Educational Attainment as a Determinant of Internal Migration

Evidence from Indonesia

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ABSTRACT

This thesis examines the effect of educational attainment on an individual's migration decision within Indonesia. Previous scholars have emphasized the importance of education as a selection factor into migration. However, empirical evidence from developing countries on the relationship between education and migration is relatively thin. Studies performed in the past mainly used aggregate data and were unable to identify the effect of educational attainment, prior to migration, on the decision to move. This thesis aims to fill this gap in the literature by using an extensive panel dataset that tracks Indonesian households and individuals over time. Using a binomial logit model, the effect of educational attainment on the migration decision is analyzed at three different spatial levels. Overall, the results indicate that educational attainment has a significant positive effect on migration for higher levels of education and that this effect is quite substantial. Supported by existing theory, it is argued that the observed positive relationship may be due to increased employment opportunities, acquired skills and enhancement of social networks associated with education.

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1 INTRODUCTION

Migration can be defined as "the movement of a person or a group of persons, either across an international border, or within a state." (IOM, 2011). More than 231 million people reside in another country than that in which they were born[1] (United Nations, 2013), which is nearly three percent of the world's population. The number of people moving within countries is even larger with an estimated number of 381 million adults on the move (Esipova, Pugliese, & Ray, 2013).

Population movements have important implications for the development process. Although migration can be beneficial to the migrant, it is not necessarily beneficial to society as a whole. Especially in developing countries, migration may lead to overcrowding of cities, unemployment and imbalances between rural and urban areas (United Nations, 2011). Once we know which (groups of) people migrate and why, it is possible to influence migration patterns by adapting policy accordingly and influence development processes. This thesis therefore investigates one of the determinants of internal migration. More specifically the analysis focuses on *the influence of educational attainment on the migration decision of an individual in Indonesia*.

Indonesia, one of the most populous countries in the world, is an interesting case to study for several reasons. The country has experienced major improvements in living standards over the past years. Educational improvements have led to substantial increases in school enrolment rates, with an increase in primary and secondary school enrollments from 72% and 16% in 1972 to 92% and 76% in 2012, respectively (Worldbank, 2014). Furthermore, Indonesia has a long history of internal migration. During the colonial rule of the Dutch a transmigration program was implemented aiming to decrease overpopulation (Muhidin, 2002), where individuals were involuntarily moved. After independence the program continued to balance regional development throughout Indonesia. Migrants received either full or partial financial support from the government (Fearnside, 1997). The program was shut down in 2000, but internal migration flows remained significant in magnitude.

Migrants do not represent a random sample of the overall population (Lee, 1966; Todaro, 1980) and seem to share certain characteristics that make them more likely to move. Previous literature on selectivity factors for migration emphasized the role of gender, age, income, family, health and education (Lee, 1966; Lucas & Stark, 1985; White & Lindstrom,

[1] This number represents the international migrant stock measured over a five year interval.

2005; Lu, 2010). Migrants in general tend to be better educated (Kuznets & Thomas, 1957; Lee, 1966; Lucas, 1997; Lu, 2008), but the direction of causality is still only weakly established.

Recent studies, examining the relationship between educational attainment and an individual's decision to move in developed countries, use instrumental variables techniques. Some studies find that education increases the likelihood of moving, especially for higher education levels (Malamud & Wozniak, 2012; Haapanen & Böckerman, 2013). Others find that lower levels of education increase the likelihood of moving (Machin et al., 2011) or by contrast, show that additional schooling at lower levels of education has a negative impact on the decision to migrate (McHenry, 2013). Although evidence from developed countries leaves us with mixed results, there is an indication that the effect of educational attainment on the decision to migrate varies by education level.

The literature presenting empirical evidence on educational selectivity in developing settings is relatively thin, since reliable data is often not available. The existing studies mainly use aggregate data and analyze the relationship in terms of migration flows instead of the individual's decision to migrate. A positive relationship between educational attainment and migration is often found (Sahota, 1968; Levy & Wadycki, 1974), although it remains doubtful whether this reflects the possibility that individuals move to obtain education elsewhere or the effect of previously obtained education on the willingness to migrate.

This thesis attempts to fill this gap in the literature in several ways. First, instead of aggregate data, an extensive panel dataset on individuals and households in Indonesia is used to analyze the effect of education on migration at the individual level. Secondly, since the same individuals are tracked over time, the data allows for identification of the effect of educational attainment, prior to migration, on the decision to move. By evaluating the migration decision at three different spatial levels, the results of this thesis show that educational attainment seems to have a positive and significant effect on an individual's decision to move for higher levels of education.

Previous scholars have emphasized various channels through which education may affect the migration decision. It is argued that the observed effect can be explained by increased employment opportunities, acquired skills and network effects that are associated with education. Higher educated individuals have better possibilities of finding a job and are more likely to obtain a higher income after moving (Harris & Todaro, 1970; Williams, 2009), which increases the likelihood of obtaining a positive outcome from migration. Furthermore, the acquisition of skills and a larger social network obtained from education make an individual more likely to migrate (Williams, 2009; De Jong, 2000; Mckenzie & Rapoport, 2007).

This thesis is organized as follows. After introducing Indonesia as the study area for the analysis, Section 3 provides a theoretical background on what has been previously established on the determinants of internal migration. Section 4 provides the analytical framework discussing the mechanisms that may drive the relationship and focuses more specifically on the relationship between education and migration. Subsequently, Section 5 elaborates on the dataset and variables used for analysis. The methodology is discussed in Section 6 and results are presented in Section 7. A discussion will follow and Section 9 concludes.

2 THE STUDY AREA

Indonesia is the fourth most populous country in the world and the largest country in South-East Asia. Its population of 250 million inhabitants is spread out over 13,000 islands that are greatly diversified in terms of population density, economic development, ethnicity and culture. The country has experienced great economic development over the last decades, with a current GDP growth rate of nearly 6% (Asian Development Bank, 2014). Indonesia has also experienced major improvements of living standards in many ways. The poverty headcount ratio[2] fell by 47% between 1984 and 2011. Infant mortality fell from 114 per thousand live births in 1970 to 25 in 2013 (Worldbank, 2014). Educational policy aimed at the provision of basic education for everyone has facilitated a rise in school enrollment rates in Indonesia (Purwadi & Muljoatmodjo, 2000). Primary and secondary school enrollments increased from 72% and 16% in 1972 to 92% and 76% in 2012, respectively (Worldbank, 2014).

Along with economic development, large shifts in rural and urban populations are observed with an urbanization rate of 3% per year over the last decade (Worldbank, 2014). Between 1971 and 1995 the proportion of Indonesians who had ever lived in another province increased from 6.3% to 11.2% for males and from 5.1% to 10.0% for females. (Hugo, 2000). Development in the past and the present has mainly centered on the most densely populated island of Java, where 60% of the population resides.

A long history of internal migration preceded these more recent population movements. During the colonial rule of the Dutch, a transmigration program was implemented in 1905 to move people from the most populated islands of Java and Bali to less populous areas aiming to decrease overpopulation. Individuals were involuntarily moved, mainly to work in agriculture at the island of Sumatra.

[2] The proportion of the population that lives below $1.25 a day.

After independence, the program continued in order to increase the standard of living of the resettled population and to balance regional development throughout Indonesia (Muhidin, 2002, p. 50-65). Although the aim of the resettlement program changed, the number of people involved increased tremendously. Between the years 1979 and 1989 more than 3.5 million people from 765,000 families were moved to the outer islands with either full or partial financial support from the government (Fearnside, 1997). Individuals or households willing to move voluntarily and at their own expense received partial financial assistance. After the Asian crisis in 1998 that hit the economy severely, the transmigration program was no longer a priority of the Indonesian government. The number of transmigrants decreased accordingly to 4,400 transmigrants between the years 1999 and 2000 (Sri Adhiati & Bobsien, 2001).

The program has been controversial, due to its association with deforestation, questions with regard to human rights violations and its inability to meet the initial goals of the program. Although some individuals were able to increase their standard of living, many transmigrants remained in poverty (Fearnside, 1997).

After the program's shutdown in 2000, internal migration flows were still significant in magnitude. The patterns of migration vary among Indonesian provinces. The larger provinces of Java and Sumatra are mainly characterized by in-migration, whereas "the provinces of West Sumatra, Maluku, Irian Jaya, Kalimantan, Nusa Tenggara, and Sulawesi have more out-migrants than in-migrants" (Muhidin, 2002, p. 56). This thesis focuses on internal migration in the period between 2000 and 2007, thereby leaving migration related to the transmigration program out of consideration. It must be noted that historical migration patterns, shaped by the transmigration program, might have influenced the pattern of current population movements in Indonesia.

3 THEORETICAL BACKGROUND

Many theories have been proposed to explain what drives internal migration. It is possible to broadly classify the literature within three different sorts of explanations for migration. The first explains migration patterns in terms of the individual's costs and benefits associated with migration. Migration can also be explained by push- and pull frameworks where the attributes of place of origin and destination are compared. Finally, more recent theories and evidence show that migration can be explained from the selectivity of migrants. The section will start with an overview of early migration theories on which more recent work is built. As this thesis focuses on education as a determinant of internal migration, the remainder of this section

discusses previous work related to individual selection factors for migration. Evidence on the relationship between educational attainment and the migration decision will be discussed in Chapter 4.

3.1 Early migration theories

3.1.1 Cost and benefits of migration

Lewis' (1954) famous dual-sector model is an economic model where the decision to migrate depends ultimately on the income differential between the traditional sector and the manufacturing sector. Rural surplus labor is withdrawn from the traditional sector to be moved to the urban manufacturing sector where wages are higher, creating a stream of rural-urban migration. Labor migrants are assumed to make fully rational decisions and at the end of the transition process, wages are equalized between the two sectors. Although the model does not seem to hold well empirically, the Lewis model has long been the point of departure in the development of migration theories.

In reality, less developed economies experience rural-urban labor migration accompanied with urban unemployment and positive marginal products of labor. The Lewis model is unable to explain this disequilibrium. Harris & Todaro (1970) develop an analytical model to account for this unemployment phenomenon. Individuals decide on migration by weighing the prospective income gain of moving, incorporating the possibility of being unemployed for a period of time, against their wage in the rural sector. Although this model, based on *expected* income differentials, better approximates the situation in developing countries, it is far from perfect. The model assumes that individuals are risk neutral and are therefore indifferent between an equal expected uncertain amount of urban income and an expected certain amount of rural income. Similarly to Lewis' framework, the model assumes migrants mainly incorporate economic factors in their decision making process, whereas in reality much more aspects are of importance.

3.1.2 Push- and pull theories

In addition to economic factors, push- and pull theories also incorporate cultural, environmental and political factors that may affect migration patterns. Differences in the characteristics of place of origin and place of destination are assumed to motivate individuals to migrate. These characteristics can be divided into push factors defined as negative attributes of the place of origin and pull factors that attract individuals to another area.

Ravenstein's 'Laws of migration' (1885) serves as a starting point of the push- and pull theories. He argues that migration occurs in a series of different stages, where migrants first move to urban areas and the gaps created from these rural-urban migrants are filled with inhabitants from more remote areas. The paper also mentions rural-urban differences in propensity to migrate, which is nowadays a topic of interest especially in developing countries where urbanization increases significantly along with economic development.

Lee (1966) extends the basic push- and pull framework of Ravenstein (1885) with the idea of intervening obstacles that make migration from one place to another more difficult. Obstacles include physical barriers that raise travel costs, such as distance, mountains and oceans, but also include invisible barriers such as language, migration laws or lack of capital.

Personal characteristics influence the way the individual perceives the attributes of place of origin and destination and the extent to which the individual can conquer the intervening obstacles. For example, younger individuals are more flexible in general and therefore better able to travel large distances and overcome language barriers. Although Lee (1966) does not provide us with any empirical evidence, he introduces the idea of a certain (individual) threshold to migration that is influenced by personal factors. The influence of these personal factors is the point of departure for theories that explain migration in terms of the selectivity of people.

3.2 Selectivity and the decision to migrate

Although the previously mentioned economic models and push- and pull frameworks have laid the basis for more recent migration theories, they have not been able to explain the characteristics of individuals who migrate and the factors influencing an individual's decision to migrate. As migrants do not represent a random sample of the population (Lee, 1966; Todaro, 1980), it is important to identify what (groups of) individuals select into migration.

Migrants seem to share certain characteristics that make them more likely to move. One of the main works emphasizing the selectivity of people is the book on 'Population redistribution and economic growth' by Kuznets & Thomas (1957). The researchers analyze inter-state movements of people in the United States measured from different population censuses between the years 1870 and 1950. They find that migrants are probably preselected "for their capacity to detach themselves from traditional surroundings" and emphasize that "there are marked migration differentials by sex, age, race, family status, education, health and

many other social and demographic characteristics" (id., p.3). In general, migrants seem to be less risk averse and better at adjusting themselves to a new environment.

3.2.1 Gender differences

Gender differences play an important role in shaping migration patterns. Especially migration for labor purposes is selective by gender, as "labor markets are often stratified by gender due to the gender typing of occupations and employers' preferences for workers of a particular gender" (White & Lindstrom, 2005, p. 326). Furthermore, familial roles and gender relations within the household may affect the decision to move.

In Indonesia and other South-East Asian countries, there seems to be stronger parental control over daughters than over sons. Households therefore prefer to send female rather than male children to migrate elsewhere to earn income for the family, as it is expected that daughters send a larger share of their earnings as remittances back home (Chant, 1998). Moreover, males rather than females are often characterized as the household head and the main decision maker of the household in developing countries. Although it is not entirely clear as to whether females or males are more likely to migrate in general, the migration decision is evidently influenced by gender differences.

3.2.2 Age and stages in the life-cycle

Selection into migration is related to different stages of the human life cycle (Lee, 1966). Mobility is higher for individuals that have fewer commitments at their place of residence (Fischer & Malmberg, 2001). The young, unmarried and those who have fewer children eligible for school are therefore more likely to move (White & Lindstrom, 2005). Certain life events also influence an individual's decision to move. Individuals who get married, have a baby, start an education or enter the labor force are more likely to change their place of residence (Lee, 1966; White & Lindstrom, 2005).

These events generally happen at common age levels for different individuals and shape the relationship between age and migration as depicted in the Rogers-Castro curve (as cited in Lucas, 1997, p. 731). The curve shows an inverted U-shaped relationship between age and migration. The migration rate increases at a decreasing rate for teenagers and finds its peak at early adulthood; it then diminishes at a decreasing rate until the retirement age.

3.2.3 Employment

In accordance with a higher propensity to move for young job-seeking individuals as mentioned before, being unemployed makes an individual more likely to move, regardless of his or her age (Bailey 1993; Ghatak, 1996). A reason for this selection effect is that "migration helps individuals find jobs by increasing the range of available job opportunities" (Bailey, 1993).

On the other hand, unemployment may deter individuals from moving as the unemployed may lack economic resources that are needed to facilitate migration. Moving involves costs associated with preparation, transport to the destination and the arrangement of accommodation. These costs can better be borne when an individual is employed and receives an income.

3.2.4 Family considerations and income

Individual agents are not completely independent in their decision to migrate and also incorporate preferences and constraints of their families (Stark, 1991). Pressure from family or other members within the household may motivate an individual to move. Individuals may be induced by their families to educate themselves at the households' expense to improve employment opportunities, which in turn allows them to send remittances to their families back home (Lucas & Stark, 1985).

Furthermore, an unexpected decrease in overall household income can affect household composition and the decision to migrate. Households that are hit by a negative income shock may choose to send members to live with other households that are less affected by the shock or to areas where the cost of consumption is lower (Frankenberg et al., 2003, p. 300). Households may also insure themselves against negative income shocks by educating a household member to earn a higher wage elsewhere and send remittances back home (Lucas & Stark, 1985).

Witoelar (2002) shows that the probability of household division is positively related to household size. When analyzing migration at the individual level, household size may therefore affect the decision to move. Assuming that the family shares its budget to some extent, individuals from larger families might be better able to afford moving to another area, since more individuals are able to earn an income for the total household budget. On the other hand, a larger family might discourage an individual from moving since he or she leaves more household members behind, which affects the emotional or psychological cost of moving.

3.2.5 Health

Individuals in good health can more easily overcome any difficulties associated with moving. Especially long-distance and work-related moves require a minimum level of physical ability to endure the journey and attain economic gains (Lu, 2008). On the other hand, illness may give individuals an incentive to move to areas where they can rely on familial support or better health care (Halliday & Kimmit, 2008).

4 EDUCATIONAL SELECTIVITY AND MIGRATION

Educated individuals seem to share certain characteristics that make them more likely to move compared to their non-educated counterparts. Education thus acts as a selection factor for migration. This section provides support for the main aim of this thesis, which is to identify the effect of educational attainment on the individual's decision to migrate. First, an analytical framework is developed presenting the main mechanisms through which educational attainment can affect the migration decision. Subsequently, empirical evidence on the relationship between education and migration from related research is discussed.

4.1 Analytical framework

The theoretical literature seems to favor a positive relationship between educational attainment and migration, especially at higher levels of education (Gould, 1982; Greenwood, 1997; Lee, 1966; Lucas, 1997; Todaro, 1980; White & Lindstrom, 2005). Three different mechanisms can be identified through which educational attainment influences the decision to migrate: employment opportunities, acquired skills and network effects.

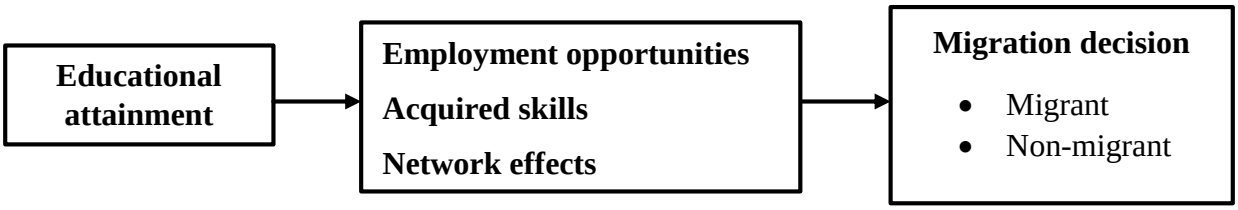

Figure 1: Representation of the analytical framework for the effect of educational attainment on an individual's decision to move.

Migration selectivity based on income levels and employment status, as discussed in Section 3.2, is closely related to educational selectivity for migration. Economic theories predict a better (economic) outcome from migration for individuals who have received education (Harris & Todaro, 1970; Williams, 2009). A higher level of education provides better employment opportunities at the place of destination through two different channels. First,

higher educated individuals have better possibilities of finding a job elsewhere as high-skilled workers are eligible for low-skilled worker jobs, but the reverse is not necessarily true. Second, the educated are more likely to obtain a higher income after moving as education generally provides individuals with improved skills to apply for jobs that are better paid.

The decision to move is not just a consideration of the individual alone. Individuals may be induced by their families to educate themselves at the households' expense to improve employment opportunities, which allows them to send remittances to their families back home (Lucas & Stark, 1985).

Education not only increases the chances of finding a (better) job, but also provides people with cognitive, emotional and social skills that are helpful throughout life (OECD, 2010). Educated individuals share certain characteristics, acquired during their education, that make them more likely to move. Education teaches individuals to be better aware of their environment and opportunities. It also provides individuals with tools for planning and making important decisions. The acquired skills from education may improve the capacity to complete the journey and conquer possible difficulties associated with moving such as adapting to a new environment, which decreases the costs and risks of migration (Williams, 2009).

Furthermore, education influences the decision to migrate through the expansion of social networks. Social networks have been identified as a determinant of internal migration, whereby individuals who have migrated themselves or live at the destination provide the migrant with information and assistance (De Jong, 2000; Mckenzie & Rapoport, 2007). Education puts individuals into contact with other people outside their families and thereby enhances their social network. Moreover, "these social networks are selectively comprised of educated individuals who may be more likely to migrate themselves" (Williams, 2009, p. 884), which may positively influence an individual's propensity to move as migration is a more common phenomenon in the social group they belong to and assistance for migration is more easily found.

Overall, more educated individuals have higher chances to obtain a job at the migration destination and are more likely to obtain a higher income after moving. Furthermore, the individual's propensity to migrate is positively influenced by the acquisition of skills and an increased social network obtained from education. This creates an incentive for the more educated to move as opposed to their non- (or less) educated counterparts as the educated have a better outlook of obtaining a positive outcome from their decision to migrate.

4.2 Empirical evidence

The view that (internal) migration is a complex process with many more factors of influence than conventional theory suggests, asks for an empirical approach in order to investigate its determinants. The studies performed in the past predominantly use aggregate data, especially in developing settings. More recent studies in developed countries are able to analyze migration at the individual level, due to better availability of microeconomic datasets.

Although education is often included as a control variable in developing settings, the majority of microeconomic studies do not center on the educational selectivity of migration (Lu, 2008; Deb & Seck, 2009). A related study by Witoelar (2002), examines the effects of intra-household differences of education on the probability of household division in Indonesia. Household division is defined as "the event when an adult leaves his or her original household" (id., p.1). This definition does not allow for identification of exactly who is leaving, but only investigates household division in general. Higher maximum years of education of household members is associated with a higher probability of household division, whereas higher education of the household head decreases the probability of home-leaving by household members. A possible explanation is that more educated household heads have "more control over household resources and may be able to increase the gains from joint household" (id., p.14) and "household division may be primarily driven by the migration of the young, more educated, adult males, from the household" (id., p. 15).

Other studies in developing settings that are directly related to education and migration, use data on general migration flows. Sahota (1968) analyses interstate migration in Brazil by using aggregate census data. Individual education levels were not available, hence the average education levels of origin and destination regions are used to examine the relationship between migration and education. Education seems to act as a deterrent on migration in the place of origin and as an attraction for the region of destination.

Sahota (1968) concludes there is evidence that education promotes migration. However, the dataset does not allow for a division in temporal and permanent movements. The possibility of including circular migration for educational or labor purposes is therefore present. Furthermore, the estimated effect captures the effect of previously obtained education on the willingness to migrate as well as the attractiveness of educational opportunities at the place of destination.

Estimating a model of interstate migration in Venezuela, Levy & Wadycki (1974) attempt to separate these effects, by taking the number of people enrolled in school in place of origin and destination as explanatory variable for migration and run separate regressions for

differently educated individuals. Educated individuals seem to be more mobile because "they have better access to information and a greater incentive to make additional investments in a search for better opportunities" (id., p. 387). It remains doubtful whether this can truly be identified, since the age at which the migrants move is unknown. Especially for young adults, who have not reached their productive age yet, moving to be (additionally) educated elsewhere may be the underlying incentive.

These studies show that identifying the effect of educational attainment on migration is rather problematic in developing countries. More recent work in developed countries uses microeconomic data on education and migration to identify a causal effect. Instrumental variable techniques are employed to show that education has a direct significant impact on internal migration.

Malamud & Wozniak (2012) use variation in college attainment in the U.S. due to draft-avoidance behavior during the Vietnam War as an instrument for education. Using individual-level census data, their results show that additional years of higher education significantly increase the likelihood that men changed their place of residence since birth. Machin et al. (2011) take a similar approach by exploiting variation in the Norwegian school reform and show that one additional year of education at the lowest levels of schooling increases the likelihood of an individual to move.

Analogous results are found by Haäpanen & Böckerman (2013) for higher education when using a major education reform in Finland as their instrument for education. In contrast, McHenry (2013) exploits variation in schooling due to compulsory schooling laws in the U.S. to show that additional schooling at low education levels has a significant *negative* effect on migration. These divergent results indicate that the relationship between educational attainment and migration may vary by education level.

Overall, education appears to be an important determinant of migration. In developing countries the absence of reliable microeconomic data is often problematic for identification, whereas evidence from developed settings provides more convincing though mixed results. There is an indication that the effect of education on migration varies by education level. However, the exact relationship between education and migration has not been completely established yet.

5 DATA & VARIABLES

This section discusses the dataset and the variables used in this thesis. After a description of the dataset and the sample that is used for analysis, the migration variables are introduced. Subsequently, the education variables are presented and the control variables will follow.

5.1 Dataset

Data used in this study is from the Indonesian Family Life Survey (IFLS), which is a longitudinal survey that tracks the same respondents over time. A total of four surveys have been completed until now, from which this thesis uses the last two surveys conducted in 2000 and 2007. The IFLS contains extensive information on individuals, households and communities. It covers a wide range of topics, such as consumption, income, education, health, migration, marriage, fertility and transfers among family members. The survey was performed in 13 out of 27 Indonesian provinces, representing 83 percent of the Indonesian population. Figure A1 of the Appendix shows a map of the sampled provinces. The sample used here contains information on 21,103 individuals and 5,489 household heads. The high re-contact rates of the survey make it a high-quality dataset with a very low probability of selection bias related to loss of participants over time.

Education variables and control variables from the 2000 survey are combined with the individual's migration histories obtained from the 2007 survey to identify the effect of educational attainment on the migration decision. Every move made by an individual that lasted for more than 6 months is documented along with the place of origin, destination and the migration motive. Data on education includes information of individuals on the highest level of education attended and the highest grade completed. Because the same individuals are tracked over time, the data allows for identification of the effect of educational attainment, prior to migration, on the decision to move.

Individuals within the same household may influence one another in their decision to migrate, which might bias the results. Therefore, only information on household heads is used. Furthermore, youths aged under 24 who are still eligible for education and not in their main productive age yet are excluded from the analysis. Excluding this age-group makes sure the effect measured is not representing the possibility that people move in order to obtain education, but truly represents the effect of educational attainment on the decision to move. The final dataset used here therefore consists of 5,407 household heads aged 24 years and over.

5.2 Migration variables

The migration variables are obtained from the 2007 wave of the survey. Unique location codes are constructed to distinguish movements at three different spatial levels. Three binary migration variables are created that indicate whether a person changed his or her sub-district, district or province of residence between 2000 and 2007. The sub-district level migration variable may therefore represent movements within districts and provinces as well as movements across district and province borders. Similarly, the district level migration variable may represent movements within provinces and movements that cross province borders.

A migrant is defined as an individual who moved between sub-districts, districts or provinces for more than 6 months. This definition thus excludes any circular migrants. The migration variables only take into account the first move of an individual, since the education effect should be observed where the decision to move is made for the first time in order to identify the effect of educational attainment on the migration decision of an individual.

To illustrate where people move, Table A1 of the appendix shows the number of migrants who moved within and between provinces of the individuals that were identified as migrants at the sub-district level. The majority of migrants appears to move within provinces. The provinces of Central Java, East Java, West-Java and North Sumatra have the highest number of migrants. However, these provinces are also the largest provinces in terms of population numbers (Statistics Indonesia, n.d.) and are therefore not necessarily characterized as the most mobile regions in relative terms.

Table 1 shows frequencies and percentages of migrants and non-migrants for the different spatial levels. Village level migration is also included in the table for completeness. However, this variable takes into account all moves of the individual between 2000 and 2007, which is not preferable when analyzing the decision to move at a certain point in time.

Table 1 – Internal migration in Indonesia

	Migration status 2000-2007						
	Non-migrant		Migrant				
Migration level	Freq.	Percent	Freq.	Percent	Observations	Missing	Total
Village[a]	4715	90.17	514	9.83	5229	178	5407
Sub-district[b]	4806	93.59	329	6.41	5135	272	5407
District[b]	4942	95.18	250	4.82	5192	215	5407
Province[b]	5104	98.12	98	1.88	5202	205	5407

[a] Records whether the household head (aged over 24) ever moved village between 2000 and 2007.
[b] Migration status of household heads aged over 24, counted from first movers between 2000 and 2007.

The overall migration rate ranges from 1.88% for individuals crossing province borders to 6.41% for individuals moving between sub-districts.

Construction of the migration variable by using location codes to distinguish movements at three different spatial levels, records more values as missing as compared to the village level migration variable that was already included in the survey for two reasons. First, the migration data includes all movements individuals ever made in their lives. Therefore, the year of the individual's move is used to select only those observations into the sample that represent movements between the years 2000 and 2007. For a few observations the year of the individual's move is unknown and the migration variable is then recorded as missing. The loss of observations only amounts to 7 observations at the sub-district level and 9 observations at the district and province level.

Second, some individuals did not answer where they resided in 2000 and 2007, which makes it impossible to construct a migration variable indicating whether they moved between sub-districts, districts or provinces. These observations are therefore recorded as missing. Overall, the number of missing values is relatively small and there's no indication of these missing observations to represent any pattern of non-randomness.

5.3 Education variables

To identify the effect of educational attainment on the decision to migrate, the independent variables for education are obtained from the 2000 wave of the survey. The analysis thus focuses on pre-existent educational attainment on an individual's decision to migrate.

Table 2 – Education in Indonesia

	Highest level attended		Highest level graduated	
Education level	Freq.	Percentage	Freq.	Percentage
No school attended/not graduated	677	12.54	2562	47.47
Elementary	2686	49.77	1229	22.77
Junior High General	537	9.95	404	7.49
Junior High Vocational	103	1.91	71	1.32
Senior High General	423	7.84	376	6.97
Senior High Vocational	437	8.10	384	7.12
College (D1, D2, D3)	150	2.78	128	2.37
University (Bachelor, Master, Doctorate)	198	3.67	135	2.50
Other	186	3.45	108	2.00
Observations	5397		5397	
Missing	10		10	
Total	5407	100	5407	100

To be able to analyze possible varying effects of education on migration for different levels of schooling, nine dummy variables are constructed for each level of education. Table 2 shows corresponding frequencies and percentages.

The categories distinguish between different levels of primary, secondary and higher education. The data allows for a distinction between individuals who only attended school and individuals who also graduated from school. Individuals who graduated from for instance Elementary School may have attended higher levels of schooling without having completed that level of education, since the education dummies are constructed from the *highest* level of education attended and the *highest* grade completed. Of the interviewed individuals, 87.46% ever attended school and 52.53% also graduated from any of the levels of education. Figure A2 of the Appendix gives an overview of the Indonesian education system.

5.4 Control variables

Apart from the education variables, additional variables are included in order to control for other possible determinants of migration. These variables are likely to be correlated with the variables of interest, which causes a bias in the coefficient of education if excluded from the regression. Individuals are not completely independent of factors surrounding them in their decision to migrate. In addition to personal characteristics, some characteristics of the (economic) environment and household characteristics should therefore be taken into account when analyzing an individual's decision to move.

As section 3.2.2 pointed out, different stages of an individual's life cycle can affect mobility. Variables for age and marital status are included in order to control for these life cycle effects. The dummy variable for marital status takes a value of 1 for those who are married and 0 for unmarried, divorced or widowed individuals. Since age is expected to be non-linearly related to migration, I also include age squared. To account for the possibility that individuals change place of residence in order to search for a job, working status in 2000 is included as a control variable.

Dummy variables are included to control for gender differences and health effects associated with both migration and education. The variable for gender takes the value of 1 for females and 0 for males. The health variable is based on a measure of activities of daily living (ADL), which is an indicator of overall physical condition. If the individual had difficulties with any of the nine tasks listed in the IFLS[3], the variable was coded by 1 and otherwise 0. The

[3] See Figure A3 of the Appendix for a list of the activities of daily living.

IFLS also includes questions on subjective health status, but measurement error is likely to be a problem for that variable. Therefore, the more objective health measure obtained from the ADL is used for analysis.

The push- and pull framework highlights the importance of characteristics of place of origin and destination. A rural-urban dummy and province dummies of place of origin are included in order to account for region-specific differences in the propensity to migrate.

Education may improve the chances of obtaining a higher income and migration is better affordable when income is higher. To control for any income effects that influence the decision to move, annual household income in 2000 is therefore included as a control variable. The household income variable is constructed by aggregating income from employment, assets, business, transfers and other income sources, such as lotteries or scholarships. The variable is log-transformed for convenience. To control for possible effects of the household's size, through influencing the total household budget or an individual's social cost of moving, household size is included as a control variable.

Any external or internal economic shocks to the household, such as job loss or a sudden decrease of production, may affect the decision to migrate. Households may insure themselves against shocks by sending household members away to live with other households or by educating a household member to find a job elsewhere and send remittances back home. Therefore a dummy variable indicating whether a household experienced a sudden economic shock over the past 12 months prior to the year 2000 is included as a control variable.

Including an indicator for household economic shocks also accounts for possible unevenly distributed effects of the Asian financial crisis in 1997 on Indonesia's economy. The crisis affected the country severely: the rupiah collapsed, wages and consumption declined and economic growth stagnated. There is an indication that households with better-educated household heads are better at mitigating the effects of the crisis (Frankenberg, Smith, & Thomas, 2003). As households may use migration as a means to alleviate negative economic shocks, excluding an indicator for household economic shocks may lead to a spurious relationship between educational attainment and migration. Table A9 of the Appendix gives an overview of all variables and definitions.

6 METHODOLOGY

This section discusses the methodology used for analysis. First, the empirical specification is presented to measure the effect of educational attainment on the decision to move. Subsequently, identification issues are discussed that may affect the estimates or the interpretation of the results.

6.1 Empirical specification

The empirical specification to measure the effect of educational attainment on an individual's decision to move is formulated as follows:

$$m_i = \alpha + \beta edu_i + \gamma X_i + \delta Y_i + \theta Z_i + \varepsilon_i \qquad (1)$$

where m_i equals 1 if individual *i* is a migrant and 0 if individual *i* is not a migrant.

The migration outcome (m_i) of individual (i) is measured at the sub-district, district and province level and indicates whether an individual moved between the years 2000 and 2007. The set of education variables in 2000 is denoted by edu_i; X_i is a vector of individual control variables in 2000; Y_i is a vector of household control variables in 2000; Z_i is a vector of province fixed effects and a rural-urban dummy in 2000, α is the intercept and ε_i represents the individual error term. Table A2 of the Appendix presents the descriptive statistics of the main variables used for analysis.

The education variables are dummy variables for seven different categories of education and represent the highest level of schooling an individual attended or graduated from. The reference category for the dummy variables representing the highest level of education attended is 'no education attended'. For the dummy variables representing the highest level of education graduated, 'no education graduated' serves as the reference category. Household control variables include household size, the log of household annual income and household economic shocks last year. The vector of individual control variables consists of age, marital status, gender, working status last year and health status as measured by activities of daily living (ADL).

6.2 Estimation

With binary migration status as the dependent variable, a binary logit model is estimated separately for the sub-district, district and province level. The signs of the coefficients indicate the direction of the relationship and are presented as the log of odds ratios.

Individuals from the same province are likely to share more similarities on various aspects than individuals that are not from that province. Standard errors are therefore adjusted for clustering at province of origin to take account of possible correlation of observations within the same region. Additional robustness checks are performed to check the sensitivity of the results to the division of the dataset into two subsamples, the inclusion of other variables or the use of different variable definitions.

In order to interpret the results in terms of their magnitude, odds ratios and marginal effects are estimated for the variables of interest. The odds ratio is defined as follows:

$$odds\ ratio = \frac{p_i}{1 - p_i}$$

where p_i is the odds of moving for an individual i who attended or graduated from the corresponding education level and $1 - p_i$ is the odds of moving for an individual i who did not attend, or graduate from, any education level. It must be noted that a high odds ratio does not necessarily imply that the chance of being a migrant when the individual is educated is high as the ratio can only be interpreted in relative terms. For example, if an individual with no education has a 1% chance of being a migrant, an odds ratio of 3 indicates that an educated individual has a 3% chance of being a migrant. If however, an individual with no education only has a 0.0001% chance of being a migrant, the chance of being a migrant when educated is likewise very small even though the odds ratio is equal to 3. In the sample used for analysis, 0.3% of all individuals with no education migrate at sub-district level, which is approximately 5% of all migrants.

To be able to interpret the difference in the probability of moving corresponding to each education level, instead of only in terms of odds ratios, marginal effects of changes in the education variables are calculated for the logit regression. The general formula used for calculation of the marginal effects is as follows:

$$\frac{\partial L(x_i'\beta)}{\partial x_{edu}} = \frac{e^{x_i'\beta}}{(1 + e^{x_i'\beta})^2}\beta_{edu}$$

In contrast to the (log) odds ratio, which can be interpreted for any value of the explanatory variables, marginal effects are not constant and depend on the values of the independent variables. The marginal effect is calculated separately for each education category fixing the other education dummy variables at 0[4] and the other independent variables at their mean. The benchmark category for the education dummy variables is 'no education attended'

[4] The education variables represent the highest education level an individual attended (or graduated from), thus only one of the education dummies can take a value of 1.

and ‘no education graduated’. The coefficients then represent the partial derivative of the probability that an individual migrates when the education dummy changes from 0 to 1 given the (fixed) values of the other independent variables.

6.3 Identification issues

6.3.1 Reverse causality and simultaneity

Recent work by McKenzie & Rapoport (2005) demonstrates that international migration may influence educational attainment. They find a significant negative effect of migration from Mexico to the U.S. on education levels of 16 and 18 year olds. Since many determinants from international migration also seem to play a role for migration within countries, this reversed relationship may also be present for internal migration.

Another related problem is the possibility that the migration and education decision are made simultaneously by the individual. Imagine an individual choosing to migrate in order to attend school elsewhere. To address the problem of reverse causality and simultaneity, the analysis only includes individuals aged over 24 who are already in their productive age and not likely to attend school anymore. Furthermore, educational attainment is measured in the year 2000, which is before the individual is bound to migrate.

6.3.2 Omitted variable bias

Identification of a causal effect between education and migration is impossible if there exist other unobserved factors that are related to both education and migration, which are omitted from the regression model. Innate character traits are often mentioned in the empirical migration literature as a possible factor that may influence the migration decision (Deb & Seck, 2009; Haapanen & Böckerman, 2013, Machin et al., 2012).

If we believe innate character traits, such as intelligence and ambition or drive, are related to education, the estimates may not reflect the effect of educational attainment on the migration decision but rather the selection of individuals with a certain personality into migration. More intelligent and ambitious individuals are more likely to enroll in education than individuals who are less able or care less about their future careers. Migration involves many difficulties, such as arranging transport, housing and leaving family or friends behind. These difficulties may be more easily overcome when an individual is intelligent or very driven to accomplish certain goals in general.

Although ambition and ability are difficult to measure and it is therefore hardly possible to directly control for these factors, control variables are included that partly reflect these unobserved factors, such as working status, health and household income. Individual characteristics such as age, marital status and gender are included to control for the possibility that individuals sharing certain characteristics select into migration. Age and marital status may also partly reflect a person's ambition or drive at the time of the migration decision.

6.3.3 Employment opportunities

As already mentioned in section 4.2, the effect of educational attainment on migration may reflect increased employment opportunities obtained from education that make an individual more likely to move. The variable of employment status in 2000 captures the possibility that the unemployed as well as the employed move to search for a job. Household annual income in 2000 controls for income prior to the decision to move, but also partly reflects the effect of education on the chances of obtaining a higher income after moving as these individuals are expected to have received more education to reach that level of income.

The income variable cannot completely control for the possibility that individuals take into account expectations about future income or job opportunities at the place of destination when deciding to move. Especially higher educated individuals may be aware of the possibilities to obtain a higher income after moving as they have learnt to be better aware of opportunities and may be more forward looking. It is therefore expected that even when controlling for income and employment status in 2000, the effect of employment opportunities is still partly reflected in the education estimates.

7 RESULTS

7.1 Relationship migration and educational attainment

Binary migration status at the sub-district, district and province level is regressed on the education variables and control variables. The empirical results, including the estimated coefficients for the education dummies, are reported in Table 3. All regressions include province dummies and standard errors are adjusted for clustering at the province level.

Table 3 – Migration & educational attainment: coefficient estimates

	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.210	0.085	0.336	0.218	0.102	0.435
	(0.166)	(0.175)	(0.281)	(0.218)	(0.408)	(0.494)
Junior High General	0.356	0.359	0.294	0.197	0.231	0.291
	(0.244)	(0.201)	(0.374)	(0.335)	(0.461)	(0.493)
Junior High Vocational	0.252	-0.577	0.639	-0.009	0.916	1.336
	(0.456)	(0.742)	(0.559)	(0.737)	(1.111)	(0.932)
Senior High General	0.676***	0.430***	0.621**	0.350**	0.352	0.369
	(0.227)	(0.159)	(0.254)	(0.144)	(0.290)	(0.245)
Senior High Vocational	0.865***	0.553***	1.035***	0.581***	0.703	0.671***
	(0.265)	(0.197)	(0.329)	(0.200)	(0.420)	(0.246)
College (D1, D2, D3)	0.837***	0.596	1.098***	1.026***	1.128***	1.363***
	(0.281)	(0.339)	(0.311)	(0.339)	(0.411)	(0.273)
University (Bachelor,	1.125***	1.131***	1.287***	1.139***	1.019	1.175***
Master, Doctorate)	(0.295)	(0.314)	(0.497)	(0.368)	(0.658)	(0.433)
Other	0.192	0.433	-0.093	0.240	0.029	0.697
	(0.286)	(0.261)	(0.529)	(0.388)	(0.694)	(0.535)
Hh size	-0.042	-0.043	-0.060	-0.061	-0.083	-0.085
	(0.035)	(0.034)	(0.037)	(0.035)	(0.067)	(0.063)
Rural residence	-0.418***	-0.471***	-0.210	-0.277	0.177	0.130
	(0.160)	(0.157)	(0.197)	(0.198)	(0.349)	(0.381)
Age	-0.084*	-0.077*	-0.084*	-0.077*	-0.126***	-0.120***
	(0.036)	(0.036)	(0.037)	(0.035)	(0.048)	(0.043)
Age squared	0.001	0.000	0.001	0.001	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital status	-0.201	-0.195	0.309	0.288	0.681***	0.596***
	(0.338)	(0.328)	(0.221)	(0.223)	(0.188)	(0.182)
Gender	-0.217	-0.273	0.250	0.172	0.883*	0.846*
	(0.321)	(0.324)	(0.276)	(0.297)	(0.420)	(0.428)
Ln(hh annual income)	0.022	0.024	0.022	0.025	0.003	0.003
	(0.013)	(0.013)	(0.013)	(0.013)	(0.021)	(0.019)
Working status	-0.234	-0.258	-0.035	-0.040	0.112	0.152
	(0.223)	(0.221)	(0.205)	(0.204)	(0.305)	(0.280)
Hh economic shock	-0.011	0.017	-0.212	-0.203	-0.128	-0.135
	(0.173)	(0.172)	(0.230)	(0.233)	(0.242)	(0.250)
Health (ADL)	0.521***	0.515**	0.488	0.485	0.199	0.215
	(0.198)	(0.204)	(0.253)	(0.259)	(0.316)	(0.327)
Constant	-0.961	-0.895	-2.456***	-2.313***	-2.037	-2.145
	(0.907)	(0.861)	(0.874)	(0.845)	(1.157)	(1.108)
Observations	5088	5088	5088	5088	4802	4802
# of migrants	328	328	210	210	77	77
Pseudo R^2	0.087	0.086	0.095	0.092	0.143	0.147
Log likelihood	-1111.038	-1111.580	-791.829	-794.205	-338.139	-336.803

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for *education* is *no education attended/graduated.*

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Columns (1) and (2) show results at the sub-district level and column (3) and (4) at the district level. The control variables for household size, marital status, gender, household income, working status and household economic shocks do not show the expected effects. The coefficients are statistically insignificant and thus do not seem to influence the propensity to move. The sub-district level results indicate that individuals from rural areas are less likely to move than individuals residing in urban areas. This effect is not observable when migration is defined at the district or province level.

Age has a statistically significant negative impact on an individual's propensity to move at the sub-district as well as the district level. There is no indication that the age-migration relationship changes over the course of the human life-cycle as age squared is statistically insignificant at both levels of observation. Unhealthy individuals seem to be more likely to move than healthy individuals at the sub-district level. This might indicate that unhealthy individuals move to receive family support or to obtain better healthcare at the place of destination. However, at the district level, this effect is not observable.

Referring to the education variables at the sub-district and district level in columns (1) until (4), lower levels of educational attainment do not seem to influence an individual's decision to migrate. For higher levels of education, educational attainment has a significant and positive effect on the propensity to migrate. More specifically, the results indicate that individuals who attended Senior High School, College or University are more likely to migrate than individuals who have not attended school. Analogous results are found for Senior High School, College and University graduates.

Columns (5) and (6) of Table 3 show results for only longer distance moves measured by migration across provinces. The results showing the effect of educational attainment on the migration decision are somewhat weaker than the findings at the sub-district and district level. The number of observations has decreased quite substantially as compared to the sub-district and district regressions. The number of migrants is reduced by approximately 250 observations when moving from sub-district to province level. The weaker results obtained may therefore be due to the absence of variation in the regression sample for province migration.

For one of the province dummies, representing the province of Bali, the probability of not being a migrant is predicted perfectly due to absence of out-migrants from that province. This can also be seen from Table A1 of the Appendix. The observations of this province are therefore automatically dropped from the analysis, which reduces the total number of observations and skews the sample towards migrants. Performing the same regression, while excluding the dummy for Bali and keeping all 5088 observations, gives similar results.

Although the results are less explicit when considering migration at the province level, the results found at the sub-district and district level are not contradicted by any means. Therefore, there is still an indication that individuals with a higher level of educational attainment are more likely to move. Overall, primary education has no statistically significant effect on the decision to migrate, whereas secondary and higher education seem to positively influence an individual's propensity to migrate. There appears to be a certain threshold level of educational attainment, where only higher levels of education have an impact on an individual's propensity to migrate.

The observed relationship can partly be explained by the fact that education is only compulsory in Indonesia up until Junior High School level. Only 12.54% of Indonesians did not attend school, so 87.56% of the individuals at least attended elementary school if we assume that individuals are not allowed to enroll for any higher level of schooling without having attended primary school. Attending secondary education and higher education is completely voluntary. Individuals therefore start differentiating themselves in terms of educational attainment when attending Senior High Schools, College and University. At that point an effect on the propensity to migrate becomes observable.

However, school attendance rates at Junior High Schools are much lower than at elementary schools as can be inferred from Table 2[5]. Therefore, the observed difference in results between lower and higher education levels cannot be entirely explained from compulsory education, but also implies that higher educated individuals are more likely to move in general.

7.2 Quantifying the effects

Table 4 shows odds ratios and marginal effects for all levels of education from Table 3 that have a significant effect on the decision to move. The province level results are not included in the table, since these results should not be relied on too strongly for aforementioned reasons.

Columns (1) and (3) show the odds ratios and marginal effects for the highest levels of education *attended* at the sub-district and district level respectively. At the sub-district level for individuals who attended education (column (1)), the odds ratios and marginal effects range from 1.967 and 0.032 for Senior High General education to 3.080 and 0.066 for University education, respectively.

[5] 49.77% of the individuals only attended elementary school and 12.41% did not attend school at all.

Table 4 – Migration & educational attainment: odds ratios and marginal effects

Odds ratios[6]				
	Sub-district		District	
	(1)	(2)	(3)	(4)
Variables	Attended	Graduated	Attended	Graduated
Senior High General	1.967***	1.538***	1.862**	1.419**
	(0.446)	(0.245)	(0.473)	(0.204)
Senior High Vocational	2.375***	1.739***	2.815***	1.788***
	(0.629)	(0.342)	(0.927)	(0.357)
College (D1, D2, D3)	2.310***	1.814	2.999***	2.790***
	(0.648)	(0.616)	(0.934)	(0.946)
University (Bachelor,	3.080***	3.098***	3.621***	3.123***
Master, Doctorate)	(0.909)	(0.973)	(1.799)	(1.150)
Marginal effects[7]				
	Sub-district		District	
	(1)	(2)	(3)	(4)
Variables	Attended	Graduated	Attended	Graduated
Senior High General	0.032***	0.021**	0.016	0.010**
	(0.010)	(0.009)	(0.006)***	(0.004)
Senior High Vocational	0.045***	0.029**	0.033***	0.018***
	(0.015)	(0.012)	(0.010)	(0.007)
College (D1, D2, D3)	0.0423*	0.032	0.036*	0.041*
	(0.019)	(0.022)	(0.016)	(0.020)
University (Bachelor,	0.066***	0.078**	0.047*	0.048*
Master, Doctorate)	(0.023)	(0.032)	(0.022)	(0.023)
Observations	5088	5088	5088	5088
# of migrants	328	328	210	210
Pseudo R^2	0.087	0.086	0.095	0.092
Log likelihood	-1111.038	-1111.580	-791.829	-794.205

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Reference category for the education dummy variables is *no education attended/graduated.*

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

An individual for whom the highest level of education attended is Senior High General is almost two times more likely to move than an individual who has not received any education. The corresponding increase in the probability of moving is 3.2% when fixing the other education dummies at 0 and the control variables at their mean. For comparison, for an individual with University education, the odds of moving are more than 3 times higher than an individual with no education at all. The corresponding increase in the probability of moving is 6.6%.

At the district level (column (3)), the odds ratios are larger for all education levels with the exception of Senior High General education. The marginal effects are somewhat smaller at

[6] The odds ratios can be interpreted for every value of the other explanatory variables.

[7] For each reported category, the other education dummies are fixed at 0 and the control variables at their mean.

the district level, but still range from 0.016 for Senior High General education to 0.047 for University education.

For the highest level of *graduation*, analogous results are found, which are reported in columns (2) and (4). Individuals who did not graduate from any level of education, may have attended school. School attendance showed to have a positive and significant effect on an individual's propensity to move for higher levels of education. This may explain why most of the odds ratios of 'education graduated' are smaller than those of 'education attended'. The corresponding marginal effects are also smaller for 'education graduated', with the exception of graduation from University. For illustration, an individual who graduated from Senior High General education is approximately 1.5 times more likely to move between sub-districts than an individual who did not graduate from any level of education. The increase in the probability of moving is 2.1%.

The results, as presented in Table 3 and 4, imply that educational attainment has a significant and positive effect on an individual's propensity to move and that this effect is quite substantial. The odds ratios and marginal effects are increasing by education level, which coincides with the expectation that education lets individuals acquire more skills, expand their network and broaden their employment opportunities which positively influences the propensity to move.

7.3 Channels of causality

As outlined in Section 4.2, educational attainment is expected to influence an individual's propensity to move through acquired skills, expansion of the individual's social network and increased employment opportunities. The data do not provide any information related to social or emotional skills of individuals nor provide information on an individuals' social contacts or network. However, the motives of the individuals' moves are documented in the data.

To examine whether the purpose of an individual's move matters for the effect of educational attainment on the migration decision, the motive for migration is regressed on the educational attainment dummies using a multinomial logit specification. A three category migration variable is constructed with migration for labor, family and other purposes[8]. Migration for other purposes is taken as the base outcome. Results are reported in Table A3 of the Appendix.

[8] The category 'other' includes the following migration purposes: political disturbance, eviction, like the destination, transmigration, dry season/drought, new housing opportunity, natural and other disasters, other.

Individuals from a rural area and older individuals are more likely to migrate for labor purposes as compared to other purposes. The variable age squared is negative and significant when considering migration for labor purposes, which indicates that the effect of age increases at a decreasing rate for individuals whose migration motive is labor related. The health variable is positive and significant for individuals whose migration motive relates to family. This provides support for the hypothesis that unhealthy individuals may be more likely to move to receive family support.

Junior High Vocational graduated shows a significant coefficient, but the log odds ratio is unrealistically high. All other education coefficients are insignificant, which indicates that the effect of educational attainment on the migration decision of an individual does not differ by the motive or purpose of the move. However, this does not mean that the before mentioned channel of increased employment opportunities is necessarily invalid.

The multinomial logit results only indicate that an educated individual whose main motive for moving is 'family' or 'labor' is not more likely to move than an educated individual whose main motive for moving is 'other'. It is very likely that individuals have multiple reasons for moving and still take employment considerations into account even though the main purpose of their move is not labor related.

7.4 Robustness checks

To examine whether the relationship between educational attainment and the decision to move, as presented in Table 3, is sensitive to changes in the regression specification, three different types of robustness checks are performed.

First, to get an idea of whether the effects differ by age group, regressions are run on two different subsamples. The first sample includes 2789 individuals aged from 24 to 45 and the second sample includes 2618 individuals aged 45 and over. The results are reported in Table 5, where the education coefficients are presented in terms of log odds ratios. The previously found positive effect of educational attainment on the migration decision at the sub-district and district level appears to be primarily driven by the young. Results for individuals aged over 45 are predominantly insignificant.

Table 5 – Migration & educational attainment: robustness check, age groups

Age 24-45						
	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.513	0.168	0.643	0.256	0.837	0.148
	(0.393)	(0.212)	(0.380)	(0.305)	(0.701)	(0.561)
Junior High General	0.735	0.422	0.797	0.356	1.120	0.143
	(0.416)	(0.271)	(0.448)	(0.492)	(0.640)	(0.804)
Junior High Vocational	-0.512	dropped	dropped	dropped	dropped	dropped
	(1.222)					
Senior High General	1.018**	0.494***	1.166***	0.582*	1.206*	0.267
	(0.434)	(0.141)	(0.436)	(0.265)	(0.595)	(0.450)
Senior High Vocational	1.163**	0.581***	1.290***	0.541	1.464**	0.438
	(0.480)	(0.207)	(0.399)	(0.341)	(0.619)	(0.451)
College (D1, D2, D3)	1.139**	0.619	1.453***	1.080*	1.803**	1.132**
	(0.450)	(0.452)	(0.502)	(0.499)	(0.729)	(0.462)
University (Bachelor,	1.448***	1.214***	1.666***	1.304***	1.871	1.389***
Master, Doctorate)	(0.481)	(0.316)	(0.559)	(0.403)	(1.141)	(0.490)
Other	0.593	0.553	0.153	0.157	0.107	-0.179
	(0.537)	(0.310)	(0.552)	(0.555)	(0.192)	(0.834)
Constant	3.244	3.536	2.378	2.786	4.341	5.462
	(2.996)	(2.906)	(3.201)	(2.958)	(5.520)	(5.326)
Observations	2587	2556	2544	2556	2105	2117
# of migrants	218	218	131	131	52	52
Pseudo R^2	0.092	0.090	0.122	0.120	0.128	0.128
Log likelihood	-678.661	-677.706	-453.096	-454.548	-212.604	-212.952

Age 45+						
	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	-0.036	-0.099	0.065	0.043	-0.709	0.750
	(0.223)	(0.178)	(0.404)	(0.183)	(0.451)	(0.582)
Junior High General	-0.084	0.173	-0.474	-0.260	-0.968	0.321
	(0.310)	(0.401)	(0.501)	(0.475)	(0.511)	(0.469)
Junior High Vocational	0.640	0.210	1.016	0.533	1.047	2.611*
	(0.510)	(0.849)	(0.654)	(0.841)	(1.314)	(1.190)
Senior High General	0.513	0.468	-0.139	-0.126	-0.416	0.701
	(0.508)	(0.542)	(0.563)	(0.556)	(0.456)	(0.429)
Senior High Vocational	0.700**	0.544	0.877*	0.627	0.012	1.115
	(0.279)	(0.351)	(0.439)	(0.343)	(0.779)	(0.587)
College (D1, D2, D3)	0.606	0.489	0.750	0.812	0.376	1.507***
	(0.547)	(0.574)	(0.710)	(0.561)	(0.505)	(0.401)
University (Bachelor,	0.976	0.996	1.078	0.896	0.198	dropped
Master, Doctorate)	(0.626)	(0.673)	(0.848)	(0.832)	(1.378)	
Other	-0.539	0.035	-0.095	0.499	0.999	2.853**
	(1.224)	(1.228)	(1.316)	(1.275)	(1.523)	(1.193)
Constant	0.910	1.206	-2.804	-2.292	-1.754	-2.965
	(2.274)	(2.085)	(2.903)	(3.067)	(9.841)	(9.439)
Observations	2501	2501	2501	2501	1588	1566
# of migrants	110	110	79	79	25	25
Pseudo R^2	0.083	0.078	0.096	0.086	0.153	0.169
Log likelihood	-413.691	-415.769	-317.031	-320.394	-108.906	-106.561

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for the education dummy variables is *no education attended/graduated.* * $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

An explanation for the observed difference in results between the two subsamples may lie in the aforementioned channels of employment opportunities and social network effects. In general, younger adults are expected to rely more on their educational attainment when searching for a job, since they have fewer years of work experience and the skills obtained during their educational careers are most relevant. Older individuals rather rely on job experience than their educational achievements of the past when searching for a job elsewhere.

Similarly, the social networks that were built during the younger individuals' education years are more recent, and therefore likely larger, as compared to the social networks of older individuals. Educational attainment may therefore have a more explicit impact on the decision to move for younger individuals as they seem to benefit more from their educational attainment when changing their place of residence.

Second, the results are robust to the inclusion of other potentially relevant variables. Finney & Simpson (2008) highlight the differences in migration behavior of different ethnic groups. Although the IFLS does not provide a direct measure of different ethnic groups, the religion of each individual is reported in the survey, which is an aspect often considered when defining ethnic groups. Table A4 of the Appendix shows the regression results when including religion as an additional variable. The inclusion of religion dummies does not change the results.

Third, using different variable definitions does not alter the results. Using another measure of economic shock, which takes into account all household shocks such as sickness and death of a householder, crop loss and natural disasters 5 years prior to the move, provides similar findings. Using Body Mass Index (BMI)[9] as a health measure instead of the Activities of Daily Living (ADL) also provides consistent results. Results are reported in Table A5 and A6 of the Appendix.

Table A7 of the Appendix shows the results when defining the migration variable as whether an individual *ever* moved between sub-district, district or province between 2000 and 2007. The education estimates obtained are analogous to the estimates reported in Table 3, where the first move of an individual is used to define migration. The province level results however, are shown to be mostly insignificant with the exception of the coefficients for College and University education.

[9]All individuals with a BMI below the cut-off point of 18.5 (underweight) and above the cut-off point of 25 (overweight) are considered unhealthy (WHO, 2006), for which the dummy variable takes a value of one and otherwise zero.

Taking the last move of an individual between 2000 and 2007 as the definition for migration provides somewhat weaker results, which are reported in Table A8 of the Appendix. The log odds ratios for the higher education dummies at sub-district and district level are smaller as compared to the regression results using first moves. The last move does not measure the point in time where the individual decides to migrate for the first time, which may explain the smaller effect observed. Furthermore, the possibility that individuals have moved before, may have influenced the results. Using the last move of an individual instead of the first move, still supports the finding that educational attainment at higher levels of education has a significant and positive effect on the decision to move.

To summarize, the results seem robust to division of the sample, the inclusion of religion dummies, other control variable definitions and a differently defined migration variable. This indicates that educational attainment has a positive and significant impact on an individual's migration propensity and is largely insensitive to changes in the regression specification.

8 DISCUSSION

The results of this thesis indicate that educational attainment has a positive and significant impact on an individual's propensity to move, though only so for higher levels of education. The use of a panel dataset tracking the same individuals over time has the advantage that the effect of education, prior to migration, on the decision to move can be identified at the individual level. The findings for the sub-district and district level regressions show that the impact of educational attainment on migration is quite substantial. The province level results do not contradict this finding, although insignificant coefficients may result from the lack of sufficient variation in the data. Overall, the results coincide with existing theory that acquired skills, enhancement of social networks and increased employment opportunities obtained from education positively influence the individual's decision to migrate.

Previous research in developed settings show contradicting results for lower levels of education, whereas higher education is only mentioned as having a positive effect on the decision to move. These mixed results indicate that the effect of educational attainment on the decision to migrate varies by education level. In developing countries a positive relationship between educational attainment and migration has often been found. The results of this thesis coincide with previous findings regarding higher levels of education. For lower levels of education, no significant effect on the decision to move was observed.

Although this study provides evidence in support of the hypothesis that educational attainment positively impacts an individual's propensity to migrate, a few limitations are worth mentioning. Firstly, the channels of causality through which education is expected to affect migration have only been hypothesized and could not be formally tested due to unavailability of data on these aspects. Furthermore, the results did not provide strong enough evidence to make inferences for longer distance moves measured by movements across provinces, due to the absence of variation in the sample for migration at province level. Additionally, the data provides information on origins and destinations of the moves, but the sample used for analysis is unfortunately not large enough to examine possible differences in results for migration to and from different regions. Finally, while the results of this study coincide with the findings of other studies and may hold for other developing countries around the world, this study is only representative of the case of Indonesia.

The most important issue to address here is that a possible endogeneity problem may still exist if we believe that innate characteristics of individuals give rise to selection of individuals into education and migration. The extensive set of individual and household level control variables included in the regression may not have completely captured this effect. Various solutions can be proposed in order to address this endogeneity problem.

First, the use of an instrumental variable for education will allow identification of a causal effect of education on migration. Unfortunately, a suitable and truly exogenous instrument was not (yet) found for the case of Indonesia. Second, using multiple survey years from the Indonesian Family Life Survey will allow one to run an individual level panel regression, which goes beyond the scope this master thesis. The advantage of a panel regression is that one can control for individual fixed effects and thereby the possibility that an individual's innate ability influences the decision to move. However, if there exist other unobserved factors that are not constant over time, a fixed effects regression is still not sufficient for identification of a causal effect. Complete randomization would be the solution in both cases, but this will be impossible to realize in practice.

These limitations leave room for future research on the relationship between educational attainment and migration. Future research is needed to examine whether differences in the effect of educational attainment on internal migration are observed between countries around the world or between regions within countries. Furthermore, better availability of reliable micro-economic data in developing settings is needed to facilitate research on a possible causal relationship between education and migration. This will also allow one to investigate the

possible channels of causality that drive the positive relationship between education and migration.

9 CONCLUSION

This thesis examined the relationship between educational attainment and internal migration by focusing on an individual's decision to move in Indonesia. Previous literature emphasized the importance of education as a determinant for internal migration. However, empirical evidence on the relationship between education and internal migration at the individual level is not that extensive. Studies performed in developing countries mainly used aggregate data and identification of the effect of educational attainment, prior to migration, on an individual's decision to move was often problematic. Evidence from developed countries shows more convincing, though mixed results.

The results of this thesis provide evidence that educational attainment seems to have a significant and positive effect on an individual's decision to move for higher levels of education. For lower levels of education, no significant effect on the decision to move was observed. Moreover, the effect of educational attainment on the migration decision does not appear to depend on the individual's main motive for moving. A new approach was taken by using a panel dataset that tracks individuals over time, instead of using aggregate data to analyze the effect of education on migration in a developing country.

Understanding the determinants of migration is important for understanding migration flows. It is also essential for more targeted policymaking to promote economic development and reduce regional inequality. This thesis shows that it is the higher educated that select into migration, which may lead to an unevenly distributed population in terms of educational attainment. Any educational policy may directly or indirectly influence the migration process and thereby the population distribution. The directions of the individual's move and its consequences should be further examined to point out in what way educational selectivity in migration leads to a potential imbalance of development between certain regions.

Despite its limitations, this thesis shows that educational attainment is an important determinant of internal migration within a developing country like Indonesia. Further research is needed to examine the channels of causality that drive the relationship, to investigate whether the results differ by region and to examine whether the results can be generalized to other developing countries.

10 REFERENCES

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11 APPENDIX

Figure A1 – The 13 sampled IFLS provinces

Source: Rand Labor & Population, The Indonesian Family Life Survey (IFLS)

Figure A2 – Indonesian education system

Age							
	Higher Education	Islamic Doctorate Program	Doctorate Program				
		Islamic Master Program	Master Program				
22		Islamic Graduate Program	Graduate Program	Diploma 4 Program	D3	D2	D1
21							
20							
19							
18	Secondary Education	Islamic Senior High School	Senior High School		Vocational High School		
17							
16							
15	Compulsory Education	Islamic Junior High School	Junior High School				
14							
13							
12		Islamic Primary School	Primary School				
11							
10							
9							
8							
7							
6	Pre-School	Islamic Kindergarten	Kindergarten				
5							

Source: Adapted from the Embassy of the Republic of Indonesia in London United Kingdom, 2009

Figure A3: Activities of Daily Living (ADL)

Carry a heavy load
Walk for 5 kilometers
Bow, squat, kneel
Sweep the house floor yard
Draw a pail of water from a well
Stand up from sitting on the floor without help
Stand up from sitting position in a chair without help
Go to the bathroom
Dress without help

Table A1 – Number of people moving within and between provinces (of people moving between sub-districts).

DESTINATION / ORIGIN	North Sumatra	West Sumatra	South Sumatra	Lampung	DKI Jakarta	West Java	Central Java	DI Yogyakarta
North Sumatra	32	0	0	0	0	1	0	0
West Sumatra	0	11	0	0	0	0	0	0
Riau Islands	2	1	0	0	0	0	0	0
South Sumatra	0	0	18	0	0	0	1	0
Bengkulu	0	0	1	0	0	0	0	0
Lampung	0	0	0	11	0	0	0	0
Bangka-Belitun Islands	0	0	0	0	1	1	0	0
DKI Jakarta	0	1	1	0	14	6	1	1
West Java	1	1	1	0	11	53	2	1
Central Java	0	0	0	1	3	0	21	1
DI Yogyakarta	0	0	0	0	2	0	1	21
East Java	0	0	0	0	0	1	1	0
Banten	0	1	0	0	8	9	0	1
Bali	0	0	0	0	2	0	0	0
West Nusa Tenggara	0	0	0	0	0	0	0	0
South Kalimantan	0	0	0	0	0	0	1	0
South Sulawesi	0	0	0	0	0	0	0	0
Total	**35**	**15**	**21**	**12**	**41**	**71**	**28**	**25**
Percentage	**10,64%**	**4,56%**	**6,38%**	**3,65%**	**12,46%**	**21,58%**	**8,51%**	**7,60%**

DESTINATION / ORIGIN	East Java	Bali	West Nusa Tenggara	Central Kalimantan	South Kalimantan	South Sulawesi	**Total**	**Percentage**
North Sumatra	0	0	0	0	0	0	**33**	**10,03%**
West Sumatra	0	0	0	0	0	0	**11**	**3,34%**
Riau Islands	0	0	0	0	0	0	**3**	**0,91%**
South Sumatra	0	0	0	0	0	0	**19**	**5,78%**
Bengkulu	0	0	0	0	0	0	**1**	**0,30%**
Lampung	0	0	0	0	0	0	**11**	**3,34%**
Bangka-Belitun Islands	0	0	0	0	0	0	**2**	**0,61%**
DKI Jakarta	2	0	0	0	0	0	**26**	**7,90%**
West Java	0	0	0	0	0	0	**70**	**21,28%**
Central Java	0	0	0	0	0	1	**27**	**8,21%**
DI Yogyakarta	0	0	0	0	0	0	**24**	**7,29%**
East Java	27	0	0	0	1	0	**30**	**9,12%**
Banten	0	0	0	0	0	0	**19**	**5,78%**
Bali	1	9	2	0	0	1	**15**	**4,56%**
West Nusa Tenggara	0	0	17	0	0	0	**17**	**5,17%**
South Kalimantan	0	0	0	2	15	0	**18**	**5,47%**
South Sulawesi	0	0	0	0	0	3	**3**	**0,91%**
Total	**30**	**9**	**19**	**2**	**16**	**5**	**329**	
Percentage	**9,12%**	**2,74%**	**5,78%**	**0,61%**	**4,86%**	**1,52%**		**100,00%**

Table A2 – Descriptive statistics

Variable	Min.	Max.	Mean.	Std. Dev.	Obs.	Missing
Variables of interest						
Moved sub-district (1st move)	0.00	1.00	0.06	0.24	5135.00	272.00
Moved district (1st move)	0.00	1.00	0.05	0.21	5192.00	215.00
Moved province (1st move)	0.00	1.00	0.02	0.14	5202.00	205.00
No school attended	0.00	1.00	0.13	0.33	5397.00	10.00
Elementary	0.00	1.00	0.50	0.50	5397.00	10.00
Junior High General	0.00	1.00	0.10	0.30	5397.00	10.00
Junior High Vocational	0.00	1.00	0.02	0.14	5397.00	10.00
Senior High General	0.00	1.00	0.08	0.27	5397.00	10.00
Senior High Vocational	0.00	1.00	0.08	0.27	5397.00	10.00
College (D1, D2, D3)	0.00	1.00	0.03	0.16	5397.00	10.00
University (Bachelor, Master, Doctorate)	0.00	1.00	0.04	0.19	5397.00	10.00
Other	0.00	1.00	0.03	0.18	5397.00	10.00
Elementary, graduated	0.00	1.00	0.23	0.42	5397.00	10.00
Junior High General, graduated	0.00	1.00	0.07	0.26	5397.00	10.00
Junior High Vocational, graduated	0.00	1.00	0.01	0.11	5397.00	10.00
Senior High General, graduated	0.00	1.00	0.07	0.25	5397.00	10.00
Senior High General, graduated	0.00	1.00	0.07	0.25	5397.00	10.00
Senior High Vocational, graduated	0.00	1.00	0.07	0.26	5397.00	10.00
College (D1, D2, D3), graduated	0.00	1.00	0.02	0.15	5397.00	10.00
University (Bachelor, Master, Doctorate), graduated	0.00	1.00	0.03	0.16	5397.00	10.00
Other, graduated	0.00	1.00	0.02	0.14	5397.00	10.00
Control variables						
Hh size	1.00	37.00	5.86	2.59	5407.00	0.00
Rural residence	0.00	1.00	0.56	0.50	5407.00	0.00
Age	24.00	101.00	46.48	12.16	5406.00	1.00
Marital status	0.00	1.00	0.85	0.36	5407.00	0.00
Gender	0.00	1.00	0.16	0.37	5407.00	0.00
Ln(hh annual income)	0.00	20.10	11.85	6.03	5404.00	3.00
Working status	0.00	1.00	0.92	0.27	5407.00	0.00
Hh economic shock	0.00	1.00	0.11	0.31	5404.00	3.00
Health (ADL)	0.00	1.00	0.20	0.01	5232.00	175.00

Table A3 – Multinomial logit: migration by purpose

	Labor		Family	
	(1)	(2)	(3)	(4)
Variables	Attended	Graduated	Attended	Graduated
Elementary	-0.420	0.358	0.322	0.425
	(1.119)	(0.380)	(0.928)	(0.325)
Junior High General	-1.066	-0.413	-0.109	-0.100
	(1.034)	(0.618)	(0.990)	(0.374)
Junior High Vocational	-0.867	1.285	0.925	14.058***
	(2.028)	(1.096)	(1.672)	(0.930)
Senior High General	-0.980	0.010	-0.175	-0.156
	(1.435)	(0.623)	(1.165)	(0.581)
Senior High Vocational	-0.883	-0.174	0.069	0.188
	(1.193)	(0.582)	(0.970)	(0.425)
College (D1, D2, D3)	-1.194	-0.037	-1.277	-0.977
	(1.096)	(0.404)	(1.311)	(0.921)
University (Bachelor, Master, Doctorate)	-0.506	0.482	0.111	0.274
	(1.720)	(0.799)	(1.150)	(0.343)
Other	0.760	1.625	2.072	2.071
	(1.794)	(1.977)	(1.892)	(1.754)
Hh size	-0.004	0.008	-0.014	-0.015
	(0.072)	(0.072)	(0.068)	(0.071)
Rural residence	0.989**	1.097***	0.400	0.495
	(0.401)	(0.345)	(0.469)	(0.424)
Age	0.230***	0.217***	-0.098	-0.083
	(0.088)	(0.081)	(0.072)	(0.073)
Age squared	-0.003***	-0.002***	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Marital status	0.409	0.234	-0.317	-0.283
	(0.782)	(0.850)	(0.789)	(0.732)
Gender	-0.045	0.027	0.494	0.574
	(0.812)	(0.785)	(0.768)	(0.768)
Ln(hh annual income)	0.059	0.056	0.013	0.012
	(0.033)	(0.032)	(0.017)	(0.016)
Working status	-0.423	-0.107	-0.369	-0.216
	(0.867)	(0.921)	(0.553)	(0.567)
Hh economic shock	-0.006	-0.073	0.527	0.465
	(0.457)	(0.460)	(0.520)	(0.539)
Health (ADL)	0.244	0.260	1.077***	1.109***
	(0.357)	(0.374)	(0.372)	(0.368)
Constant	-4.949*	-5.788*	3.318	2.753
	(2.388)	(2.583)	(1.951)	(2.022)
Observations/# of migrants	328	328	328	328
Pseudo R^2	0.139	0.137	0.139	0.137
Log likelihood	-307.462	-308.205	-307.462	-308.205

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for *education* is *no education attended/graduated.* The category 'other' is taken as the base outcome.

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Table A4 : Migration & educational attainment: robustness check, religion

	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.212	0.078	0.352	0.213	0.212	0.304
	(0.167)	(0.181)	(0.293)	(0.335)	(0.460)	(0.509)
Junior High General	0.373	0.366	0.330	0.007	0.327	1.402
	(0.241)	(0.199)	(0.377)	(0.747)	(0.520)	(0.932)
Junior High Vocational	0.261	-0.572	0.665	0.376***	1.047	0.442
	(0.461)	(0.753)	(0.577)	(0.146)	(1.159)	(0.243)
Senior High General	0.705***	0.444***	0.675**	0.595***	0.497	0.721***
	(0.236)	(0.161)	(0.289)	(0.200)	(0.345)	(0.279)
Senior High Vocational	0.878***	0.557***	1.063***	1.034***	0.807	1.277***
	(0.265)	(0.198)	(0.339)	(0.335)	(0.473)	(0.276)
College (D1, D2, D3)	0.860***	0.602	1.136***	1.174***	1.119**	1.245***
	(0.265)	(0.331)	(0.304)	(0.385)	(0.435)	(0.424)
University (Bachelor, Master, Doctorate)	1.163***	1.144***	1.342**	0.242	1.029	0.782
	(0.316)	(0.321)	(0.534)	(0.398)	(0.865)	(0.541)
Other	0.196	0.430	-0.075	0.213	0.160	0.304
	(0.291)	(0.266)	(0.541)	(0.335)	(0.733)	(0.509)
Constant	-1.699	-1.627	-1.606	-1.371	0.097	0.034
	(2.034)	(1.962)	(1.508)	(1.536)	(1.137)	(1.129)
Observations	5084	5084	5064	5064	4778	4778
# of migrants	328	328	210	210	77	77
Pseudo R^2	0.088	0.087	0.098	0.095	0.164	0.169
Log likelihood	-1109.601	-1110.411	-788.500	-790.944	-329.445	-327.606

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for the education dummy variables is *no education attended/graduated*. The following religion dummies are included: Islam, Protestant, Catholic, Hindu, Buddha and Confucians serving as reference category.
* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Table A5: Migration & educational attainment: robustness check, economic shock

	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.213	0.086	0.322	0.214	0.116	0.447
	(0.166)	(0.174)	(0.277)	(0.216)	(0.405)	(0.490)
Junior High General	0.358	0.359	0.278	0.196	0.246	0.309
	(0.245)	(0.201)	(0.370)	(0.335)	(0.457)	(0.481)
Junior High Vocational	0.252	-0.578	0.624	-0.014	0.928	1.335
	(0.458)	(0.741)	(0.561)	(0.738)	(1.105)	(0.921)
Senior High General	0.678***	0.430***	0.607**	0.346**	0.355	0.369
	(0.231)	(0.161)	(0.251)	(0.143)	(0.297)	(0.235)
Senior High Vocational	0.867***	0.553***	1.022***	0.583***	0.700	0.671***
	(0.266)	(0.197)	(0.325)	(0.198)	(0.425)	(0.244)
College (D1, D2, D3)	0.838***	0.596	1.074***	1.014***	1.116***	1.344***
	(0.282)	(0.341)	(0.318)	(0.342)	(0.429)	(0.275)
University (Bachelor,	1.126***	1.130***	1.274***	1.145***	1.029	1.182***
Master, Doctorate)	(0.299)	(0.313)	(0.494)	(0.366)	(0.670)	(0.438)
Other	0.191	0.432	-0.116	0.232	0.008	0.672
	(0.301)	(0.268)	(0.533)	(0.387)	(0.707)	(0.527)
Constant	-0.960	-0.892	-2.450***	-2.318***	-1.998	-2.104
	(0.906)	(0.859)	(0.863)	(0.837)	(1.140)	(1.107)
Observations	5088	5088	5088	5088	4802	4802
# of migrants	328	328	210	210	77	77
Pseudo R^2	0.087	0.086	0.095	0.092	0.144	0.147
Log likelihood	-1111.007	-1111.552	-792.073	-794.411	-337.789	-336.418

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for the education dummy variables is *no education attended/graduated.*

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Table A6: Migration & educational attainment: robustness check, BMI as a measure of health

	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.200	0.086	0.325	0.223	0.091	0.419
	(0.173)	(0.183)	(0.288)	(0.228)	(0.410)	(0.502)
Junior High General	0.333	0.355	0.278	0.211	0.249	0.314
	(0.238)	(0.194)	(0.373)	(0.341)	(0.458)	(0.491)
Junior High Vocational	0.202	-0.625	0.617	-0.020	0.983	1.403
	(0.455)	(0.732)	(0.554)	(0.728)	(1.100)	(0.930)
Senior High General	0.647***	0.421***	0.607**	0.365**	0.377	0.399
	(0.225)	(0.157)	(0.256)	(0.155)	(0.296)	(0.242)
Senior High Vocational	0.816***	0.543***	0.993***	0.592***	0.718	0.667**
	(0.277)	(0.188)	(0.344)	(0.196)	(0.422)	(0.264)
College (D1, D2, D3)	0.810***	0.583	1.069***	1.017***	1.118***	1.345***
	(0.280)	(0.355)	(0.315)	(0.357)	(0.412)	(0.280)
University (Bachelor,	1.078***	1.100***	1.246**	1.123***	1.018	1.161***
Master, Doctorate)	(0.296)	(0.301)	(0.495)	(0.355)	(0.649)	(0.427)
Other	0.193	0.428	-0.077	0.267	0.062	0.736
	(0.286)	(0.273)	(0.527)	(0.398)	(0.703)	(0.554)
Constant	-0.817	-0.776	-2.330***	-2.230***	-1.966	-2.073
	(0.913)	(0.876)	(0.855)	(0.831)	(1.183)	(1.131)
Observations	5076	5076	5076	5076	4793	4793
# of migrants	327	327	209	209	77	77
Pseudo R^2	0.082	0.082	0.091	0.089	0.147	0.150
Log likelihood	-1113.471	-1113.337	-792.440	-794.142	-336.677	-335.457

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for the education dummy variables is *no education attended/graduated.*

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Table A7 – Migration & educational attainment: robustness check, ever moved

	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.262	0.124	0.353	0.264	0.132	0.237
	(0.180)	(0.166)	(0.278)	(0.206)	(0.328)	(0.407)
Junior High General	0.418*	0.368	0.331	0.204	0.164	-0.075
	(0.208)	(0.201)	(0.343)	(0.330)	(0.381)	(0.416)
Junior High Vocational	0.209	-0.623	0.706	-0.150	1.208	0.739
	(0.485)	(0.738)	(0.480)	(0.723)	(0.670)	(0.861)
Senior High General	0.778***	0.519***	0.778***	0.496***	0.557	0.385
	(0.239)	(0.178)	(0.278)	(0.123)	(0.390)	(0.231)
Senior High Vocational	0.870***	0.527***	0.946***	0.505***	0.651	0.328
	(0.249)	(0.186)	(0.314)	(0.189)	(0.473)	(0.178)
College (D1, D2, D3)	0.856***	0.581	0.986***	0.906**	0.824	0.796*
	(0.254)	(0.343)	(0.347)	(0.368)	(0.496)	(0.360)
University (Bachelor,	1.229***	1.183***	1.407***	1.260***	1.432**	1.111**
Master, Doctorate)	(0.312)	(0.348)	(0.522)	(0.391)	(0.573)	(0.472)
Other	0.170	0.366	-0.219	0.073	-0.243	0.151
	(0.268)	(0.253)	(0.549)	(0.413)	(0.744)	(0.587)
Constant	-0.100	0.003	-1.239	-1.090	-1.091	-0.936
	(0.909)	(0.912)	(0.645)	(0.754)	(1.105)	(1.193)
Observations	5126	5126	5126	5126	5126	5126
# of migrants	350	350	244	244	106	106
Pseudo R^2	0.085	0.085	0.091	0.089	0.122	0.116
Log likelihood	-1168.505	-1169.205	-891.584	-893.778	-452.884	-456.376

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for the education dummy variables is *no education attended/graduated.*

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Table A8 – Migration & educational attainment: robustness check, last move

	Sub-district		District		Province	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Attended	Graduated	Attended	Graduated	Attended	Graduated
Elementary	0.113	0.041	0.177	0.105	-0.351	0.059
	(0.161)	(0.186)	(0.290)	(0.227)	(0.365)	(0.500)
Junior High General	0.219	0.383	0.124	0.196	-0.098	0.321
	(0.227)	(0.216)	(0.407)	(0.353)	(0.466)	(0.504)
Junior High Vocational	-0.013	-1.213	0.294	-0.663	-0.090	0.539
	(0.566)	(1.113)	(0.681)	(1.139)	(1.416)	(1.333)
Senior High General	0.586***	0.473***	0.602*	0.460***	0.106	0.371**
	(0.200)	(0.177)	(0.272)	(0.161)	(0.291)	(0.149)
Senior High Vocational	0.666***	0.455**	0.799*	0.458***	0.264	0.536
	(0.216)	(0.179)	(0.350)	(0.165)	(0.387)	(0.288)
College (D1, D2, D3)	0.659*	0.595	0.935***	0.991***	0.861*	1.340***
	(0.299)	(0.381)	(0.352)	(0.382)	(0.431)	(0.304)
University (Bachelor, Master, Doctorate)	0.934***	1.067***	1.230*	1.281***	0.752	0.914
	(0.317)	(0.356)	(0.535)	(0.387)	(0.560)	(0.546)
Other	0.101	0.435	-0.071	0.379	0.016	0.913
	(0.306)	(0.343)	(0.541)	(0.353)	(0.688)	(0.562)
Constant	-1.649	-1.675	-3.623***	-3.581***	-3.681***	-3.915***
	(1.069)	(1.021)	(0.922)	(0.890)	(1.299)	(1.045)
Observations	5084	5084	5087	5087	4802	4802
# of migrants	298	298	193	193	66	66
Pseudo R^2	0.087	0.089	0.113	0.114	0.155	0.155
Log likelihood	-1035.621	-1033.474	-727.737	-727.551	-294.502	-294.560

Standard errors are adjusted for clustering at the province level and are reported in parentheses. All regressions include individual- and household control variables, province dummies and a rural-urban dummy. Coefficients represent log odds ratios. Reference category for the education dummy variables is *no education attended/graduated.*

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

Table A9: Variable definitions

Variable	Definition
Moved sub-district 1st (IFLS 4: 2007)	Binary variable indicating whether an individual moved across sub-districts between the years 2000-2007, only taking into account an individual's first move. This variable may also include movements across district- or province borders.
Moved district 1st (IFLS 4: 2007)	Binary variable indicating whether an individual moved between districts between the years 2000-2007, only taking into account an individual's first move. This variable may also include movements across province borders.
Moved province 1st (IFLS 4: 2007)	Binary variable indicating whether an individual moved across provinces between the years 2000-2007, only taking into account an individual's first move.
Ever moved sub-district (IFLS 4: 2007)	Binary variable indicating whether an individual ever moved across sub-districts between the years 2000-2007. This variable takes into account all moves between 2000 and 2007 and may also include movements across district- or province borders.
Ever moved district (IFLS 4: 2007)	Binary variable indicating whether an individual ever moved across districts between the years 2000-2007. This variable takes into account all moves between 2000 and 2007 and may also include movements across province borders.
Ever moved province (IFLS 4: 2007)	Binary variable indicating whether an individual ever moved across provinces between the years 2000-2007. This variable takes into account all moves between 2000 and 2007.
Moved sub-district last (IFLS 4: 2007)	Binary variable indicating whether an individual moved across sub-districts between the years 2000-2007, only taking into account an individual's last move. This variable may also include movements across district- or province borders
Moved district last (IFLS 4: 2007)	Binary variable indicating whether an individual moved between districts between the years 2000-2007, only taking into account an individual's last move. This variable may also include movements across province borders.
Moved province last (IFLS 4: 2007)	Binary variable indicating whether an individual moved across provinces between the years 2000-2007, only taking into account an individual's last move.
Elementary attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is Elementary School. Otherwise the dummy takes a value of 0.
Junior High General attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is Junior High General School. Otherwise the dummy takes a value of 0.
Junior High Vocational attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is Junior High Vocational School. Otherwise the dummy takes a value of 0.
Senior High General attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is Senior High General School. Otherwise the dummy takes a value of 0.

Senior High Vocational attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is Senior High Vocational School. Otherwise the dummy takes a value of 0.
College (D1, D2, D3) attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is College education. Otherwise the dummy takes a value of 0.
University (Bachelor, Master, Doctorate) attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is University education. Otherwise the dummy takes a value of 0.
Other attended/graduated (IFLS 3: 2000)	Education dummy variable which takes a value of 1 if the individual's highest level of school attendance/graduation is from other education. Otherwise the dummy takes a value of 0. Other education includes Adult Education A, Adult Education B, Open University, Islamic School, School For Disabled, Madrasah General, Islamic Elementary School, Islamic Junior/High School, Madrasah Senior High School, Kindergarten.
Household size (IFLS 3: 2000)	Number of household members.
Rural residence (IFLS 3: 2000)	Dummy variable for rural or urban residence.
Age (IFLS 3: 2000)	Age of the individual.
Marital status (IFLS 3: 2000)	Dummy variable for marital status.
Gender (IFLS 3: 2000)	Dummy variable for gender: male/female.
Ln(household annual income) (IFLS 3: 2000)	The log of household annual income over the past 12 months prior to the year 2000. The variable is an aggregate of income from employment, non-business asset income, farm business income, non-farm business income, transfers from non-coresident family members, transfers from parents, non-coresident children and other income sources.
Working status (IFLS 3: 2000)	Dummy variable indicating whether the individual worked during the past 12 months prior to the year 2000.
Household economic shock last year (IFLS 3: 2000)	Dummy variable indicating whether the household experienced any economic hardship over the past 12 months prior to the year 2000. Economic hardship includes job loss, business failure, sudden decrease in household income due to decrease in production or prices and other hardship.
Household economic shock past 5 years (IFLS 3: 2000)	Dummy variable indicating whether the household experienced any economic hardship over the past 5 years prior to the year 2000. Economic hardship includes death of a householder or other family member, sickness of a householder or family member who needs hospitalization or medical treatment, crop loss, loss of household or business due to earthquake, fire or other national disaster.
Health (ADL) (IFLS 3: 2000)	Health dummy variable indicating whether an individual is healthy based on whether the individual had difficulties with performing any of the activities of daily living (see figure A3).
Health (BMI) (IFLS 3: 2000)	Health dummy variable indicating whether the individual is healthy based on his or her weight. All individuals with a body mass index (BMI) below the cut-off point of 18.5 (underweight) and above the cut-off point of 25 (overweight) are considered unhealthy.

Religion (IFLS 3: 2000)	Dummy variables indicating the religion of the individual. Categories include *Islam, Protestant, Catholic, Hindu, Buddha, and Confucians.*