION**

| SAMPLE:                                    | ALL REGIONS |          | CENTRAL  |          | EASTERN  |          | NORTHERN |          | WESTERN  |           |
|--|-------------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
|  | <u>1</u>    | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> | <u>10</u> |
| <b>Total years of schooling</b>            | 0.103**     |          | 0.06     |          | 0.089    |          | 0.267    |          | 0.169*   |           |
|  | [0.050]     |          | [0.096]  |          | [0.058]  |          | [0.528]  |          | [0.097]  |           |
| <b>Primary School Qualification</b>        |             | 0.185    |          | 0.312    |          | 0.066    |          | 1.175*   |          | -0.25     |
|  |             | [0.339]  |          | [0.380]  |          | [0.491]  |          | [0.611]  |          | [0.575]   |
| <b>Vocational Qualification</b>            |             | -0.034   |          | -1.109   |          | -0.35    |          | 2.171**  |          | 0.138     |
|  |             | [0.627]  |          | [0.691]  |          | [0.835]  |          | [0.792]  |          | [1.386]   |
| <b>Secondary School Qualification</b>      |             | 0.21     |          | 0.206    |          | 0.281    |          | 1.184    |          | -0.573    |
|  |             | [0.406]  |          | [0.528]  |          | [0.611]  |          | [0.972]  |          | [0.789]   |
| <b>College Qualification</b>               |             | 0.502    |          | 0.506    |          | 0.407    |          | 0.946    |          | -0.402    |
|  |             | [0.471]  |          | [0.835]  |          | [0.704]  |          | [0.774]  |          | [1.221]   |
| <b>log of land *mean yrs of schooling</b>  | -0.009      | -0.012   | 0.002    | -0.003   | 0.002    | -0.001   | 0.071    | 0.062    | -0.011   | -0.019    |
|  | [0.018]     | [0.018]  | [0.044]  | [0.045]  | [0.031]  | [0.031]  | [0.050]  | [0.040]  | [0.024]  | [0.027]   |
| <b>log of labour*mean yrs of schooling</b> | -0.003      | 0.007*   | -0.004   | 0.005    | -0.005   | 0.002    | -0.035   | -0.007   | -0.007   | 0.016**   |
|  | [0.006]     | [0.004]  | [0.014]  | [0.008]  | [0.008]  | [0.006]  | [0.059]  | [0.009]  | [0.012]  | [0.007]   |
| <b>Observations:</b>                       | 423         | 423      | 95       | 95       | 139      | 139      | 66       | 66       | 123      | 123       |
| <b>ADJUSTED R-SQUARED</b>                  | 0.231       | 0.229    | 0.389    | 0.421    | 0.416    | 0.415    | 0.354    | 0.397    | 0.286    | 0.28      |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log value of outputs from plantation (excluding livestock), aggregated at household level. Qualifications are dummies of where 1 indicates individuals with the qualification and zero otherwise. Years of schoolings are measured as total, and separately at each level of highest education. In this table, if not indicate otherwise, education indicators are taken from the maximum level of education attained among all managers of the plots within the household. The figures refer to the percentage returns of education. Labour quantity is calculated from the number of hours of total labour indicated to work for the household's plots. Each household indicate the number of labourers worked for each plot in a day, as well as estimated hours for each type of labourers. All specifications control for maximum age of all plot managers within household, the age-squared, total labour hours for each type (men, women and children). Mean years of schooling is average years of schooling for all individuals age above 15 years old indicated to work for the household's agricultural plots. Standard Errors are clustered at community level.

**Table A.3**

**DEPENDENT VARIABLE: LOG (PROFIT)**

| SAMPLES:                             | WAVE 2005          |                     | WAVE 2009          |                    |
|--------------------------------------|--------------------|---------------------|--------------------|--------------------|
|                                      | RURAL              | URBAN               | RURAL              | URBAN              |
|                                      | <u>1</u>           | <u>2</u>            | <u>5</u>           | <u>6</u>           |
| Years of primary school              | 0.195*<br>[0.102]  | 0.066<br>[0.054]    | 0.292*<br>[0.164]  | 0.082<br>[0.078]   |
| Years of secondary school            | 0.075<br>[0.060]   | 0.152***<br>[0.052] | 0.059<br>[0.083]   | 0.02<br>[0.065]    |
| Years of college                     | -0.148<br>[0.182]  | -0.36<br>[0.227]    | 0.244<br>[0.226]   | 0.087<br>[0.588]   |
| log(total labour)*years of primary   | 0.589<br>[0.588]   | 0.886**<br>[0.362]  | 2.324**<br>[0.906] | 0.885**<br>[0.420] |
| log(total labour)*years of secondary | 0.008<br>[0.110]   | 0.003<br>[0.066]    | -0.243<br>[0.157]  | -0.004<br>[0.078]  |
| log(total labour)*years of college   | -0.031<br>[0.058]  | -0.071<br>[0.055]   | 0.026<br>[0.069]   | 0.047<br>[0.057]   |
| log(labour persons)                  | 0.297**<br>[0.134] | 0.421***<br>[0.121] | -0.001<br>[0.131]  | -0.12<br>[0.237]   |
| <b>CONTROLS:</b>                     |                    |                     |                    |                    |
| Industry                             | YES                | YES                 | YES                | YES                |
| Observation                          | 410                | 838                 | 410                | 838                |
| Adjusted R-Squared                   | 0.318              | 0.301               | 0.318              | 0.301              |

Notes: \*\*\* denotes significance at 1%, \*\* at 5%, and \* at 10% level. Dependent variable is the log profit of an enterprise. Profit is calculated from reported revenue of each enterprise, net all costs of hired labour and stated costs of inputs from the survey. The reported figures refer to the percentage returns of education. Highest years of schoolings are separately measured at each level of education. In this table, if not indicate otherwise, education indicators are taken from the level of education attained among by the main manager of the enterprise. Labour quantity is calculated from the number of people indicated to work for the enterprise, including managers, own household workers and hired workers. All specifications control for age of the main manager, the age-squared, average age of the enterprise at household level and its age-squared. Standard Errors are clustered at community level.

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