Returns to schooling in Indonesia: a household consumption approach*

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Abstract

This paper uses household consumption to estimate the returns to schooling in Indonesia. I use school availability, proxied by the distance to the nearest junior high school, as an instrument to overcome endogeneity concerns over schooling decisions. I find that an additional year of schooling is associated with a 5.0 - 9.3% increase in consumption. The richness of the household data also allows me to explore the effect of assortative matching, where couples of similar educational qualifications form unions, on evaluating the returns to schooling. I find evidence suggesting its significance, with higher educated individuals experiencing a stronger effect. The effect of education on the components of household consumption is highly heterogeneous, ranging from -19.3% (alcohol and tobacco) to 28.3% (transportation).

1 Introduction

Education has been widely acknowledged as an important instrument for sustainable poverty alleviation (Ribich, 1968; Jung and Thorbecke, 2003). As compared to transfer

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programs, promoting access to education is not mired by dis-incentivisation side effects, such as reduced employment (Lemieux and Milligan, 2008). This paper aims to provide an estimate for the returns to schooling in Indonesia using a household consumption approach instead of the conventional income approach. The richness of household level data grants me the opportunity to explore in greater detail the effects of education on individual welfare.

This paper contributes to the literature in the following ways. First, it provides an estimate for the return to schooling in Indonesia using an alternative proxy for welfare – household per capita consumption. The majority of existing literature uses income as the outcome variable due to its simplicity and availability. I will first explore the usefulness of this alternative measure for assessing the return to schooling and discuss its advantages and limitations. Next, I will examine the use of school availability, in particular distance to the nearest junior high school, as an instrument for education. Third, the availability of spousal data grants me the opportunity to examine the effect of educational assortative matching on consumption, a relatively unexplored area in the returns to schooling literature. Lastly, I look at how increased years of education affects the consumption of various components of household consumption.

I find that the estimate for the return to schooling using household consumption is lower than the existing literature which uses income as the outcome variable. Compared to existing estimates between 6-11%, the OLS estimate for my data is 5.0%. Controlling for ability had little effect on the estimate. Using an IV model, on the other hand, produced an estimate of 9.3%, almost double of the OLS estimate. I also found that assortative matching has a significant effect on welfare and the effect is stronger for educated individuals who tend to marry other highly-educated individuals. The effect of education on the components of consumption is extremely heterogeneous, ranging from -20.1% (alcohol and tobacco) to 28.5% (transportation).

The paper is organised as follows: section two summarises the current returns to schooling literature, section three provides the conceptual framework, section four de-

scribes the data used, section five presents and discusses the results, section six examines the limitations, and section seven concludes.

2 Human capital and education

The concept of human capital dates back to the founding of economics by Adam Smith, who first defined human capital as the acquired and useful abilities of workers. Becker (1962) provided a more definite explanation of the concept as the skills, education, health, and training of individuals. Since its popularisation in the 1960s, extensive research has been conducted in the mechanisms through which human capital accumulates and its positive impact on the wider economy. Schultz (1961) and Lockheed et al. (1980) found that education is one of the main channels of human capital accumulation. Another important discovery is that human capital can be the engine of long-run growth. Unlike capital stock and labour, human capital does not face diminishing returns and can drive endogenous growth in an economy (Romer, 1986).

In addition to the direct positive effects on welfare, which can be measured by consumption and income, increased education also positively impacts future generations and the wider society. Morgan et al. (1962) found that two additional years of schooling in the first generation results in more than a year of extra schooling in the next generation. Education also yields positive psychic returns for an individual by promoting the development of character, granting access to more interesting and fulfilling jobs, as well as giving the pleasure from consuming education per se (Ribich, 1968). Sen (2000) also relates education to increased human security. He pointed out that illiteracy and innumeracy are major sources of insecurity as uneducated agents are vulnerable to exploitation. Chen (2000) illustrates this point with the example of widows in India, whose rights are violated due mainly to their illiteracy which translates to the lack of legal knowledge.

Despite the numerous benefits of education, investment in education is not always

straightforward. Ribich (1968) observed that there is a tendency for sub-optimal levels of investment in human capital. A possible explanation for the market failure originates from the risky nature of education loans. In the credit market, loans for physical assets are limited in risk as the lenders are able to recoup part of the loaned amount through collaterals or residual assets. However, investment in human capital is an all-or-nothing gamble as it is not possible to post a human agent as a collateral. As a result, the responsibility of providing access to education falls largely on the government through government-funded schools and subsidies.

2.1 Existing Literature

There is a wealth of literature dedicated to verifying the return to schooling. The majority uses income as a direct measure for welfare, with the estimated return to schooling ranging from 6% to 11% (see Angrist and Krueger (1991); Ashenfelter and Krueger (1994); Harmon and Walker (1995)). In the context of Indonesia, Duflo (2001) examined how the construction of over 61,000 primary schools in the 1970s affected education and income. She estimated the economic return to schooling to be between 6.8% and 10.6%. Almost all of the limited recent research conducted in the context of Indonesia use income. Their estimates range from 5% to 10.8% (see Dumauli (2015); Purnastuti et al. (2015); Carneiro et al. (2017)). I hope to contribute to the literature by using consumption as an alternate measure of the return to schooling. Additionally, I would like to examine how education affects consumption decisions. The choice of consumption as the measure of welfare is motivated by both theory and knowledge of the local Indonesian context.

Income is considerably susceptible to transitory shocks. As a result, temporarily high or low incomes may not be representative of the true position of the household when borrowing or saving is allowed to smooth the stream of consumption (Blundell and Preston, 1998). According to Attanasio and Pistaferri (2016), individual income can be viewed as the sum of two components: the permanent component, which is determined

by personal attributes such as human capital and experience, and the temporary component, which is affected by transitory shocks such as a change in job or location. Under the permanent income hypothesis of Friedman (1957), consumers will only spend the permanent portion of the income. Together with the life-cycle hypothesis of Modigliani and Brumberg (1954), consumers can be depicted as saving and dis-saving to ensure a smooth consumption and stable level of welfare. Since it is difficult to distinguish the permanent component of income from the temporary component in real-world data, consumption will present a more accurate picture of household welfare.

The choice of income as the measure of welfare in the majority of literature stems from the ease of obtaining fairly accurate income data in developed countries with robust tax systems (Meyer and Sullivan, 2012; Attanasio and Pistaferri, 2016). The required data can be easily obtained from the authorities or annual income surveys. In contrast, the collection of consumption data usually requires detailed household surveys. For developing countries with less robust tax systems, income data is rarely readily available. Additionally, given that a relatively large proportion of the Indonesian labour force is self-employed and engaged in informal employment, income data from the authorities may not be representative of the population. Meyer and Sullivan (2012) also argued that income is likely to be mis-measured. They found a general downward bias in reported income. Consumption, on the other hand, is less vulnerable to under-reporting bias.

3 Conceptual Framework

In this section, I present a simple theoretical model linking consumption and education using the Mincer earnings function, Friedman's permanent income hypothesis and Modigliani's life-cycle hypothesis.

3.1 Mincer earnings function

The classic approach to verifying the returns to schooling is the use of the canonical Mincer (1974) earnings function where w is the income received, s is the years of schooling, x is the years of labour experience and ε is a conditional mean zero residual ($E(\varepsilon|s,x)=0$):

$$\ln w(s,x) = \alpha_0 + \rho_s s + \beta_0 x + \beta_1 x^2 + \varepsilon \tag{1}$$

Following the explanation of Heckman et al. (2003), the Mincer earnings function captures two distinct economic concepts: compensating differences and human capital investment. The first concept of compensating differences explains why individuals who received varying levels of education receive different incomes. Assume that individuals have similar levels of abilities and access to opportunities, that credit markets are perfect, that there is perfect information, and that occupations differ in the years of schooling required. Apart from the opportunity cost of foregone income, schooling has no other direct costs. As a result of the costly nature of schooling, there is a need for a compensating differential. This is given by the present value of the income stream associated with a given number of years of schooling minus the cost of foregone income.

Let $w(s)$ be the wage associated with s years of schooling, which is assumed to be fixed throughout the individual's lifetime. Let T be the length of working life, which is independent of s. Let r be an exogenously determined interest rate. The compensating differential $V(s)$ can then be expressed as:

$$V(s) = w(s)\int_s^T e^{-rt}dt = \frac{w(s)}{r}(e^{-rs} - e^{-rT}) \tag{2}$$

In an equilibrium where there is heterogeneous schooling decisions, individuals must be indifferent between the lengths of schooling. The allocation of individuals to different levels of schooling is driven by demand conditions. Since an individual is indifferent between not obtaining schooling at all ($s=0$) and obtaining s years of schooling, we can write:

$$V(0) = V(s) \tag{3}$$

Substituting in Equation 2 and taking logs, we arrive at:

$$\ln w(s) = \ln w(0) + \ln \frac{(1 - e^{-rT})}{1 - e^{-r(T-s)}} + rs \tag{4}$$

By defining the internal rate of return to schooling as the interest rate r, the coefficient on s will reflect the percentage increase in wages associated with an additional year of schooling.

In addition to the concept of compensating differences, the Mincer earnings function also captures the idea of human capital investment. This concept builds on an accounting framework developed by Becker (1965) for human capital investment on the job. Let E_t be the potential earnings at time t. Drawing on the fact that an individual incurs the opportunity cost of foregone earnings to pursue education, we can express investments in education as a fraction of the potential earnings in the current period i.e. $C_t = k_t E_t$, where k_t is the fraction invested at time t. Let ρ_t be the return to education investments at time t. We can then express the relationship between future expected earnings and investments in education as:

$$E_{t+1} = E_t + C_t \rho_t = E_t(1 + k_t \rho_t) \tag{5}$$

After substitutions, we will obtain $E_t = \prod_{j=0}^{t-1}(1 + k_j \rho_j) E_0$. Define formal schooling as the number of years spent in full-time investment i.e. $k_j = 1$. Assume that formal schooling is continuous, starts from $t = 0$ and has a constant rate of return i.e. $\rho_j = \rho_s$ if $j < s$. We also assume that any investment after formal schooling has a constant rate of return for all years i.e. $\rho_j = \rho_0$ if $t \geq s$. We can then express E_t as the product of the rate of return from s years of full-time schooling $(1 + \rho_s)^s$ and post-formal schooling investment $\prod_{j=s}^{t-1}(1 + k_j \rho_j) = \prod_{j=s}^{t-1}(1 + k_j \rho_0)$:

$$E_t = E_0(1+\rho_s)^s \prod_{j=s}^{t-1}(1+k_j\rho_0)$$

After taking logs, we obtain:

$$\ln E_t = \ln E_0 + s\ln(1+\rho_s) + \sum_{j=s}^{t-1}\ln(1+k_j\rho_0)$$

For small ρ_s and ρ_0:

$$\ln E_t \approx \ln E_0 + s\rho_s + \rho_0 \sum_{j=s}^{t-1} k_j$$

Mincer (1974) further assumes a linearly declining rate of post-school investment, given by:

$$k_{s+x} = \kappa(1-\frac{x}{T})$$

where $x = t - s \geq 0$ is the amount of work experience at age t and T is the total number of periods in which investment is positive. The relationship between potential earnings, schooling and experience can then be expressed as:

$$\ln E_{s+x} \approx [\ln E_0 - \rho_0\kappa] + \rho_s s + (\rho_0\kappa + \frac{\rho_0\kappa}{2T})x - \frac{\rho_0\kappa}{2T}x^2$$

We can then equate observed earnings with the potential earnings less investments costs, which would give us the following relationship:

$$\begin{aligned}
\ln w(s,x) &\approx \ln E_{s+x} - \kappa(1-\frac{x}{T}) \\
&= [\ln E_0 - \rho_0\kappa - \kappa] + \rho_s s + (\rho_0\kappa + \frac{\rho_0\kappa}{2T} + \frac{\kappa}{T})x - \frac{\rho_0\kappa}{2T}x^2 \\
&= \alpha_0 + \rho_s s + \beta_0 x + \beta_1 x^2
\end{aligned}$$

This would bring us to the standard form of the Mincer earnings function in 1, which expresses log earnings as a linear relationship with the years of schooling with linear and quadratic terms in the years of labour experience.

3.2 Permanent income hypothesis and life cycle theory

Friedman's permanent income hypothesis (1957) states that an individual's income can be treated as a sum of two components: a permanent component (y_p) and a transitory component (y_t), which can be expressed as:

$$y = y_p + y_t$$

The permanent component, which I shall call the permanent income, captures the effects of the individual's characteristics, including human capital and work experience. The transitory component can be interpreted as absorbing the effects of all other factors which occurred at "random", such as weather shocks and cyclical fluctuations in economic activity. The Mincer earnings function can then be applied to approximate the relationship between the permanent income and years of schooling:

$$\ln y_p = \alpha_0 + \rho_s s + \beta_0 x + \beta_1 x^2$$

Next, I apply Modigliani and Brumberg's (1954) life-cycle hypothesis by assuming that there is a perfect credit market which allows saving and dis-saving, that all households practice consumption smoothing perfectly, and that their consumption decisions are based solely on their permanent income. Consumption can then be expressed as a function of the permanent income ie. $c = f(y_p)$. Assuming a linear relationship between consumption and income for simplicity, we can then express the relationship between consumption and schooling as:

$$\ln c = f(s, x) = \alpha + \beta s + \gamma_1 x + \gamma_2 x^2 \tag{6}$$

Acknowledging that this is an over-simplified model of the relationship between consumption and schooling, this paper does not seek to pin down the exact mechanisms through which schooling affects consumption levels. Instead, the focus is to identify the effects of education on welfare levels, as measured by the level of household consumption.

3.3 Context: education in Indonesia

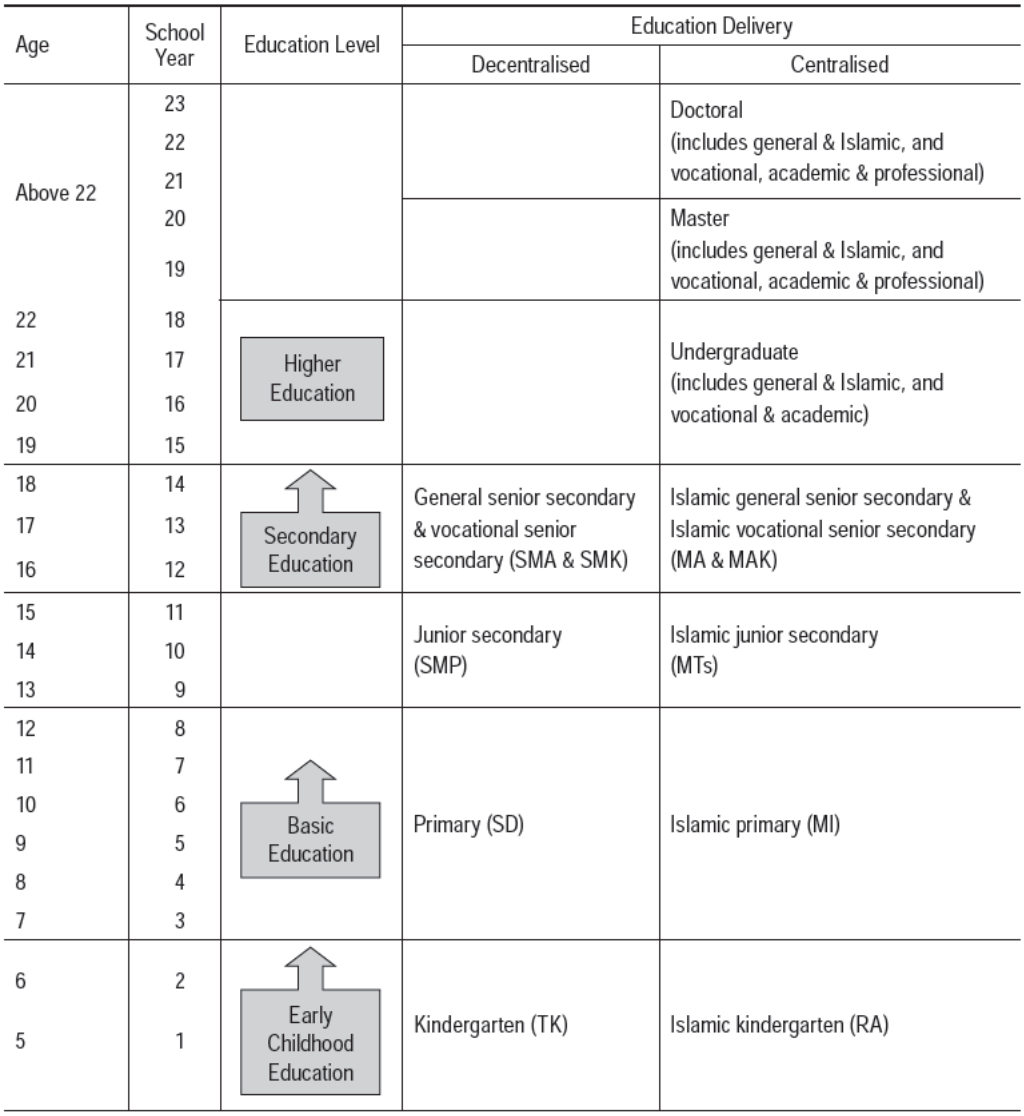
The focus of my research will be on Indonesia, which has more than 60 million students and almost 4 million teachers in over 340,000 educational institutions. Over the past two decades, the country has recorded strong growth accompanied by reduced output volatility and relatively stable inflation. At the same time, it has made dramatic progress on many fronts in the education sector. Illiteracy rate among those above the age of 15 fell from 14.8% to 4.5% between 1994 and 2017. School participation rate for those between 13 and 15 years old increased from 72.4% to 95.0% in the same period.[1]

Figure 1[2] gives an overview of the Indonesian education system. The general, secular education system is administered by the Ministry of Education and Culture (MOEC) and is mostly decentralised to municipal governments. The central government would set the national educational standards in terms of national curriculum and exams, as well as the organisation and development of higher education. The provincial governments are tasked with the provision of learning materials, student selection and acceptance. All other aspects are handled by the municipal governments. On the other hand, the Ministry of Religious Affairs (MORA) oversees the Islamic schools, also known as *madrasahs*. *Madrasahs* provide a detailed study of the Quran, the Arabic language, Muslim traditions and history. In addition to the religious subjects, the Islamic schools also teach subjects from the general school curriculum. As less than 10% of my sample received an Islamic education, I will treat education under non-secular schools as equivalent to secular ones.

[1] Numbers from Badan Pusat Statistik (Statistics Indonesia), 2017

[2] Figure from Indonesia Ministry of Education and Culture, 2012

Figure 1: Indonesian Education System



3.4 Identification Strategy

This paper has two main objectives. The first is to estimate the effect of education on household consumption. The second is to estimate the effect of education on the composition of household consumption. The main estimating equation for the effect of

education on household consumption is:

$$\ln c_i = \alpha + \beta s_i + \gamma_1 x_i + \gamma_2 x_i^2 + \boldsymbol{b_i'}\boldsymbol{\delta} + \epsilon_i \tag{7}$$

where c_i is the household per capita consumption (PCE) for individual i, x_i is the potential labour experience (age−years of schooling−6), $\boldsymbol{b_i}$ is a vector of controls, δ is a vector of the coefficients and ϵ_i is the error term.

4 Data

4.1 Indonesia Family Life Survey

My paper uses data from the Indonesia Family Life Survey (IFLS), an on-going longitudinal survey in Indonesia conducted by RAND. The sample is representative of about 83% of the population and contains over 30,000 individuals stratified on provinces. 13 out of the 27 provinces in Indonesia were included in the sample. Appendix C contains a map of the 13 provinces surveyed. According to RAND, these provinces were selected to maximize representation of the population, capture the cultural and socioeconomic diversity of Indonesia, and be cost-effective to survey given the size and terrain of the country. As of 2017, 5 waves of study have been conducted, with each wave consisting of a household survey and a community survey. The household survey contains detailed information on consumption and education at the household and individual levels. Each individual and household is tagged with a unique ID, which allows me to link them across datasets and waves. The location ID allows me to link individuals with data on their communities, a useful feature for an IV strategy.

I prepared the data by extracting two types of information: consumption and schooling. To obtain the consumption data, I used the IFLS consumption aggregates, which are datasets prepared by RAND based on the original IFLS surveys. These datasets contain comprehensive consumption data broken down into a few main categories. Further

details of the consumption data are in the appendix.

As the survey does not contain information on parental consumption, I have to manually match parents with children who were sampled in the survey. This is done by accessing the household roster dataset, which includes information of the household members. Each member is listed as one of seventeen possible household members, which includes head of the household, spouse to the head of the household, and child. I used IFLS1/1993 (wave 1) (Frankenberg and Karoly, 1995) to define 'parents' and 'child'. The head of the household and his/her spouse in wave 1 are defined as the parents. I do not make distinctions between a male and a female household head for wave 1. For convenience, I would label the household head as the father and the spouse as the mother in the regression tables. I then extracted the educational information of the parents and their household consumption information. The figures are then re-based to 2007 prices using CPI data obtained from *Badan Pusat Statistik*, the government body responsible for conducting statistical surveys. Next, I filtered out the children from each household in wave 1. Only a small proportion of the children are step or adopted (2% of the total children sample). This group of children are included in the sample as well. The children are then linked with their parents' consumption and educational data using the unique household IDs from wave 1. Next, I use IFLS4/2007 (wave 4) (Strauss and Wattie, 2009) for the children's consumption and educational data. I limited my sample of children to those above the age of 25, which is the age at which the number of years of the schooling is expected to stablise.

In the process of cleaning the data, there were a few cases where there are multiple spouses matched to one household head. Upon closer examination, this is due to the legality of polygamy in Indonesia. As allowed by Islam, a man may take more than one wive as long as he treats them equally and can financially support them all. For such cases, the higher educated spouse is taken.

The most difficult aspect of cleaning the data is linking parents' data with children's data. In cleaning of the children's data in wave 4, there were instances where an indi-

vidual was found in multiple households. This is due to the "first contact" rule observed by the survey. At the point of first contact with any of the previous wave's household member, the original household was said to have been found and a household roster based on the previous wave would be generated. An interview would then be conducted under the same household ID, with current information collected for everyone listed in the pre-printed roster. However, if the household member were later located in another household, the same individual would be recorded under another household ID. There was a variable which indicated if the household member was still living in that household which allowed me to remove the household member from the pre-printed roster. There are also instances where individuals who were defined as children in wave 1 married and formed new households in wave 4. As a result, these two individuals would be listed as 2 separate observations and share the same household per capita consumption. It would be of interest to examine how an individual's educational level affects his choice of spouse and its impact on household consumption. In one of the subsequent sections, I explore the effect of educational assortative matching on the evaluation of the returns to schooling.

4.2 Educational data

Three issues arose when preparing the education data. The first is the distinction between secular and non-secular schools. In the household survey, household members are asked the highest level of school attended as well as the type of school. As non-secular schools follow the same structure and curriculum of the general education system, I treated the education received from both types of school as equal. In addition to general education schools, there are also vocational schools. The base specification treats the education received from both types of schools as equal. Alternative specifications allow for different effect from attending the different types of schools. Due to the small number of respondents who attended master's and above levels of schooling, the top coding for education is undergraduate. Adult education, open university and special education

are not coded as contributing to the years of education. Table 1 presents the summary statistics for the main variables while Figure 4 presents the distributions of education and consumption by years of education. In Figure 2c, we observe jumps at each boundaries of grade level ie. primary school to junior high school (6 years to 7 years), junior high school to senior high school (9 years to 10 years), senior high school to university (12 years to 13 years). Figure 2d illustrates the jumps more clearly. The largest jumps are from primary school to junior high school and senior high school to university. The peak at 14 years of education can be explained by 2-year diplomas. Figures 2b and 2a shows the distributions of consumption by years of education. A simple linear model without any controls is shown in Figure 3 as part of the exploratory analysis. Generally, more years of education is associated with higher levels of consumption.

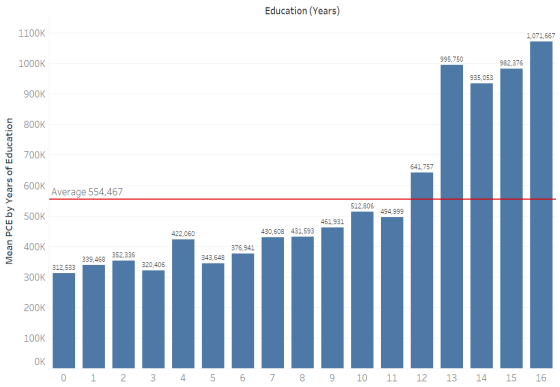
Table 1: Summary statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Consumption[a]	4,517	572,737	543,625	49,733	8,448,556
Education variables					
Education (Years)	4,702	9.55	4.11	0	16
Primary = 1	1,098	-	-	-	
Junior High [b] = 1	756	-	-	-	-
Vocational Junior High = 1	23	-	-	-	-
Senior High = 1	1,125	-	-	-	-
Vocational Senior High = 1	721	-	-	-	-
Advanced = 1	473	-	-	-	-
Control variables					
Spouse's Education (Years)	3,033	9.75	3.88	0	16
Age	4,702	31.59	5.911	25	80
Experience	4,702	16.0	7.57	3	59
Experience^2	4,702	314.3	317.6	9	3,481
Parents' Consumption	4,673	311,829	320,916	17,805	5,337,556
Father's Education	4,702	5.713	4.244	0	16
Mother's Education	4,702	4.219	3.772	0	16
Household Size	4,702	4.39	1.92	1	14
Ability Test Score (Out of 13)	2,452	7.87	3.10	0	13
IV Model					
Distance to Junior High School (Km)	3,618	2.22	2.50	0	22.5

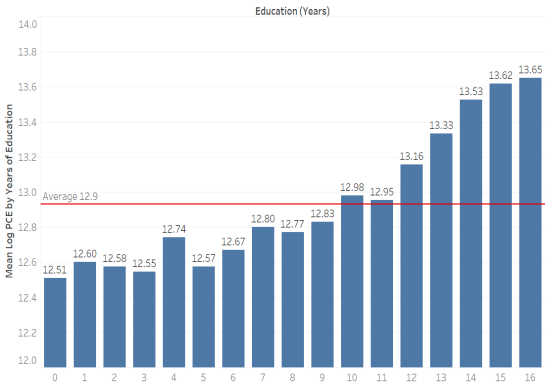
[a]Consumption figures are at the individual monthly level and in IDR at 2007 prices.

[b]Vocational and non-vocational dummies are mutually exclusive sets.

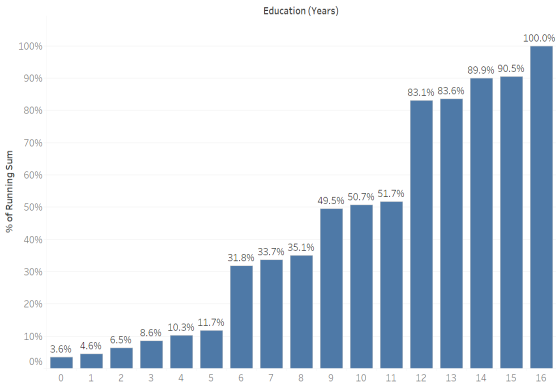
Figure 2: Education and Consumption Distributions



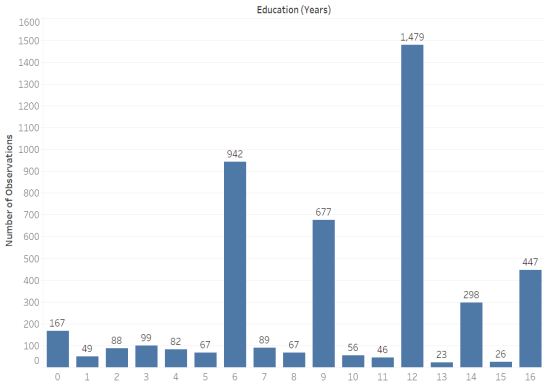
(a) Mean PCE by Years of Education



(b) Mean Log PCE by Years of Education

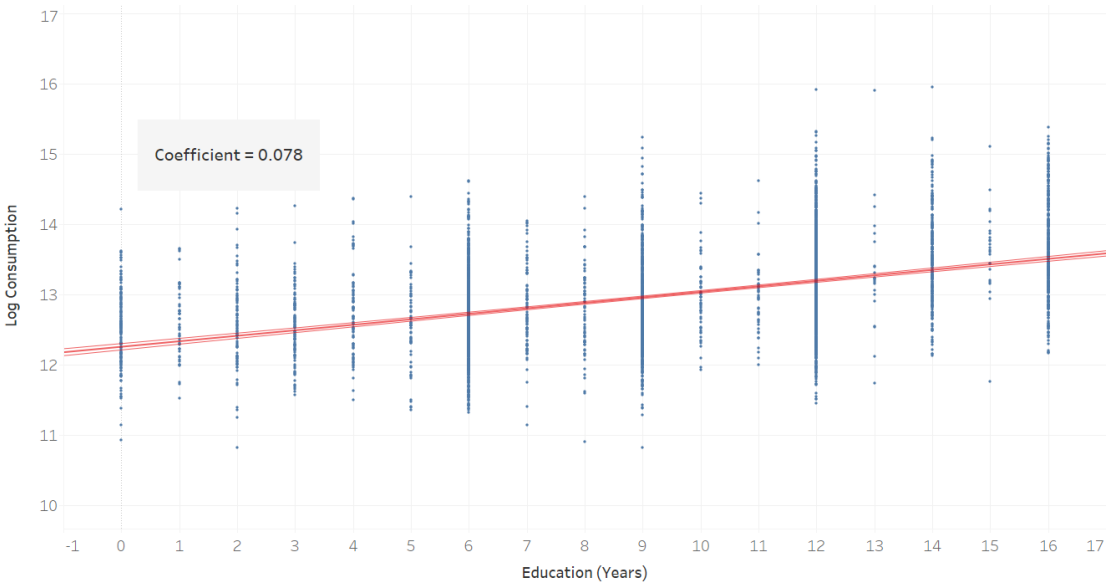


(c) Cumulative Distribution of Years of Education



(d) Distribution of Years of Education

Figure 3: Scatter Plot with Simple Linear Approximation (without controls



5 Results

5.1 OLS

The first regression model that I run is an OLS. In this model, I assume that schooling decisions are exogenous conditional on household and parental characteristics.

$$\ln c_i = \alpha + \beta s_i + \gamma_1 x_i + \gamma_2 x_i^2 + \boldsymbol{b_i'}\boldsymbol{\delta} + \epsilon_i \tag{8}$$

where c_i is the household per capita consumption for individual i, x_i is the potential labour experience (age−years of schooling−6), $\boldsymbol{b_i}$ is a vector of individual, parental and province controls and $\boldsymbol{\delta}$ is a vector of the coefficients. The controls include the natural log of parents' per capita household consumption, which gives the coefficient on the variable an elasticity interpretation and parents' education levels. I also included dummy variables for each of the 13 provinces surveyed to account for provincial differences. Table

2 presents the results.

Column (1) estimates the returns to schooling as 8.0%. Once the controls are added in column (2), the coefficient on education falls significantly from 8.0% to 5.0%, suggesting the presence of positive omitted variable bias. This is unsurprising due to strong positive influences of parental wealth, proxied by parents' consumption, on children's educational attainment and economic outcomes (Conley, 2001; Shanks, 2007). Additionally, a significant amount of literature suggests positive correlation between parents' wealth and children's economic outcomes. Thus, the naive OLS estimate in column (1) would be biased upwards (Charles and Hurst, 2002; Chevalier and Lanot, 2002; Chevalier et al., 2013; Karagiannaki, 2017).

In column (3), province dummies are included in the regression to control for provincial differences in prices and standards of living. The constant term is interpreted as the average household per capita consumption for an uneducated individual in the province of *North Sumatera*, which has been excluded from the province dummies. The same province has been excluded in all subsequent regressions with province controls. The coefficient on education is relatively stable to the inclusion of the province dummies, suggesting provincial differences do not account for a considerable part of the variation in consumption. The elasticity between parents' consumption and children's consumption is estimated at 0.16. Compared to existing estimates of inter-generational correlation of wealth which used income data (0.27 in Denmark (Adermon et al., 2016), 0.37 in the U.S. (Charles and Hurst, 2003)), the estimate shows greater inter-generational mobility. This means that parental consumption level only has a small effect on an individual's level of consumption. The effect of household size on consumption is also statistically significant. Adding an additional household member is associated with a 12% fall in household per capita consumption, which can be explained by household economies of scale in consumption (Nelson, 1988).

Column (4) provides an alternative specification where the education variable is replaced with mutually exclusive dummy variables for the highest level of education

completed by the individual. For instance, an individual with senior high school qualifications will be coded as 1 for senior high school and 0 for all others. The coefficient on the education variables are interpreted as the increase in consumption relative to an average individual with below 6 years of education from the province of *North Sumatera*. The returns to schooling for the completion of primary school is 7.7% (statistically insignificant). Those with advanced qualifications enjoy almost double the per capita consumption of those with below 6 years of education. In column (5), I controlled for potential differences in the returns to schooling between general and vocational education. Interestingly, the return to vocational junior high school is significantly higher than that of general junior high school and senior high-equivalent education. However, the estimate for vocational junior high school should be interpreted with caution given the extremely small sample size of only 23 individuals.

Table 2: Log-consumption OLS with province controls

	(1)	(2)	(3)	(4)	(5)
				Alternative Specifications	
VARIABLES	OLS	With controls	With province dummies	Highest education	Vocational Schools
Education (Years)	0.0804***	0.0499***	0.0491***		
	(0.00612)	(0.00297)	(0.00320)		
Primary				0.0765*	0.0447
				(0.0421)	(0.0354)
Junior High				0.165***	0.110***
				(0.0397)	(0.0278)
Junior High(Vocational)					0.385**
					(0.129)
Senior High				0.375***	0.368***
				(0.0431)	(0.0365)
Senior High(Vocational)					0.277***
					(0.0315)
Advanced				0.685***	0.647***
				(0.0413)	(0.0324)
Experience	-0.0153***	-0.00384	-0.00265	0.00174	0.00114
	(0.00448)	(0.00434)	(0.00410)	(0.00432)	(0.00408)
Experience^2	0.000460***	0.000193*	0.000187	1.64e-05	6.64e-06
	(0.000100)	(0.000108)	(0.000107)	(0.000111)	(0.000106)
Parents' Consumption		0.215***	0.162***	0.161***	0.160***
		(0.0413)	(0.0148)	(0.0152)	(0.0145)
Father's Education		0.0120***	0.0148***	0.0151***	0.0151***
		(0.00229)	(0.00214)	(0.00203)	(0.00181)
Mother's Education		0.0114***	0.0112***	0.00935***	0.00950***
		(0.00359)	(0.00227)	(0.00253)	(0.00262)
Household Size		-0.114***	-0.122***	-0.122***	-0.122***
		(0.0110)	(0.0107)	(0.0107)	(0.0108)
Constant	12.33***	9.905***	10.63***	10.87***	10.92***
	(0.0723)	(0.555)	(0.214)	(0.229)	(0.219)
Observations	4,517	4,491	4,491	4,491	4,491
Adjusted R-squared	0.215	0.376	0.423	0.425	0.425
Province Controls	NO	NO	YES	YES	YES

Robust standard errors in parentheses are clustered at the province level.

*** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable is ln(consumption). 'Household Size' refers to the child's household characteristics in 2007.

5.2 Correcting for ability bias

Differences in individual abilities may violate the exogenous schooling assumption. In Spence's (1973) signalling model, education serves a screening function in differentiating high-ability workers from low-ability ones as the former face lower costs from attaining more education. Becker's (1975) human-capital model further predicts that an individual's ability affects the rate of return from human capital investment. Since more talented individuals reap higher returns from educational investments, they would select into obtaining more education. As a result, there is a need to control for the heterogeneity in abilities across individuals, which would influence schooling decisions.

To proxy for ability, I use cognitive tests administered as part of the survey. The tests were issued from IFLS2/1997 onwards. However, data from the first administration of the test is of poor quality[3]. I hence used data from IFLS3/2000 instead. Assuming that the test is an accurate measure of ability uncorrelated with the level of schooling, the timing of the test should not matter. The test was designed by members from the testing division of the Indonesian Ministry of Education and was issued to 15-24 year olds. It consists of 8 cognitive questions and 5 math questions. Figure 4a shows the distribution of the scores. The distribution is characteristic of a normal curve typical of a standard ability test but is slightly skewed towards the higher end of the score. Hence, the test may not be very well-designed to differentiate among the high ability students. To increase the interpretability of the results, I normalised the test scores. A sample of the question can be found in Appendix C.

Following Blackburn and Neumark's (1993) definition, I assume that ability is well-measured by the test score and is not affected by the level of schooling. I further assume that ability is time-invariant. The model represented by equation 6 can then be modified to account for the differences in individual ability:

[3]The test was poorly designed. According to RAND, "the first few weeks of fieldwork revealed that the highest test level was too difficult. Subsequently all respondents 1324 were given the same test..(which was) originally designed for 13 to 15-year-olds."

$$\ln c_i = \alpha + \beta s_i + \gamma_1 x_i + \gamma_2 x_i^2 + \boldsymbol{b_i'\delta} + \phi A_i + \epsilon_i \tag{9}$$

where A_i is the standardised test score of individual i. The results can be found in Table 3.

To compare the effects of including the ability control, I limited my sample to individuals who have completed the cognitive test. Running the same estimating model represented by equation 8 in column (1) on the sub-sample, I noted a higher marginal return from an additional year of schooling compared to the entire sample. Those who took the test averages a 9.5% increase in consumption compared to the 8.0% increase for the combined sample. Since the survey respondents can refuse to take the test, selection bias is a potential concern. Examining the distribution of years of schooling for the sub-sample in Figure 4b finds that there is a marginally lower proportion of low-educated individuals ($\leq$6 years) and a slightly higher proportion of high-educated individuals ($\geq$12 years).

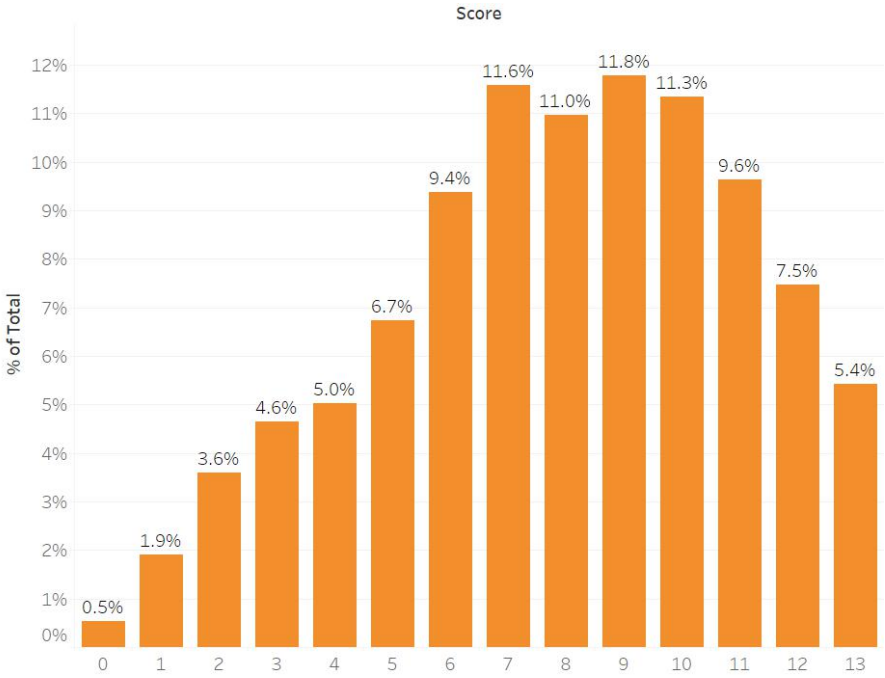
Following the inclusion of ability in column (3), there is a moderate fall in the coefficient of education which suggests the presence of positive ability bias, in line with predictions. A one standard deviation increase in score is associated with a 3.6% increase in consumption. Column (4) presents the alternative specification where the education variable is replaced with dummy variables for the highest level of qualification completed. Column (5) makes a distinction between vocational and non-vocational education. In column (4), it is observed that attaining a junior high school level of qualification is associated with a 11.3% increase in household per capita consumption, attaining a senior high school level of qualification is associated with a 34.3% increase, and attaining an advanced diploma is associated with a 72.2% increase. In column (5), we find that the increase in consumption from completing junior high equivalent level of education is driven mainly by vocational junior high education. Mirroring the finding from the previous section, the return to vocational junior high education is greater than that of both vocational and non-vocational senior high education. Again, the estimate should

be interpreted with caution due to the small sample of individuals with vocational junior high qualifications.

The small number of questions and possible selection into taking the test may threaten both the internal and external validity of the results. In view of such a possibility, I do not include the test scores as a control in the subsequent sections. In the absence of a control for ability, I would expect an upward bias in my estimates for the returns to schooling.

Figure 4: Education and Consumption Distributions

(a) Distribution of cognitive test scores



(b) Cumulative Distribution of Years of Education (Ability sub-sample)

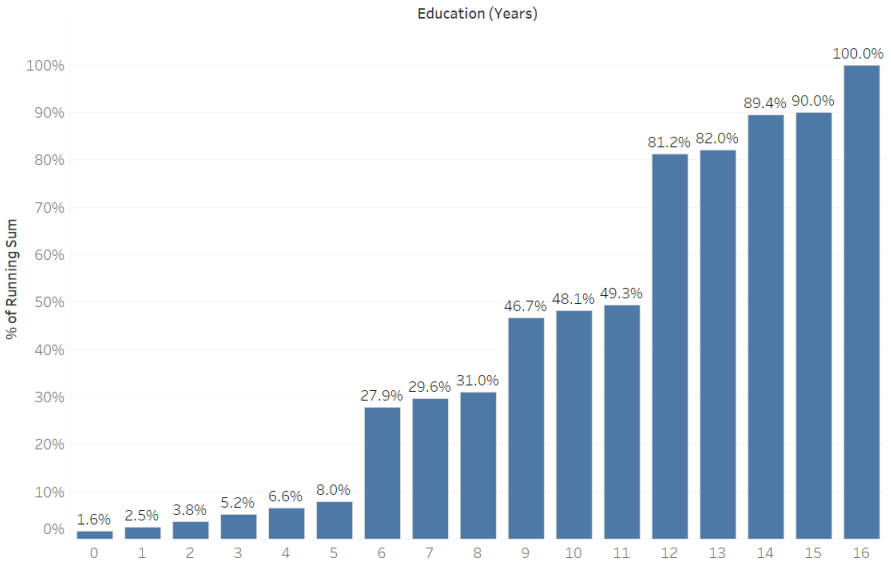


Table 3: Log-consumption OLS with ability control

	(1)	(2)	(3)	(4)	(5)
				Alternative Specifications	
VARIABLES	OLS	With controls	With test scores	Grade level	Vocational
Education (Years)	0.0954***	0.0506***	0.0478***		
	(0.00958)	(0.00520)	(0.00408)		
Primary				0.0619	-0.00469
				(0.0581)	(0.0451)
Junior High				0.107**	0.00460
				(0.0477)	(0.0312)
Junior High(Vocational)					0.354**
					(0.154)
Senior High				0.295***	0.215***
				(0.0681)	(0.0510)
Senior High(Vocational)					0.155***
					(0.0426)
Advanced				0.544***	0.442***
				(0.0551)	(0.0548)
Standardised Test Score			0.0359**	0.0378**	0.0390**
			(0.0153)	(0.0159)	(0.0155)
Experience	-0.0733***	-0.0633***	-0.0619***	-0.0348**	-0.0301**
	(0.0136)	(0.0105)	(0.0104)	(0.0115)	(0.0118)
Experience^2	0.00321***	0.00254***	0.00250***	0.00116**	0.000797*
	(0.000514)	(0.000387)	(0.000387)	(0.000393)	(0.000384)
Parents' Consumption		0.156***	0.154***	0.154***	0.152***
		(0.0143)	(0.0140)	(0.0156)	(0.0150)
Father's Education		0.0159***	0.0155***	0.0166***	0.0171***
		(0.00291)	(0.00290)	(0.00279)	(0.00249)
Mother's Education		0.0113**	0.0106**	0.0101**	0.0104**
		(0.00421)	(0.00399)	(0.00399)	(0.00383)
Household Size		-0.125***	-0.125***	-0.125***	-0.126***
		(0.0129)	(0.0125)	(0.0123)	(0.0117)
Constant	12.43***	11.03***	11.08***	11.24***	11.36***
	(0.125)	(0.246)	(0.228)	(0.236)	(0.207)
Observations	2,361	2,346	2,346	2,346	2,346
Adjusted R-squared	0.238	0.460	0.462	0.459	0.461
Province Controls	NO	YES	YES	YES	YES

Robust standard errors in parentheses are clustered at province level.

*** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable is log(consumption)

5.3 School availability as an instrument

5.3.1 Distance to the nearest junior high school

There may still be concerns over the endogeneity of education arising from unobservable individual and household characteristics. We thus need a source of exogenous variation in education, which can be achieved with an instrument for education. In the same vein as Card's (1993) use of proximity to college as an instrument for educational attainments, I will be exploiting variations in accessibility to junior high education across communities as an instrument for years of schooling.

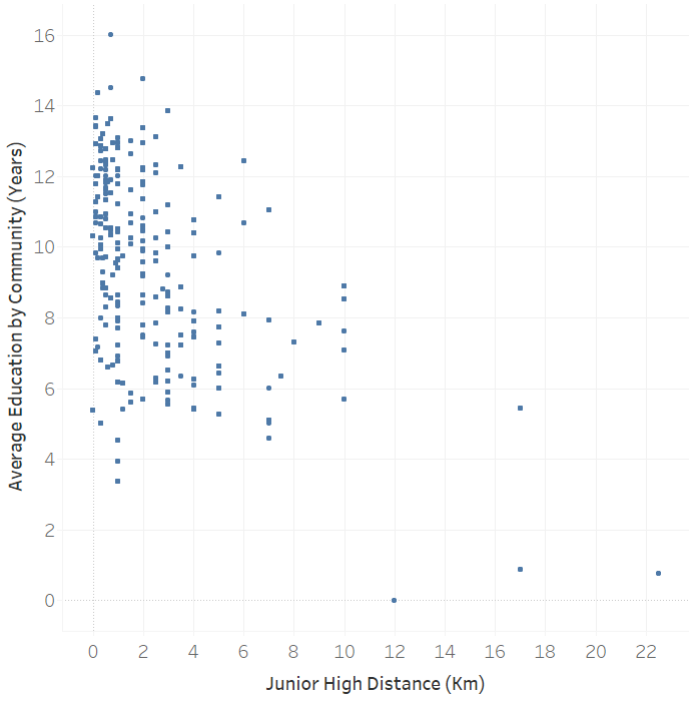
Students who grow up in an area far from school will incur higher monetary and non-monetary costs. Monetary costs can come in the form of travel expenses and boarding fees while non-monetary costs can include the troubles of travelling and the reduced ability to help out with family duties. As a result of the higher costs associated with longer distances, individuals may decide against attending school.

The motivation behind choosing junior high school as an instrument instead of other grade levels has three dimensions. First, junior high school is a relatively easy transition from primary school in terms of academic difficulty. As a result, the decision to attend junior high school is less likely to be contaminated by ability bias as compared to other grade levels (e.g. from senior high school to university). Second, completing junior high school provides a statistically significant increase in consumption, as noted in in the previous section (see Table 2). Thus, variations in the decision to attend junior high school are likely to impact consumption levels. Lastly, as suggested by Figure 2d, most people who attended high school achieved senior high school and above levels of qualification. Only a relatively small proportion drops out at junior high school level. Attending junior high school may thus have a disproportionate effect on an individual's schooling outcomes, as compared to other grade levels.

As there is no information on the distance between the nearest junior high school and each individual household, I am exploiting the variation in access to junior high school

at the community-level. The IFLS community survey provides the distance between the nearest junior high school and the community office. Since there are only an average of 20 households in each of the 312 community, I would not expect large variations in access to junior high school within a community. Thus, I would argue that this distance is a good proxy for an individual household's access to education. Additionally, even if the households are geographically scattered within a community, the control for household characteristics should capture most of the differences (e.g. richer households are located nearer to village centres where the office is located). Even though there is no way to verify this due to the absence of geographical data at the household level, it is comforting to find a negative relationship between the average years of schooling within the community and the distance to the nearest junior high school for that community, as shown in Figure 5. This provides preliminary support for the relevance of the instrument.

Figure 5: Average education by community vs distance to nearest junior high school



5.3.2 IV model

The data used for the IV strategy originate from the IFLS1/1993 community survey. The heads of each of the 312 communities were asked about the distances between the village head office and the schools. The IV model is as follows:

First stage:

$$s_i = \pi_0 + \pi_1 d_i + \pi_2 x_i + \pi_2 x_i^2 + \boldsymbol{b_i'}\boldsymbol{\delta} + \mu_i \tag{10}$$

Reduced form:

$$\ln c_i = \beta_0 + \beta_1 d_i + \gamma_1 x_i + \gamma_2 x_i^2 + \boldsymbol{b_i'}\boldsymbol{\lambda} + \epsilon_i \tag{11}$$

where c_i is the household per capita consumption for individual i, d_i is the distance to the nearest school from the village head office, x_i is the potential labour experience (age−years of schooling−6), $\boldsymbol{b_i}$ is a vector of controls, $\boldsymbol{\delta}$ and $\boldsymbol{\lambda}$ are vectors of the coefficients to the controls in the first stage and reduced form respectively. In addition to the controls from the previous sections, I also included controls for the number of siblings and gender due to potential causal effects on educational decisions in the first stage (see Butcher and Case (1994); Klasen (2002)).

5.3.3 Results

The results are shown in Table 4. Due to missing data, households from some communities are excluded in the IV regression. To check if the sub-sample remains representative, I ran an OLS in column (1). The estimate on education is 4.9%, only slightly higher than the 4.6% obtained in the OLS on the whole sample. In column (2), I ran the first stage regression to check for relevance. A F-statistic of 7.2 is obtained, which is lower than the heuristic of F-statistic=10. I also employed the Anderson-Rubin test (1949) as a further weak instrument check, which produced a confidence interval of [0.0172 ,

0.169]. Even though the coefficient for education is within the confidence interval, the wide interval suggests that my estimate for the effect of education is quite imprecise.

The first stage regression shows that a one standard deviation increase in distance to the nearest junior high school is associated with 0.32 fewer year of schooling. Notably, the effect of gender and the number of siblings on educational attainment is insignificant, suggesting that there are no detectable gender and sibling biases in educational decisions. Compared with the OLS estimate of approximately 4.9% in column (1), the IV produced an estimate double of that. The IV estimate, however, is imprecise and is only significant at 10% level.

In an attempt to improve the precision of my estimates, I limited my sample to those with $\geq$ 6 years of education in columns (5) - (8), which excludes approximately 400 observations out of a total of about 3,600. According to Imbens and Angrist (1994), the 2SLS identifies the Local Average Treatment Effect (LATE), which is the average effect of distance to school on the compliers ie. those who change their decision from non-enrolment to enrolment due to the close proximity to school. Under the reasonable assumption that there are no defiers ie. those who do not enrol when they are near to school and enrol when they are far from school, the useful variation in years of schooling (signal) originates solely from the compliers. The unhelpful variation (noise), on the other hand, is contributed by the never-takers ie. those who would not enrol no matter what, and the always-takers ie. those who would always enrol. Assuming that those with $<$ 6 years of schooling are the never-takers, removing them from the sample would increase the precision of my estimates by reducing the noise without introducing selection bias.

The OLS regression in column (5) shows a significantly higher return to schooling for the sub-sample (5.96% vs 4.89%), which is due to the different interpretation of the coefficient on education. Instead of estimating the effect from an additional year of education averaged over 16 years, the new coefficient in columns (5) and (8) reflect the effects from an additional year of *post-primary* education. Running the first stage

in column (6) produced a comparable estimate for the effect of distance on education as that in column (2). The statistical significance remains at 5% significance level. Obvious differences can be observed in the reduced form and 2SLS regressions. There is an increase in the effect of distance on consumption and education on consumption. The coefficient on distance becomes more statistically significant at 5% significance level in the sub-sample. Similarly, the coefficient on education in column (8) increases in statistical significance to 1%, from the previous significance level of 10% in column (4). There are two possible reasons for the differences. First, is due to the reduction in noise from the first stage as the never-takers are removed from the sample. Second, is due to the partialling out of the effect of additional primary education from the average return to schooling.

Table 4: Distance to Junior High School as Instrument

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Entire IV Sample				IV Sample ≥6 Years			
VARIABLES	OLS	First Stage	Reduced form	2SLS	OLS	First Stage	Reduced form	2SLS
Education (Years)	0.0489***			0.0889*	0.0596***			0.111***
	(0.00360)			(0.0532)	(0.00508)			(0.0423)
Experience	-0.00115	-0.385***	-0.0200***	0.0144	-0.00698*	-0.430***	-0.0324***	0.0154
	(0.00396)	(0.0232)	(0.00405)	(0.0221)	(0.00389)	(0.0249)	(0.00476)	(0.0191)
Experienceˆ2	0.000201*	0.00331***	0.000366***	6.24e-05	0.000392**	0.00727***	0.000823***	9.16e-06
	(0.000111)	(0.000566)	(0.000115)	(0.000242)	(0.000129)	(0.000700)	(0.000158)	(0.000347)
Standardised Dist.		-0.325**	-0.0283*			-0.330**	-0.0369**	
		(0.121)	(0.0134)			(0.131)	(0.0136)	
Male	-0.0174	0.144	-0.00986	-0.0244	-0.0129	0.155	-0.00293	-0.0213
	(0.0147)	(0.103)	(0.0149)	(0.0163)	(0.0169)	(0.0972)	(0.0161)	(0.0209)
Parents' Consumption	0.177***	1.147***	0.230***	0.130**	0.167***	1.078***	0.228***	0.109**
	(0.0166)	(0.150)	(0.0168)	(0.0653)	(0.0188)	(0.118)	(0.0178)	(0.0495)
Father's Education	0.0125***	0.196***	0.0218***	0.00448	0.0127***	0.161***	0.0220***	0.00419
	(0.00239)	(0.0246)	(0.00248)	(0.00981)	(0.00273)	(0.0223)	(0.00314)	(0.00778)
Mother's Education	0.0138***	0.0760***	0.0176***	0.0104	0.0123***	0.0853***	0.0174***	0.00757
	(0.00314)	(0.0210)	(0.00331)	(0.00698)	(0.00341)	(0.0134)	(0.00360)	(0.00549)
Siblings	0.0103***	-0.0286	0.00868**	0.0110***	0.0116***	-0.0100	0.0106***	0.0119***
	(0.00309)	(0.0259)	(0.00319)	(0.00361)	(0.00298)	(0.0201)	(0.00293)	(0.00315)
Household Size	-0.130***	-0.000914	-0.130***	-0.130***	-0.132***	-0.00495	-0.132***	-0.132***
	(0.0120)	(0.0314)	(0.0122)	(0.0114)	(0.0122)	(0.0328)	(0.0124)	(0.00526)
Observations	3,461	3,587	3,461	3,461	3,037	3,156	3,037	3,037
Adjusted R-squared	0.434	0.594	0.401	0.411	0.429	0.541	0.395	0.402
Province Controls	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses and clustered at the province level.

*** p<0.01, ** p<0.05, * p<0.1

5.3.4 Discussions of the validity of the instrument

The key identifying assumption for the use of distance to the nearest junior high school as an instrument is that its effect on household consumption is solely through educational decisions. This assumption could be violated if parents choose to live in communities nearer to junior high schools and that they have children who display higher academic abilities which affect their earning potential. As discussed earlier, the 2SLS estimates the LATE. The compliers are most likely to be students from poorer socio-economic backgrounds where distance to school would constitute a significant cost in assessing the net value of education. For example, students from more well-off households would be able to circumvent long distances by paying for transportation. I would expect the compliers, who come from poor economic backgrounds, to have limited flexibility to the choice of location. Additionally, parents who would move nearer to school obviously place a high value on education. It is not far-fetched to predict that their children would be the always-takers, given that an individual's early life educational decisions are largely dictated by parents. Thus, parental attitude is unlikely to affect the schooling decision for the compliers and bias the estimate for the effect of education on consumption.

Assuming that the instrument is valid, the higher 2SLS estimates relative to the OLS estimates suggest that students from poorer socio-economic backgrounds enjoy greater returns from schooling than the average individual. On the other hand, if students from poorer socio-economic background in fact experience the same returns to schooling as an average individual, the doubling of the estimate for the return to schooling in the 2SLS suggests significant endogeneity in schooling decisions which results in a negative bias for the OLS estimates.

5.4 Assortative matching

Assortative matching is the phenomenon where individuals choose partners based on either the similarities (positive assortative matching) or differences (negative assortative

matching) in characteristics. In the returns to schooling setting, positive assortative matching is characterised by individuals choosing partners of comparable levels of education, whereas negative assortative matching is where unions are formed between two individuals of different educational qualifications. Much research has been conducted in examining the effect of assortative matching on income inequality (see Rockwell (1976); Mare (1991)). However, little has been done on examining the impact of assortative matching on assessing the return to schooling. In this section, I attempt to shed more light on this potential causal channel through which education affects the level of household consumption.

The presence of assortative matching on our estimate for the return to schooling has an ambiguous effect. If individuals exhibit positive assortative matching, the difference in per capita household consumption would be magnified since the effect of education on household consumption is aggregated over both spouses. This suggests that the estimate on the individual return to schooling is biased upwards if the effect of assortative matching is uncontrolled for, since there would be a positive correlation between an additional year of spouse's schooling and household consumption and a positive correlation between an individual's schooling and spouse's schooling. On the other hand, if individuals exhibit negative assortative matching ie. a low-educated individual marries someone with a higher level of education, the estimate for the return to schooling would be biased downwards.

In Becker's (1974) model of the household, marriage is characterised by positive assortative matching, where couples of similar characteristics, such as intelligence, family background and education, form unions. Initial observations of the data support this prediction. Figure 6a shows a positive correlation between an individual's and his spouse's education, with stronger positive correlation noted among higher educated individuals. Figure 6b indicates that approximately 1/3 of the sample are married to partners with exactly the same number of years of schooling. Close to half of them married someone with less than 3 years difference in years of schooling. Positive assortative

matching is more pronounced among high-educated individuals with senior high school and above level of schooling. Approximately half of the sample married someone with the exact same qualifications, as shown in Figure 6c. In fact, the largest concentration of couples with the exact same years of schooling is found at the senior high school level (12 years of schooling). On the other hand, positive assortative matching is less apparent for low-educated individuals with primary-school equivalent or lower qualifications, as illustrated in 6d.

I formulated a model which attempts to separate out the effect of assortative matching on the estimates for the returns to schooling. Rather than providing an indicative estimate of the effect of assortative matching, the purpose of this model is aimed at verifying the importance of the assortative matching channel in influencing household consumption. In particular, I am looking for evidence of positive assortative matching, as suggested by Becker (1974) and Mare (1991). The general specification of my model is as follows:

$$\ln c_i = \alpha + \beta_1 education_i + \beta_2 spouse\ education_i + \beta_3 education_i * spouse\ education_i + \gamma_1 x_i + \gamma_2 x_i^2 + \boldsymbol{b_i'\delta} + \epsilon_i \quad (12)$$

β_1 and β_2 are the effects of the individual's education and spouse's education on household consumption respectively. To simplify the analysis, I categorised individuals and their spouses into two groups: high-educated, where the individual completed senior high school[4] and above level of schooling, and non-high-educated, where the individual completed below senior high school level of schooling. The $education_i$ and $spouse\ education_i$ terms in Equation 12 are dummy variables which turn on if the individual falls into the high-educated category. The interaction term, $education_i * spouse\ education_i$, turns on if both husband and wife are high-educated. The variable of interest is β_3 as it indicates the marginal effect of marrying an equally-educated spouse

[4]The average years of schooling in my sample is 9.5 years.

on consumption, after controlling for both the individual's and spouse's individual effects on consumption.

Table 5 shows the results. In column (1), we see that an individual who received high-education is associated with a 38.1%[5] higher consumption than the average person who has below senior-high education. The inclusion of spouse's education in column (2) results in the estimate falling to 31.1% [5], indicating that a sizeable portion of the positive returns to schooling can be attributed to one's spouse's education. The addition of the interaction term in column (3) results in a further decrease in the effect of an individual's education on consumption. After controlling for an individual's level of schooling, marrying an equally-educated spouse has a two-fold effect. Firstly, this is through the higher earning ability of the spouse. Secondly, this is through the interaction between an individual and his/her spouse's high education level. Summing the three coefficients give 0.47, higher than the estimate obtained in column (1). Overall, the results lend support for the importance of the assortative matching channel when examining the returns to education for high-educated individuals.

To address concerns of possible different effects of positive assortative matching between high- and low-educated individuals, I ran a second set of regressions using the same specification in Equation 12 after replacing the dummies for high education with dummies for low education, which I define as having primary school and lower qualifications. To increase interpretability, I coded the dummies such that they turn on when the individual has above primary school levels of education[6]. I run a simple OLS regression in column (4), which suggests that the average return from obtaining above primary school qualifications is 24.6%, as compared to the average person with primary school and below qualifications. The inclusion of spouse's education in column (5) led to a fall in the effect of an individual's low education, which aligns with the results from

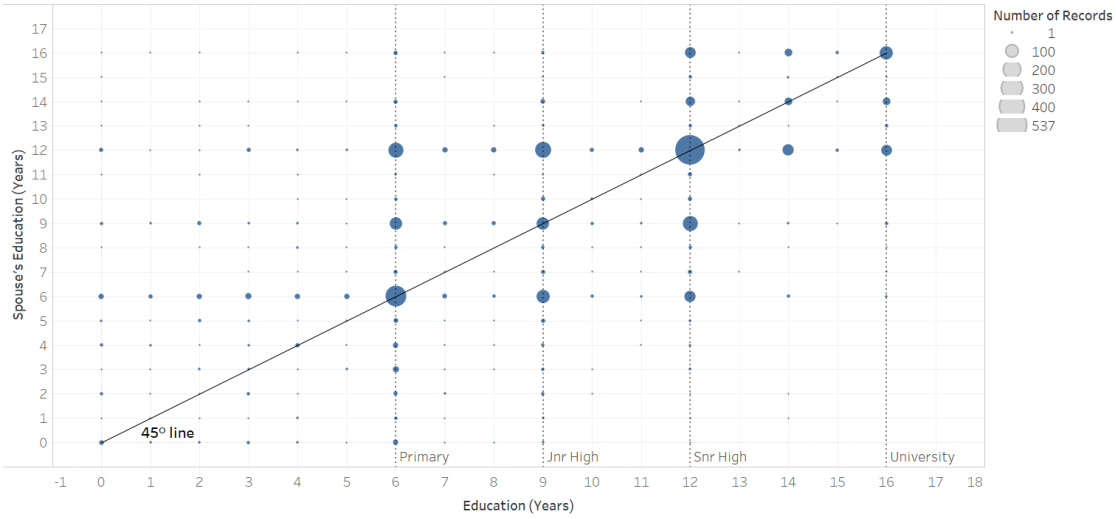
[5]Linear approximation for the exponential function is not used here for precision.

[6]Coding the dummies such that they turn on when an individual has low education would produce negative estimates for education. These are somewhat counter-intuitive as they would suggest a "negative" return to schooling.

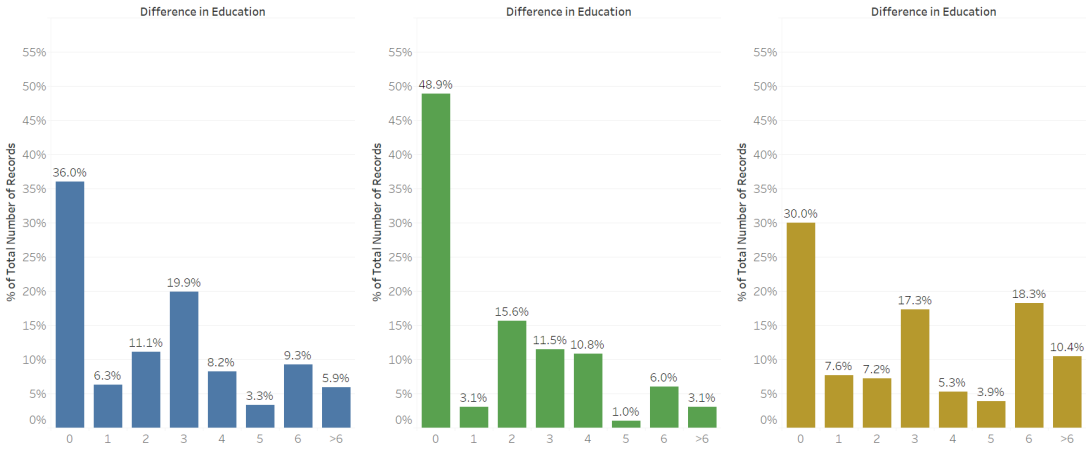
the "high education" specification. Adding the interaction term in column (6) causes the effect of an individual's education to fall dramatically and become less statistically significant, suggesting that the effect of assortative matching has been largely captured by the inclusion of spouse's education. Unlike for high-educated couples, the effect of assortative matching for low-educated couples is less pronounced. The difference could arise from the dissimilarity in labour participation as there is a higher chance for highly-educated couples to be both working. As a result, the union of two highly-educated individuals would result in a more significant increase in combined earning abilities and consumption.

Overall, the results from the model lend support for the assortative matching channel in examining the returns to schooling. In particular, highly-educated couples experience significant gains from assortative matching. Returns to schooling studies which do not account for this channel may understate the welfare returns from education, especially for high-educated individuals.

Figure 6: Educational assortative matching



(a) Scatter Plot of Education vs. Spouse's Education



(b) Overall Sample (c) High-educated($\geq$ 12 Years) (d) Low-educated($\leq$ 6 Years)

Table 5: assortative matching

	(1)	(2)	(3)	(4)	(5)	(6)
	High Education			Low Education		
	Assortative matching	Assortative matching	Assortative matching	Assortative matching	Assortative matching	Assortative matching
VARIABLES		Spouse Education	Interaction	Spouse Education	Interaction	
High Education	0.323***	0.271***	0.177***			
	(0.0165)	(0.0194)	(0.0281)			
Spouse High Education		0.196***	0.139***			
		(0.0229)	(0.0311)			
High Education*Spouse High Education			0.154***			
			(0.0419)			
Low Education				0.220***	0.167***	0.0563*
				(0.0219)	(0.0196)	(0.0287)
Spouse Low Education					0.207***	0.123***
					(0.0174)	(0.0317)
Low Education*Spouse Low Education						0.174***
						(0.0554)
Experience	-0.00299	-0.00142	-0.000536	-0.0115*	-0.0111*	-0.00918
	(0.00583)	(0.00583)	(0.00584)	(0.00574)	(0.00592)	(0.00576)
Experience^2	0.000134	0.000141	0.000111	0.000332**	0.000369**	0.000320**
	(0.000141)	(0.000142)	(0.000141)	(0.000144)	(0.000151)	(0.000146)
Parents' Consumption	0.196***	0.188***	0.187***	0.214***	0.205***	0.204***
	(0.0144)	(0.0145)	(0.0143)	(0.0138)	(0.0136)	(0.0131)
Father's Education	0.0158***	0.0138***	0.0134***	0.0198***	0.0186***	0.0182***
	(0.00221)	(0.00215)	(0.00205)	(0.00301)	(0.00312)	(0.00316)
Mother's Education	0.00927**	0.00801**	0.00739**	0.0135***	0.0113***	0.0106***
	(0.00344)	(0.00308)	(0.00317)	(0.00333)	(0.00293)	(0.00300)
Household Size	-0.113***	-0.113***	-0.113***	-0.112***	-0.112***	-0.113***
	(0.0108)	(0.0102)	(0.0101)	(0.0115)	(0.0110)	(0.0111)
Constant	10.44***	10.44***	10.47***	10.19***	10.20***	10.24***
	(0.226)	(0.215)	(0.208)	(0.214)	(0.204)	(0.199)
Observations	3,256	3,256	3,256	3,256	3,256	3,256
Adjusted R-squared	0.385	0.399	0.402	0.368	0.381	0.383
Province Controls	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses are clustered at province level.

*** p<0.01, ** p<0.05, * p<0.1

5.5 Examining the effects of education on the components of household consumption

In the previous sections, I have examined the effects of education on household welfare, as measured by changes in household per capita consumption. In this section, I aim to explore the effects of education on specific components of household consumption. I grouped household consumption into two main categories: "Food" and "Non-food." The "Food" category consists of fourteen main items, which includes staple food, oil, dairy, meat and fish (see **Appendix A** for full list and examples). Following the definition of the IFLS, tobacco and alcohol consumption are also included under the "Food" category.

The estimating model is as follows:

$$f_{gi} = \alpha_g + \beta_g s_i + \theta_{1g} x_{gi} + \theta_{2g} x_{gi}^2 + \boldsymbol{b_i'\delta} + \epsilon_{gi} \tag{13}$$

where f_{gi} is the log-consumption of item g for individual i, s_i the years of schooling for individual i, x_i the years of potential labour experience for individual i and $\boldsymbol{b_i}$ is a vector of controls for individual characteristics. The same controls from the original OLS regression are included (household and parental characteristics as well as province controls). β_g can be interpreted as a rough estimate for the income elasticity of demand for item g. I present the results in the following sections. The results are summarised in charts, while the full regression tables can be found in **Appendix B**.

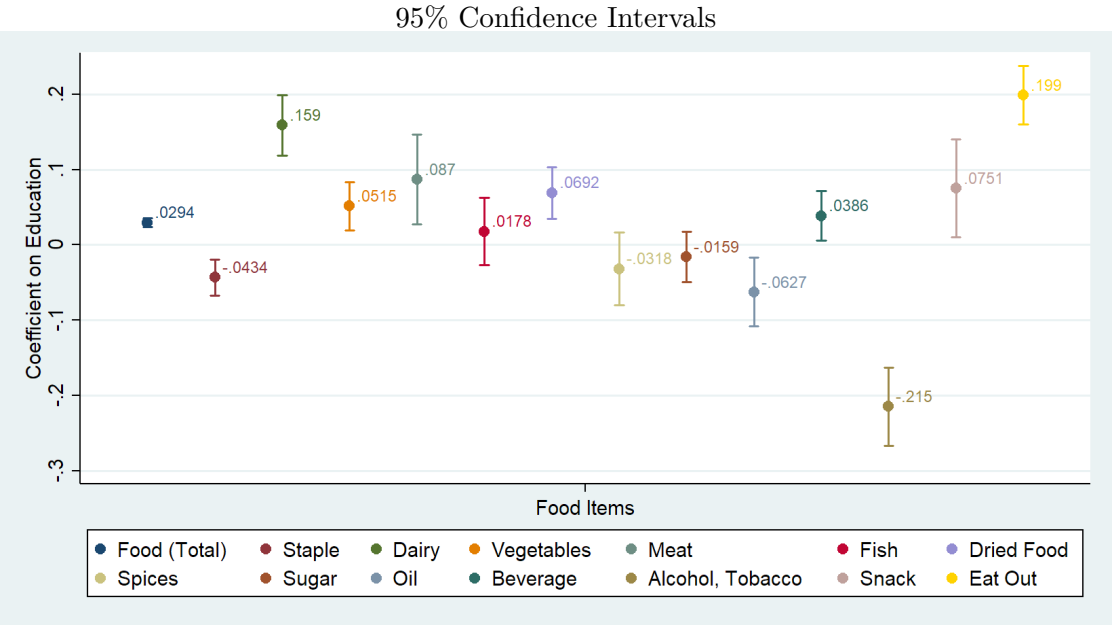
5.5.1 Food consumption

I run the model on the fourteen food items. The data were originally collected at the *weekly* level and then converted to monthly values by multiplying them with 52 and dividing by 12. The results are summarised in Figure 7. An additional year of schooling is associated with an approximately 2.9% increase in food consumption, as compared to the approximately 4.6% increase in total consumption obtained under the OLS model in the previous section. The relatively modest increase in food consumption accompa-

nied by the increase in education can be explained by the comparatively lower income elasticity of demand for food and the constraints on food intake. Additional education is negatively associated with the consumption of staple food, which includes the following: rice, corn, sago, cassava, potatoes, sweet potatoes, and yams. The consumption of spices (not significant) and sugar (not significant) are also negatively associated with higher education. On the other hand, the expenditure on dairy products experiences the greatest increase (15.9%) when an individual receives an additional year of education. The consumption of vegetables, meat and fish (not significant) are also positively associated with higher education. Notably, the consumption of alcohol and tobacco falls significantly when an individual becomes more educated. Expenditure for eating out increases by 19.9% for every extra year of schooling.

The results suggest that staple food is viewed as an inferior good, while dairy, vegetables, meat, fish, dried food and eating out are viewed as normal goods. In particular, considering their relatively large magnitudes of increase in consumption, dairy products and eating out could be luxury goods whose consumption increase more than proportionately with respect to income.

Figure 7: Approximate % change in food consumption associated with an additional year of schooling



5.6 Non-food consumption

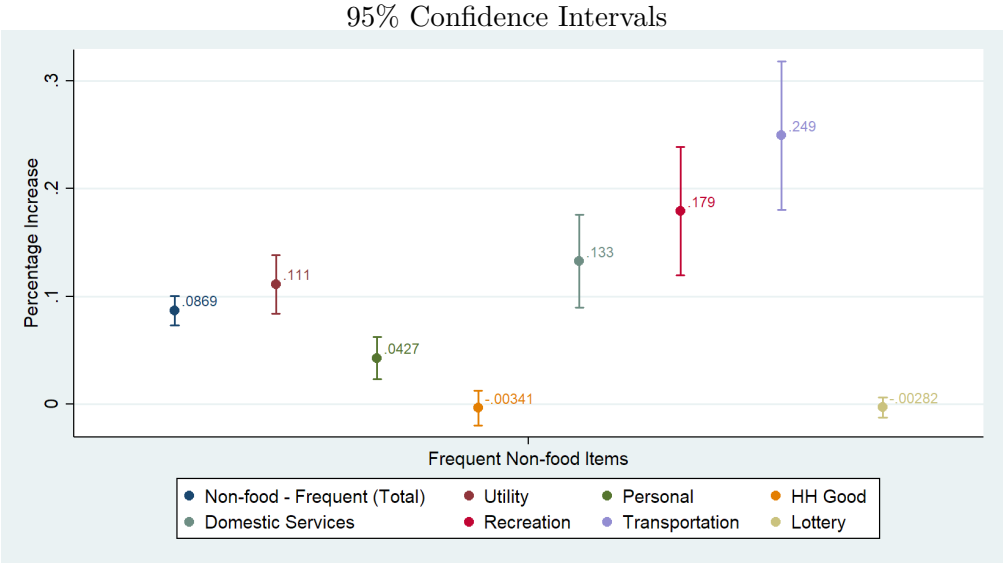
5.6.1 Frequently purchased non-food goods and services

The category of frequently purchased non-food goods and services includes: utilities (electricity, water, fuel, telephone), personal toiletries (soap, cosmetics etc.), household good (laundry soap, cleaning suppliers etc.), domestic services (maid, gardener etc.), recreation, transportation, and lottery. The consumption data for the goods were collected at the *monthly* level in the survey. The full regression table can be found in **Appendix B** while the results are summarised in Figure 8.

We observe that an additional year of schooling is associated with an approximately 8.7% increase in consumption of this category of goods, significantly higher than the increase for the "Food" category (2.9%). The largest increase is in transportation costs

(gasoline, car repairs and public transport fares) where an additional year of education is associated with a 28.3% increase. Recreation costs (movies, newspaper and magazine subscriptions) also experienced a significant increase with an additional year of schooling — 19.6% for an extra year of schooling. Consumption of lottery and household goods (cleaning items, detergent etc.) barely experience any change.

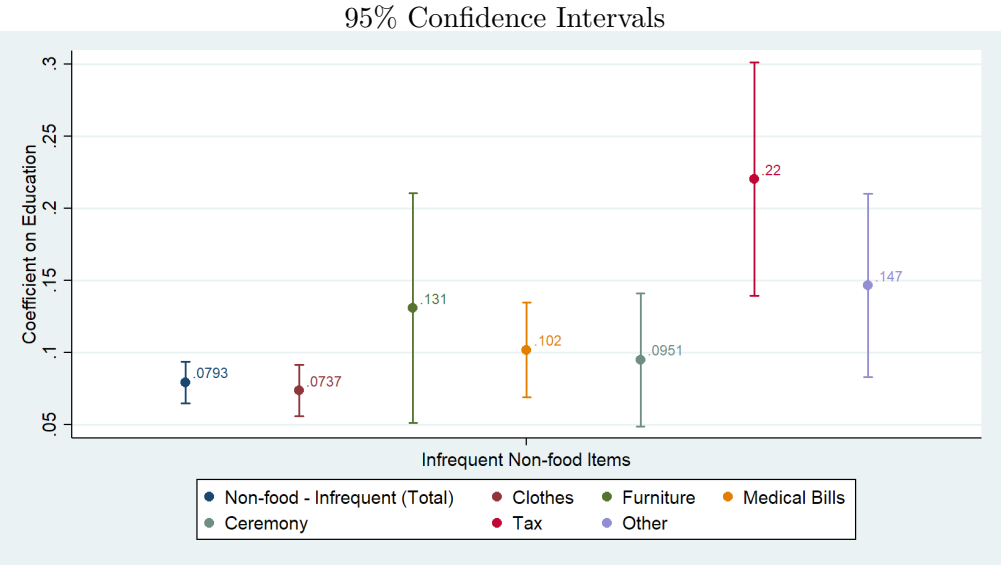
Figure 8: Approximate % change in frequent non-food consumption associated with an additional year of schooling



5.6.2 Infrequently purchased non-food goods and services

The results for infrequently purchased non-food goods and services are summarised in Figure 9. The data for these items were collected at the *annual* level and were then converted to monthly figures by dividing them by 12. An additional year of schooling is associated with an approximately 7.9% increase in the total consumption of these items. The greatest increase in expenditure under this category is tax expenses. An additional year of education is associated with a 24.6% increase in tax expenses. Furniture expense is also a significant contributor for this category of items, where an additional year of education is associated with a 10.0% increase.

Figure 9: Approximate % change in infrequent non-food consumption associated with an additional year of schooling



5.6.3 Housing and education

The final two items are housing and education. In Figure 10, we observe that an additional year of education is associated with an approximately 6.2% increase in housing expenses, which can either be the cost of rent or the rental value if the property is owned by the indiviudal. As the education level of an individual increases, he earns a higher income on average which allows him to either buy or rent a bigger house. A positive association is also found between an individual's level of education and the amount he spends on the education of his children. An additional year of education is associated with a 25.4% increase in children's education expenditure. The effect of gaining access to education is thus inter-generational as a higher educated individual is also more likely to provide higher quality education for his children.

However, there are a number of caveats associated with interpreting these estimates. The first issue is the measurement of housing expenditure. In the IFLS, respondents self-report the rent or rental value of their dwellings. The accuracy of the data depends on

how well-informed house owners and renters are in assessing the rental market value of their properties. If there is a correlation between the measurement error in the housing value and the education level of the respondent, I would expect the estimate for the effect of education to be biased. For instance, higher educated individuals may be more financially savvy and thus have better information on the rental values of their homes, which reduces the measurement error. On the other hand, the case of a classical measurement error structure in the outcome variable (housing expenditure) is less concerning as it would only result in a less precise estimate for the effect of education.

In addition, I did not model for the number of children, the type of school attended, the level of schooling and academic ability of the children which may affect the level of educational expenditure incurred by the individual. I propose this to be an area of further research. Since this area is not the focus of my research, my findings only suggests a potentially significant positive association between an individual's educational level and the amount he spends on the education of his children.

Another area of interest is how the level of education affects house ownership. I constructed a linear probability model with house ownership as the outcome variable and education as the independent variable. I also included all the usual controls. The results (not shown) are not indicative of any association between the two. In fact, 89.8% of my sample own the house they are living in.

Figure 10: Approximate % change in housing and education expenditure associated with an additional year of schooling

6 Discussions and limitations

Under the permanent income hypothesis and life-cycle theory, household consumption would paint a more accurate picture of household welfare as compared to income. However, significant challenges arise in attempting to model household idiosyncrasies. It is thus unsurprising that income is the preferred proxy for welfare for the majority of existing literature as it provides a more straight-forward estimate. Additionally, the use of self-reported consumption data in most household surveys increases the propensity of measurement error. Assuming a classical measurement error structure, measurement error in consumption data (dependent variables) would lead to less precise estimates, reducing the statistcal power of tests for the effect of education. Error in self-reported years of schooling (independent variables) would result in an attenuation bias. The estimates for the effect of schooling may then be biased downwards.

On the other hand, there may be complications if the measurement error is cor-

related with the required length of recall period or personal characteristics which are correlated with the level of education. Some items require respondents to recall expenses from a year before e.g. tax, clothes, medical. Another area of concern would be the different consumption patterns between households. Each household may have varying preferences for the purchase of goods and services. For instance, the food consumption data asks how much the household spend on various items over the past week. The timing of purchases is thus a concern here. Richer and more educated households may prefer to purchase in bulk. If the survey timing coincides with the bulk purchase, there would be an overestimate of the effect.

Despite its shortcomings, the use of household data as a measure of welfare does have many merits. First, household level data offers richer information on household and parental characteristics, which is not always available in income datasets. For example, household level data allows the exploration of the effect of education on specific components of consumption, which may be helpful for policymakers concerned with the welfare effects of government aid. Second, the use of consumption data has stronger theoretical grounding than income data as a measure of welfare. Especially in the case of developing countries where a large proportion of the labour force is in informal employment, consumption data provides an estimate for a more permanent level of welfare.

In general, consumption data presents itself as a viable alternative to the use of income data for the measurement of the returns to schooling. In exchange for the challenges involved with the modelling of household idiosyncrasies, household consumption data rewards us with a more accurate representation of the permanent level of welfare enjoyed by individuals.

7 Conclusion

This paper studies the effect of education on individual welfare, as measured by household per capita consumption. Building on the Mincer earnings function, Friedman's

permanent income hypothesis and Modigliani's life-cycle hypothesis, I constructed a simple linear model of the effect of education on household consumption. I found that the OLS model produced a smaller estimate as compared to existing literature which uses income as a measure of welfare. In my research, I attempted to control for ability bias using data from a standardised test administered as part of the survey. The small number of questions raises the concern over the validity of the test scores as a proxy for ability. Hence, I also adopted an IV strategy to introduce exogenous variation in education. The distance to the nearest junior high school is selected as an instrument and I found it to fulfil the relevance condition, even though there are concerns of it being a weak instrument. The validity of the instrument is also difficult to ascertain given the limited data. The IV model produced an estimate double that of the OLS estimate. Overall, I estimate the return to schooling in Indonesia to be in the range of 5.0 - 9.3%, slightly lower as compared to Duflo's (2001) study of Indonesia in the 1990s which produced estimates between 6.8 - 10.6%. I also explored the assortative matching channel for return to schooling and found it to have a positive effect on consumption as equally-educated individuals form unions. The effect from the positive assortative matching is stronger for educated individuals and explains a significant portion of their higher household consumptions. Lastly, I found significant heterogeneity in the effects of education on various components of household consumption. The increase in consumption of food items is relatively modest (2.9% for an additional year of education) as compared to the increase in transportation (28.3%) and recreation (19.6%) expenditures.

The paper, however, has its limitations. I can only construct a simple linear model linking education with consumption. Becker (1962; 1965; 1966; 1974; 1975) found household production to be a complex process which my model does not capture. This is an area where further research is needed, especially given the significance of the assortative matching channel. Additionally, the use of self-reported consumption data raises concerns of measurement errors, which may result in complications if the errors are correlated with an individual's level of education. I would suggest the use of alternative datasets to verify the extent of this error. In my paper, I assume homogeneity in the

quality of education. In reality, this assumption rarely holds due to significant heterogeneity in school funding and quality of teachers. An extension of this research is to include a control for the quality of schools.

Nevertheless, the paper adds to the limited literature of using consumption data to estimate the returns to schooling. I found consumption to be a viable alternative, especially when there is an absence of high-quality income data. Also, developing countries usually have a significant proportion of their labour forces employed in the informal sector, which makes income data especially susceptible to transitory shocks. Under such a scenario, consumption data may be a better proxy for welfare than income data.

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Appendices

A Household expenditure

The household expenditures are categorised as follows:

1. Food expenditure
2. Non-food expenditures: frequently purchased goods/services
3. Non-food expenditures: less frequently purchased goods/services (including durables)
4. Education expenditures
5. Housing expenditures

A.1 Food expenditure

Data on food consumption were collected by asking households about the values of each of the 37 food items purchased within the past week and the values of the food items out of own production or from a gift. The values were then converted to monthly figures by multiplying them by 52 and dividing them by 12. New variables were then constructed by grouping several relevant food items, such as staple food, vegetables, dried food, etc. A question is also asked about the value of the food given by the household to outside parties in the past week. The value of food transfer is excluded from the calculation of total food expenditure.

A.2 Non-food expenditures: frequently purchased goods/services

The expenditure categories are: utilities (electricity,water,phone), personal toiletries, household items, domestic services, recreation and entertainment, transportation, sweep-

stakes, *arisan*[7], and the values of non-food items given to other parties outside the household on a regular basis.

A.3 Non-food expenditures: less frequently purchased goods/services

The categories include expenditure for clothing, furniture, medical bills, ceremonies, and tax. Households were also asked about the value of self-produced goods and services (if any) from these categories. The figures were given for the previous survey year, which were then converted to monthly figures by dividing by 12.

A.4 Housing

Households were asked how much money they had to pay for monthly rent. Those which own the houses they were living in were asked how much money they would have to pay if they were renting their houses instead.

A.5 Education

Questions were asked about expenditure for education in the past year for the following categories: tuition, uniform, and transportation. For households with children who were living outside the household, additional questions about boarding were also asked. The values were divided by 12 in order to create the monthly figures.

A.6 Total household expenditures and per capita expenditure

Total household expenditure was constructed by adding the total food expenditure and the total non-food expenditure. The total food expenditure does not include transfers.

[7] An arisan is a form of rotating savings and credit association. Generally, it is a social gathering that takes place at a fixed interval at each member's home in turn. The rotating arisan holder (drawn by lots) receives payment from each other member and provides food for those members.

Similarly, the total non-food expenditure excludes transfers and *arisan*. It includes "non-food expenditures: frequently purchased goods/services", "non-food expenditures: less frequently purchased goods/services", education expenditures for children living in the household but not those living outside the household, and non-food items that were self-produced. The items included in the calculation of the household expenditure can be summarised as: hhexp = food + nonfood(frequent) + nonfood(less frequent) + educ(in household) + self-produced

Table A.6: List of items and examples

Item	**Examples**
Food	
Staple food	Hulled, uncooked rice
	Corn
	Sago/Flour
	Cassava, tapioca, dried cassava
Dairy	Fresh and canned milk, powered milk
Vegetables	Cucumber, spinach, tomatoes
	Beans and the like
	Fruits
Meat	Beef, mutton chicken
Fish	Salted fish, smoked fish
	Fresh fish, oyster, shrimp
Dried food	Noodles, macaroni etc.
	Cookies, bread, crackers
Spices	Soy sauce
	Shrimp paste
	Chilli sauce
	Salt
Sugar	
Oil	Cooking oil
Beverage	Coffee, tea
	Soft drinks
Alcohol,tobacco	Beer, wine, cigarettes
Frequent Non-food	
Utility	Electricity, water, fuel, telephone
Personal	Soap, shaving cream
Household good	Laundry soap, cleaning supplies
Domestic services	Housekeeper wages, chauffeur
Recreation	Movies, theater, outings
Transportation	Bus fare, cab fare, vehicle repair costs, gasoline
Lottery	Sweepstakes etc.
Infrequent Non-food	
Clothes	Shoes, hats, shirts, trousers
Furniture	Tables, chairs, bed sheets, towels
Medical	Hospitalisation charges, traditional healer's fee, medicines
Ceremony	Weddings, charities, gifts
Tax	Property, vehicle, income, sales tax
Other	Handphone, television sets, house, cars

B Additional Tables

Table B.1: Effect of education on food consumption

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
VARIABLES	Food(Total)	Staple	Dairy	Vegetables	Meat	Fish	Dried Food	Spices	Sugar	Oil	Beverage	Alcohol,Tobacco	Snack	Eat Out
Education (Years)	0.0294***	-0.0434***	0.159***	0.0515***	0.0870***	0.0178	0.0692***	-0.0318	-0.0159	-0.0627**	0.0386**	-0.215***	0.0751**	0.199***
	(0.00259)	(0.0110)	(0.0185)	(0.0148)	(0.0273)	(0.0204)	(0.0157)	(0.0221)	(0.0153)	(0.0210)	(0.0150)	(0.0238)	(0.0300)	(0.0179)
Experience	0.00659**	0.0552*	0.0714***	0.0444**	0.102***	0.122***	0.0619**	0.0697***	0.0159	0.0580	-0.00311	0.0406	0.0617*	-0.0495*
	(0.00268)	(0.0293)	(0.0226)	(0.0156)	(0.0268)	(0.0354)	(0.0257)	(0.0213)	(0.0227)	(0.0336)	(0.0266)	(0.0317)	(0.0330)	(0.0274)
Experience^2	-9.48e-05	-0.00105	-0.00156**	-0.000549**	-0.00168**	-0.00227***	-0.00125**	-0.00130**	9.67e-05	-0.00131*	0.000251	-0.00241***	-0.00172**	0.00122*
	(8.05e-05)	(0.000631)	(0.000620)	(0.000245)	(0.000569)	(0.000720)	(0.000545)	(0.000445)	(0.000366)	(0.000706)	(0.000570)	(0.000762)	(0.000704)	(0.000646)
Parents' Consumption	0.132***	0.0979*	0.685***	0.164**	0.416***	0.283*	0.218***	0.125	0.0564	0.0809	0.266**	0.0821	0.592***	0.462***
	(0.0166)	(0.0478)	(0.103)	(0.0685)	(0.0787)	(0.135)	(0.0652)	(0.0773)	(0.111)	(0.0985)	(0.0911)	(0.162)	(0.134)	(0.139)
Father's Education	0.00734***	-0.0113	0.00307	0.0213**	0.0395	0.00978	0.00952	-0.00891	-0.0435**	-0.0235	0.0412	-0.00115	0.0237	0.0332
	(0.00166)	(0.0130)	(0.0187)	(0.00864)	(0.0225)	(0.0304)	(0.0160)	(0.00913)	(0.0183)	(0.0201)	(0.0302)	(0.0198)	(0.0453)	(0.0267)
Mother's Education	0.00688**	-0.0194	0.0455**	-0.0110	-0.00793	-0.0442	-0.00536	-0.0272	-0.0334	-0.0537**	-0.0409*	-0.0605*	-0.00919	0.0269
	(0.00286)	(0.0197)	(0.0197)	(0.0141)	(0.0229)	(0.0302)	(0.0147)	(0.0189)	(0.0223)	(0.0198)	(0.0210)	(0.0321)	(0.0508)	(0.0407)
Household Size	0.0975***	0.450***	0.346***	0.286***	0.509***	0.473***	0.226***	0.476***	0.402***	0.474***	0.172***	0.392***	-0.0512	-0.211**
	(0.00429)	(0.0583)	(0.0357)	(0.0455)	(0.0699)	(0.0774)	(0.0470)	(0.0785)	(0.0596)	(0.0702)	(0.0379)	(0.0600)	(0.0754)	(0.0747)
Constant	11.14***	7.755***	-4.719***	6.067***	-1.423	3.149	3.917***	6.443***	6.849***	6.778***	3.166**	8.336***	-2.910	-3.752*
Observations	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543	4,543
Adjusted R-squared	0.302	0.108	0.102	0.090	0.123	0.158	0.058	0.141	0.097	0.105	0.057	0.060	0.062	0.092
Province Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B.2: Effect of education on frequent non-food consumption

VARIABLES	(1) Non-food - Frequent (Total)	(2) Utility	(3) Personal	(4) HH Good	(5) Domestic Services	(6) Recreation	(7) Transportation	(8) Lottery
Education (Years)	0.0869***	0.111***	0.0427***	-0.00341	0.133***	0.179***	0.249***	-0.00282
	(0.00630)	(0.0125)	(0.00897)	(0.00744)	(0.0197)	(0.0273)	(0.0317)	(0.00428)
Experience	0.0124*	0.000643	0.0211	0.0241*	0.0296	0.0574**	0.0357	-0.00390
	(0.00658)	(0.0101)	(0.0139)	(0.0132)	(0.0197)	(0.0208)	(0.0326)	(0.00578)
Experience^2	-0.000140	0.000312	-0.000552**	-0.000844**	4.24e-05	-0.000105	-0.00110	7.09e-05
	(0.000177)	(0.000303)	(0.000230)	(0.000348)	(0.000403)	(0.000383)	(0.000745)	(0.000122)
Parents' Consumption	0.238***	0.324***	0.133*	0.0605	0.460***	0.502***	0.579***	0.00337
	(0.0236)	(0.0626)	(0.0626)	(0.0741)	(0.119)	(0.0639)	(0.108)	(0.0213)
Father's Education	0.0284***	0.0133	0.0122	0.00137	0.00920	0.108***	0.123***	-0.000390
	(0.00355)	(0.00770)	(0.00972)	(0.0148)	(0.0226)	(0.0272)	(0.0304)	(0.00440)
Mother's Education	0.0159***	0.0244**	0.0146	0.0253	0.105***	0.0879***	-0.00229	-0.000507
	(0.00354)	(0.00806)	(0.0122)	(0.0177)	(0.0270)	(0.0275)	(0.0325)	(0.00619)
Household Size	0.132***	0.220***	0.0763***	0.120***	0.0933	0.0233	0.192***	-0.00709
	(0.00772)	(0.0211)	(0.0192)	(0.0204)	(0.0664)	(0.0287)	(0.0582)	(0.00930)
Constant	7.257***	4.575***	6.703***	8.022***	-8.106***	-8.573***	-4.584**	0.160
	(0.348)	(0.876)	(0.838)	(1.065)	(1.741)	(1.036)	(1.541)	(0.317)
Observations	4,588	4,588	4,588	4,588	4,588	4,588	4,588	4,588
Adjusted R-squared	0.395	0.236	0.054	0.017	0.168	0.138	0.127	-0.001
Province Controls	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses and clustered at province level.

*** p<0.01, ** p<0.05, * p<0.1

Table B.3: Effect of education on infrequent non-food consumption

VARIABLES	(1) Non-food - Infrequent (Total)	(2) Clothes	(3) Furniture	(4) Medical	(5) Ceremony	(6) Tax	(7) Other
Education (Years)	0.0793***	0.0737***	0.131***	0.102***	0.0951***	0.220***	0.147***
	(0.00665)	(0.00820)	(0.0366)	(0.0151)	(0.0212)	(0.0372)	(0.0293)
Experience	0.0118	0.0198	0.00406	0.0305	0.0331	0.0161	0.0131
	(0.00937)	(0.0120)	(0.0312)	(0.0241)	(0.0297)	(0.0247)	(0.0385)
Experience^2	-0.000183	-0.000459	-0.000206	-0.000761	-0.000428	0.000892*	-0.000412
	(0.000240)	(0.000299)	(0.000701)	(0.000525)	(0.000674)	(0.000441)	(0.000662)
Parents' Consumption	0.300***	0.258***	0.361**	0.390***	0.407***	0.682***	0.528***
	(0.0304)	(0.0265)	(0.132)	(0.0737)	(0.0746)	(0.113)	(0.162)
Father's Education	0.0152**	0.0167	0.00540	-0.0262	-0.00783	0.0112	-0.00222
	(0.00511)	(0.00955)	(0.0220)	(0.0248)	(0.0130)	(0.0132)	(0.0209)
Mother's Education	0.000832	-0.00859	-0.0109	0.00325	-0.0282	0.0152	0.0118
	(0.00571)	(0.00903)	(0.0305)	(0.0229)	(0.0193)	(0.0232)	(0.0407)
Household Size	0.125***	0.112***	-0.0140	0.207***	0.218***	0.458***	-0.0386
	(0.0122)	(0.0228)	(0.0550)	(0.0395)	(0.0316)	(0.0337)	(0.0601)
Constant	6.056***	5.261***	-3.403**	0.833	0.256	-9.981***	-5.342**
	(0.406)	(0.436)	(1.476)	(1.020)	(1.172)	(1.523)	(1.957)
Observations	4,599	4,599	4,599	4,599	4,599	4,602	4,599
Adjusted R-squared	0.232	0.092	0.044	0.049	0.073	0.213	0.058
Province Controls	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses and clustered at province level.

*** p<0.01, ** p<0.05, * p<0.1

Table B.4: Effect of education on housing and education for children of individuals

	(1)	(2)
VARIABLES	Housing	Children's Education
Education (Years)	0.0617***	0.226***
	(0.00729)	(0.0483)
Experience	-0.000330	0.565***
	(0.0105)	(0.0383)
Experience^2	0.000262	-0.00944***
	(0.000254)	(0.000926)
Parents' Consumption	0.177***	0.0715
	(0.0254)	(0.169)
Father's Education	0.0214***	-0.0120
	(0.00586)	(0.0376)
Mother's Education	0.0229***	0.00158
	(0.00593)	(0.0337)
Household Size	0.0604***	1.209***
	(0.00987)	(0.0831)
Constant	7.980***	-9.247***
	(0.335)	(2.448)
Observations	4,628	4,617
Adjusted R-squared	0.339	0.224
Province Controls	YES	YES
Controls	YES	YES

Robust standard errors in parentheses and clustered at province level.

*** p<0.01, ** p<0.05, * p<0.1

C Data sources

Figure C.1: Map of the 13 IFLS provinces in Indonesia

Figure C.2: Sample of ability test question