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The Impact of Short-Term Economic Crises on Out-Migration in Indonesia through Living Standard Perspectives: A Case Study on Indonesian Family Life Survey Panel Data

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Abstract: Migration is used as a coping strategy in developing countries in times of economic uncertainty. In this paper I examine the relative risk probability of out-migration in Indonesia between males and females and the impact of short-term economic stress on out-migration in Indonesia using the Indonesian Family Life Survey longitudinal panel data from 1993-2007 and using the natural logarithm of rice price as an economic indicator for the community level. The result suggest that the male population has higher relative risk of migration compared to women, education is a significant variable when measuring the relative risk of migration, and there is a relationship between short-term economic stress and migration in Indonesia.

Key words: Migration, standards of living, Asian financial crisis, Indonesia 1961-2007, Short-term Economic crisis

Table of Contents

List of Figures

List of Tables

List of Pictures

1. Introduction

Migration is a common coping strategy in Indonesia. With the continuously rising population, the level of migration in Indonesia has also risen. Looking across different provinces in Indonesia the level of migration has varied in past decades. Furthermore, discussing migration is also a controversial topic. Migration on a permanent and temporary level has been one of the key of coping by the Indonesian when faced with natural or human disasters (Hugo, 2004).

Developing countries can be characterized by high level of economic and political uncertainty. A major source of uncertainty is fluctuations in the price of staple foods or the level of the harvest. This situation leads to a relationship between economic volatility and demographic outcomes (Galloway 1988, Lee 1990). Consumption is a commonly used measure of living standards. In most developing countries today, consumption is heavily affected by food prices. The estimated household consumption elasticity with respect to food prices varies. The relationship between household consumption elasticities to the food price is that increase in the food price will have the consequence of reduced household consumption (Dasgupta, 1993).

People living under uncertain economic conditions can use various methods as a coping strategy. Coping strategies during short-term economic stress can be delaying nuptiality, fertility or migrating by relocating family members as part of labor supply. An evaluation at socio-economic status can be used to classify which groups of people are most vulnerable (Bengtsson, 2004).

This paper will study the patterns of migration in Indonesia by classifying by gender and analyzing to what extent migration was used as a coping strategy to deal with economic stress that is defined at an aggregate level during the period 1961-2007. This period is also known as the post colonization period where the economy was starting to recover from a deep recession and going on towards stable growth. In the late 1990s the Asian Financial Crisis occurred (affecting growth significantly) and had a mixed outcome on different groups of socioeconomic status. The approach that will be used in analyzing the impact of short-term economic stress on out-migration is event-history analysis.

The analysis is done using micro data from the Indonesian Family Life Survey from the years 1993-2007. The annual rice price is taken into account to measure short-term economic stress at the aggregate level, as rice is one of the most important staple foods in Indonesia.

The next section will provide a background of Indonesian demographics, vital statistics and the nature of the price of rice. This will be followed by discussion of the theory, previous findings and hypothesis. Furthermore, explanations of the data and variables will be discussed for the models. Finally an analysis of the demographic response to short-term economic stress resulted is conducted. The analysis is done by running the defined model and controlling the following variables; (1) Period, (2) age, (3) education, (4) occupation, (5) land hold status. This study aims to provide the nature of the relationship for demographic behavior, Indonesian household characteristics and the development of the economy.

Studies have been done in the topic of migration; it has not been easy to measure migration in Indonesia, as the availability of data is still limited. Many unrecorded migration have taken place. This is also the limitation of this paper.

1.1 Research Problem

Speculation has been made on migration after the 1998 financial crisis hampered the economy. As one of the most populous countries in the world, the population continues to grow and the level of migration in general grows respectively. However, the question of migration continues to be debated, specifically whether people had moved due to the crisis or there is simply a stable increasing trend for out-migration in Indonesia. The crisis saw a dramatic increase in the level of unemployment, especially within the agricultural and construction sector.

To define the research problems therefore, the following research problems can be addressed:

1. Are there any patterns to migration in Indonesia?
2. Is out-migration used as a method with coping with short-term economic stress?

2. Background

2.1 Demographics & Vital Statistics in Indonesia (1960-2007)

The population of Indonesia has been increasing from at least the start of the data in the 1960s until today. It is said to have been approximately around 92 million in 1960, which increased to approximately 232.5 million by 2007. Based on World Bank databases where the data is interpolated from 5-year period data, the next figures illustrate the population growth and the life expectancy statistics in Indonesia.

Figure 1: Annual Population Growth (%) in Indonesia, 1960-2007
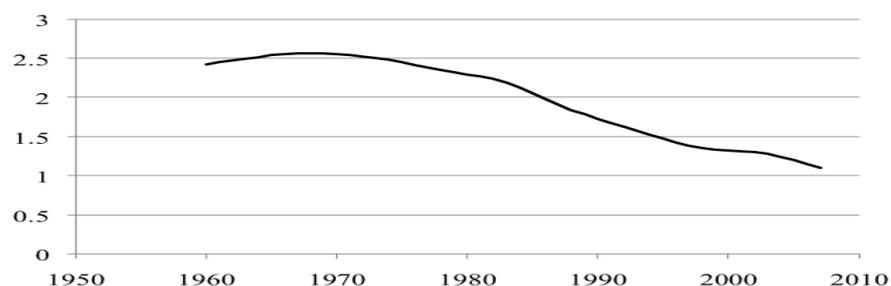
Source: World Bank Database (2013)

Figure 1 however shows and increasing population growth from before 1960s until the 1970s, when population growth started declining gradually. The population growth was stated as 2% in 1960 that annually decreased up to approximately 1% by 2007. As the population grew, the life expectancy at birth in Indonesia also increased. The life expectancy of people who were born in 1960 was approximately 45-50 years and these figures rise gradually; in the 1970s the life expectancy is stated at approximately 51 until

1980s where the life expectancy went above 60 years old just around the late 1980s. This figure then increased further to 67 by 2007.

Figure 2: Life Expectancy (e_0) in Indonesia, 1961-2007
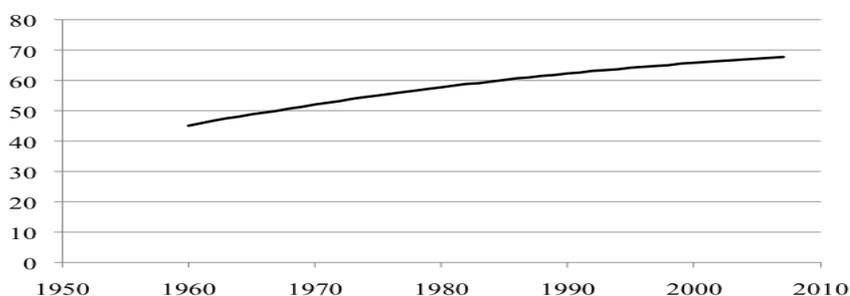
Source: World Bank Database (2013)

To follow on the increase of life expectancy, the Crude Birth Rate (CBR) and the Crude Death Rate (CDR) declined accordingly. The Crude Birth Rate was approximately 45 per thousand of people in 1960, this figures declines steadily until 2007 where the Crude Birth rate was recorded at 19 per thousands of people in the population. The Crude Death Rate also fell from 2012; in 1960 this number declines to 7 in 2007 (See Appendix).

2.2 Demographic Settings and Migration in Indonesia

Approximately 23 million people migrate internationally each year, 10% of the population (Lu, 2008). The rapid growth of its economy for the past over 30 years can also be associated with improvements to health access, rising life expectancy, and declining infant mortality rate (Frankenberg & Thomas, 2002; Muhidin, 2002). 1 out of 10 Indonesians is classified as a migrant. With the intensification of the industrialization process, geographical mobility increased respectively (Hugo, 2005; Muhidin, 2002). Internal migration in Indonesia mainly took place from rural to urban areas and is primarily motivated by economic incentives. Previous research indicates that migrant workers are usually characterized as young adult males who are educated (Speare & Harris, 1986; Muhidin, 2002).

The transition of vital rates in Indonesia started around the 1950s, when the infant mortality rate started declining rapidly. As the infant mortality rate declined, the norms of having children did not change. This situation resulted in what is known as population explosion (Ananta & Wongkaren, 1996). Throughout the late 1960s the Indonesian government introduced a family planning program. Only after the first half of 1990s had the Total Fertility Rate dropped from 5 to 2. The transition for the vital rates in Indonesia did not take place evenly across the provinces. For example, in provinces in Java and Bali the fertility levels nearly reached replacement level or even below (Muhidin, 2002).

The pattern of migration in Indonesia varies across provinces. To compare the in-migration and out-migration rate, there is a narrowing range of differences of the in-migration the rates are gradually converging across the provinces. On the other hand, the out-migration rates in Indonesia across the provinces are more stable compared to the in-migration with the possibility of rising rates (Ananta & Muhidin; 2005). Harris and Todaro (1970) presented the hypothesis that individual migration is due to the differentiations in the level of incomes; this theory of migration is applicable for migration events in developing countries. To this extent, Harris and Sabot (1982) elaborated on this theory stating that the process of seeking employment by migrants can be characterized by a probability distribution where the offer for wages in the labor market are not uniform. Additionally, the theory of Harris and Todaro were evaluated for the case of Indonesia. The outcome reveals that in the early 1970s there were little systematic institutional differentiations for the wage adjustments. Furthermore, there is also little systematic differentiation when comparing the wage between rural and urban when the individuals are compared with similar characteristics (Speare & Harris, 1986).

2.3 The History of Indonesian Economy

Post-colonial period Indonesia recovered from the recession with robust GDP growth except during the Asian financial crisis. When the crisis hit the Indonesian economy, GDP growth plummeted, with different sectors being affected by the crisis. From 1965 to 1995 the real GDP per capita increased constantly with an average growth rate of 4.5%. The crisis hit the economy hardest in. The real GDP started to decline by approximately 13%. It only started to grow again in 2000 (World Bank, 2007).

In 1998, the Indonesian Bureau Statistics recorded that the crisis decreased the real growth domestic fixed investment by 35.5%. The crisis also had a direct impact on household consumption levels, mainly due to the rapid price changes resulted from the exchange rate volatility. Prices of staple foods and tradable goods rose during the crisis due to the depreciation of the currency. Nominal food prices also tripled, this particular period happened throughout 1998 to 1999. The changes of the macroeconomic conditions were felt most by those at the bottom of the income distribution, especially with the explosion of the food prices. Rural and urban areas have approximately similar percentage of food relative to the total household budget, approximately 50-57%. For people within lower income distribution the proportion spent on food share are higher (Strauss, 2004).

The decline in household welfare was due to the fall in real incomes and increased in the price of food. Households can be divided into two groups net producers and net purchasers. The majority of the Indonesian population goes into the category of net food purchasers. As food prices increase during the crisis nominal wages increased respectively. However, the level of increase in the food price and the nominal wages was not balanced, the rise in the nominal wage was much less than the increase in the food and non-food prices. As a result these individuals experienced serious economic shocks. The figure next illustrates the fluctuations in the GDP growth in Indonesia between 1961 and 2007 (Strauss, 2004).

Figure 3: Annual GDP Growth (%) in Indonesia, 1961-2007
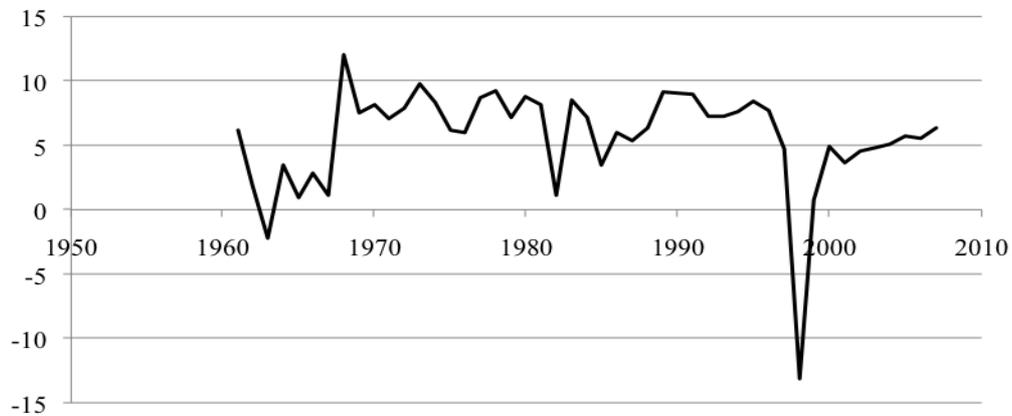
Source: World Bank Database (2013)

3. Previous Research

3.1 Theoretical Background
Definition of Living Standards

Living standard is a core perception that explains the relationship between population and the economy, for the past and present. Living standards are likely to have a strong influence on demographic behavior. Many scholars have focus on the studies of living standards. This section will discuss more about the studies that were presented by Amartya Sen and Tommy Bengtsson. Living standards in the past were difficult to measure due to the lack of data. However, scholars such as Lee have found relationships between economic indicators such as grain prices and demographic behaviors such as; nuptiality, fertility, mortality, and migration (Lee, 1981).

Bengtsson states that people living standards can have a strong impact on demographic behavior, especially for those who are living under the condition of economic uncertainty. Data on household consumptions and income were not easy to obtain in the past, which leads to difficulties in measuring living standards. Hence, Bengtsson proposed a dynamic idea for longitudinal micro studies. The notion behind the measure is that demographic responses of individuals and households to short-term economic stress depend on their access to resources (Bengtsson, 1994). The impact of demographic outcome can be used as an indirect measure of living standard. The concept was designed to measure and analyze the standard of living for men and women for different ages, and socio economic status, and household characteristics for their ability to tackle short-term economic stress.

Amartya Sen uses the concept of standards of living by defining it into two elements; functioning's and capabilities. Figure 4 illustrates the concept of standards of living by Sen. Living standard is a concept of functionings (beings and doings), not wealth (income), commodities (goods) or utilities (Sen 1987, 26).

Illustration 1. The transformation of income to utility through capabilities and functionings in the spirit of Amartya Sen
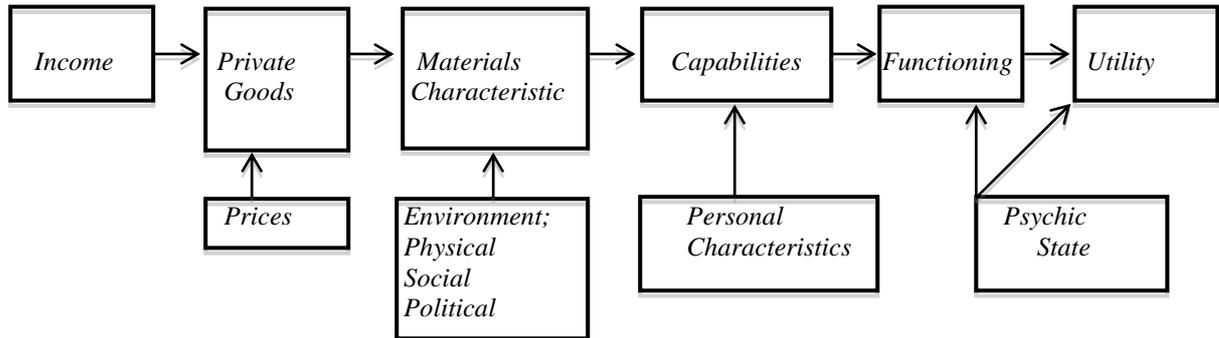
Source: John Muellbauer (1987, 40)

The basic concept of functionings is the types of living conditions we can or cannot achieve as for the individuals or households ability to attain them. Different elements can be explained as the basic set of functionings. This includes things such as being sufficiently nourished, being healthy, and avoiding the premature mortality and particular illness. Illustration 1 illustrates how income could produce private goods that are transformed into intermediate goods; this includes goods such as protein and calories this can also be referred to as material characteristic, which includes both individual freedoms. These characteristics can also be in forms of environmental factors such as climate, clean air, and secure environment. Capabilities reflect the different types of functionings an individual can attain as a result of personal characteristics. Both material characteristics and individual characteristics can determine the individuals capabilities to achieve functionings. This explains how an individual's psychological state affects the functioning's that the individual will attain. This psychological value also can be expressed by religious faith. Sen argues that neither incomes nor goods are a good indicator to measure living standards since needs and wants differs for every individual and community characteristics (Sen, 1987, 14).

Bengtsson uses the concept of standard of living slightly different to Sen where he designed the concept to measure an individual's or household's ability to overcome short-term economic stress. The short-term economic stress in this situation means the variations in income or food prices from one year to the year after. If an individual is able to accomplish the long-term plan, which is to marry, have children and survive. In conditions where there are short-term changes environment indicates high standard of living. However, if the opposite situation occurs this indicates that there is lower standard of living (Bengtsson, 1994). There are several options of coping strategies of economic and demographic, which can be taken during short-term economic stress. The table illustrates how different social groups would use different coping strategies depending on their socio-economic status.

List 1. Economic and demographic response to short-term economic stress

1. Spending of savings (foodstuff, money, and saleable items)
2. Borrow from kin, neighbors, employer, church, or bank
3. Receive relief (rent, tax, poor)
4. Adjust household labor supply (firing servants, out migration of family members)
5. Postpone consumption (marriage, births)
6. Reallocate consumption within the family (mortality)

Source: Bengtsson, 1994

The studies of demographic time series among economic historians can analyze the systemic fluctuations in economic cycles and the outcome on demographic behavior such as fertility, mortality and migration (Bengtsson, 1994).

The Todaro Migration Model

Theory of migration in developing countries is based on the assumption that migration decision is taken based on the individual's economic calculations. The Todaro model illustrates how migration is taken as a response to difference in the 'expected rather than actual earnings'. Figure 5 illustrates the framework describing different factors, which affects decision on migration. Where there are both economic and non-economic variables were included in the framework. Nevertheless economic reasons dominated the framework (Todaro, 1980). Todaro illustrates his framework as follows; an average unskilled or semi skilled rural worker has two options in the labor market. First, to work as a farm laborer earning the average income. Second, to migrate and work in the city with his skill or education background that would provide him with higher earnings. Todaro explains in his frameworks where decisions are made mainly due to economic reasons.

The idea of traditional economic theory is that migration occurs exclusively due to the earnings differential factor as the determinant for an individual to migrate, especially migration that occurs from rural to urban area. However, Todaro argues that this theory might be applicable to developed countries but not developing countries. In developing countries it is often the case that when individuals migrate from rural to urban area they find themselves in state of unemployment or seeking casual or part-time work for some time due to the problem of urban surplus labor (Todaro, 1980).

Todaro had four main points in his migration model that states:
1. The reason for migration to take place is mainly driven by economic motivation and considerations of relative benefits and costs, primarily financial and psychological.
2. Decision for individuals or household to migrate depends on *'expected' rather than actual urban-rural real-wage differentials.* The expected differentials is based on the interactions of two variables the actual urban-rural wage differentials and the probability of successfully having employment within the formal sector in the urban area.
3. The probability of getting an urban job is negatively correlated to the urban unemployment.

Illustration 2. A framework for the analysis of the migration decision
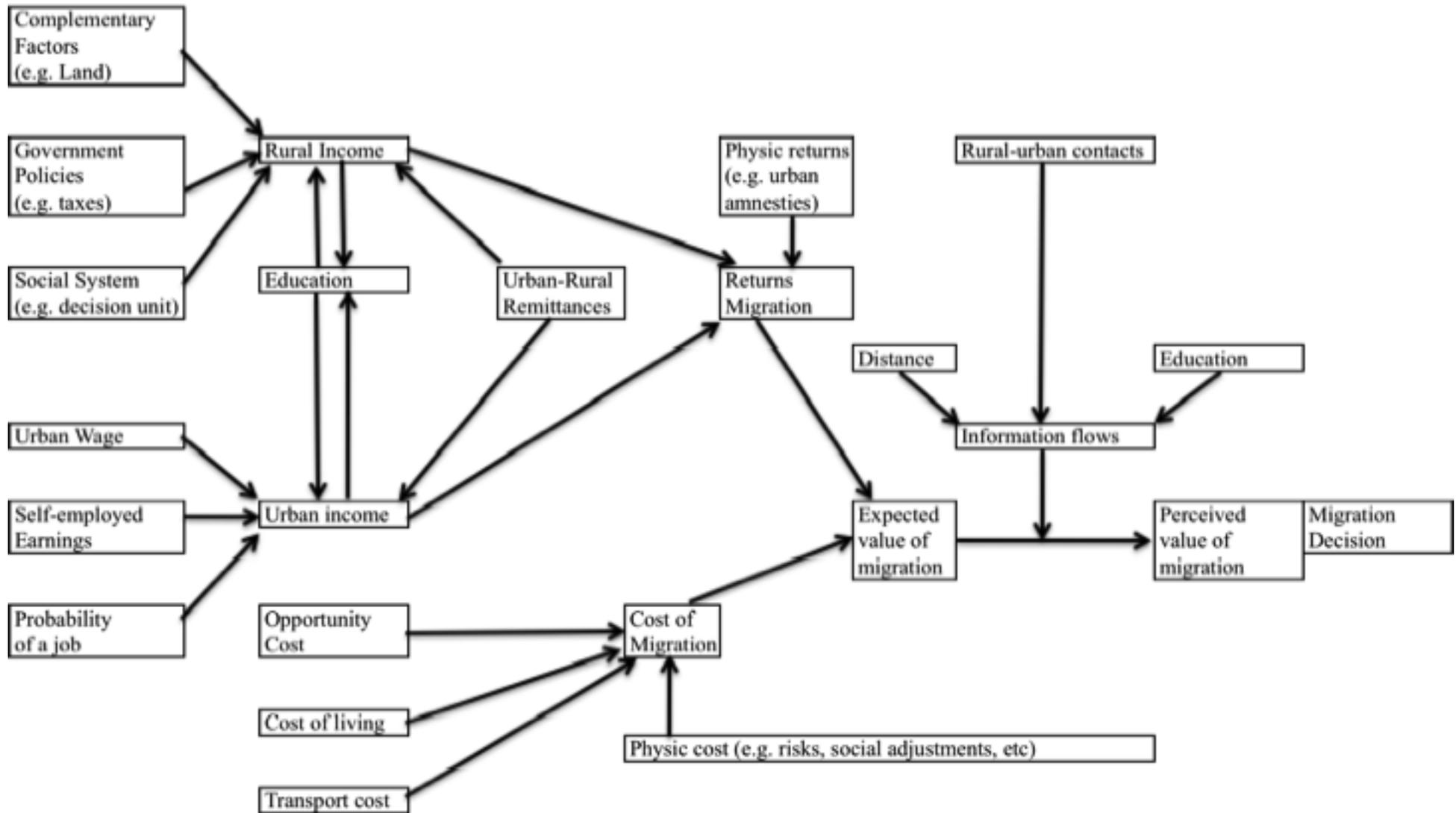
Source: Todaro, 1980

4. Migration rates in excess of urban job opportunity growth rates are likely to occur. This is due to the positive rural-urban expected income differentials. People are likely to relocate due to the expected wage differentials this lead to inevitable unemployment (Todaro, 1980).

Todaro and Harris then modified Todaro's model, they state that as an individual's migration decision was based on differential in expected earnings, as urban wages fail to accommodate the labor surplus, unemployment occurs as an equilibrating variable. This led to different employment probabilities in informal sectors and these sectors have been classified according to education levels. Harris-Todaro thus summarizes that instead of urban wages adjusting to the employment probabilities (Speare & Harris, 1986).

3.2 Previous Findings

Speare and Harris found little systematic institutional differentiations in Indonesia throughout 1970s. There was also little systemic differentiation between rural and urban wages for individuals with similar set of characteristics. Migration flow however, continues to rise. Aklilu and Harris reveals that estimated earnings based on 1970s survey data for migrants in Indonesia reveals that there is positive expected return to education for both men and women. Furthermore, according to their occupation, individuals working within large-scare self-employment positive return. However, this is not the case for individuals working within the government sector and small scale-private employment, and petty-self employment, when education and sex are controlled they found no significant differentiation in real wage level. From the data survey that they used Aklilu and Harris also found that poorly educated migrants from the rural find work instantly once they have migrated to the urban area and remain employed (Speare & Harris, 1986).

Hart found that in Indonesia the rural labor markets are structured according to landholding status and there is a relationship between labor, land, and credit arrangements. Rural and urban labor market differs in a terms of social position of landowners and entrepreneurs. Additionally, Simanjuntak argues that the classification between government and nongovernment labor markets has increased especially for those with higher education level (Hart, 1981).

Rural-to-urban migration in Indonesia is mainly selective young adults with higher level of education compared to the average level of education in their rural residents in their original province. This confirms the previous theories of rural-to-urban migration in developing countries (Speare & Harris, 1986).

When observing migration propensities by age and education, Speare and Harris found that measuring migration in Indonesia was not a simple response to wage differentials. The results shows that individuals within the age group 15-19 often migrate two to five times more frequently than averages males and females as a whole. These rates decline rapidly for those who spend less time in school, indicating that individuals with lower level of education tend to move at a young age or remain where they are. As for individuals who have completed junior high school or high school or more, migration propensities was higher than the groups of all ages and the decline with age, the results reveal that it is statistically significant however not much can be said about the result as it does not indicate great significance.

The Asian Financial Crisis

Many studies concluded that migration is an event, which the process of the event is based on collective household strategy especially in developing countries. Migration if considered in a household in order to minimize the exposure of uncertainty and numerous market failures (Stark & Bloom, 1985; Lucas & Stark, 1985; Rosenweig & stark, 1989; Lauby & Stark; 2000; Stark, 1991).

Natural disasters such as earthquakes, floods and draughts have an impact on the household welfare through physical and human capital stock. Conversely, economic crises have an impact on household welfare and can be characterized by several different conditions. For example, an economic crises can affect the welfare of household by slowing down economic activity that could lower down the demand for labor service, decrease the probability of having employment, increase the unemployment rate, and also decrease the level of income of an individual who are involved in the labor market (Fallon & Lucas; 2002).

Hugo found that the impact of the Asian financial crisis was severe on Indonesia; migration was not an unusual coping strategies. The magnitude of the crisis had different impact for different areas in Indonesia. Where the effects of the crisis was particularly severe, individuals or households would relocate on a temporary, or in some cases on a permanent basis to areas there the effects of the crisis was les severe or positive one.

As the crisis had different impacts on different groups of socio-economic groups, when comparing the areas within Indonesia specifically the outer islands where the economic activities depend on cash crops or resource extraction activities, these areas had minor impacts compared to places in Java in terms of the decline in domestic demand and continue with their export. Additionally, those who did not get affected by the El Niño also did not have a major impact from the crisis (Hugo, 2000).

It has not been easy to collect migration data in Indonesia, however Hugo sound that over the past three decades there have been massive migration flows and the internal migration data that has been collected by the census only represent parts of the population mobility. Since it provides records for only long-term mobility (Hugo, 2000).

Changes of structure in the type of employment occur after the crisis. The result from Sakernas (Indonesian Labor Department) indicates that people lost their jobs particularly in the construction and manufacturing sector. Throughout the crisis Almost half a million jobs were lost in big cities (Sakernas, BPS, 1997 and 1998).

The unemployment impact was similar for both the men and women population. The groups that had to face unemployment were mainly women coming from different parts of Java, relatively well educated and coming from middle class rural families. These women population had to return to their villages and many remained to wait for another employment opportunity. Before the crisis occur studies reveals that women particularly who had been employed in the city were not attracted to pursuing gainful occupation, this was one of the major factors that triggers for women to move (Sunaryanto, 1998).

The change in work status of labor force in 1997-1998 also had significant impact for the people within the workforce to shift into the agricultural sector. The results from the Indonesian statistics indicate that approximately 2 million jobs were lost within the non-agricultural sector and the result of the crisis creates about 3 million jobs within the informal sector and a loss of 1.4 million formal job sectors. Thus, population mobility played a significant role for that time (Hugo, 2000).

3.3 Hypotheses

Based from the previous research therefore the á priori expectation are:

1. Men generally have higher probability of migrating. However, women have higher probability of migration compared to the men population in Indonesia in facing short-term economic crisis

2. Individuals with higher education are more likely to migrate compared to individuals with less education level

3. There is a positive relationship between short-term economic stress and the probability of out-migration in Indonesia

4. Data

4.1 Data Source
The Indonesian Family Life Survey is a survey is a longitudinal socioeconomic and health survey provided by RAND Corporation. Different waves of the survey are the result from different collaborators; the first wave of the survey was collaborating efforts between RAND and the demographic institution of University of Indonesia. The sample in the survey represents approximately 83% of the Indonesian population from 13 of the 26 provinces in 1993. The survey provides information on individual, household, and community level. The information also includes; individual's health and education facilities they use. The second waves attempted to re-interview the same respondent in 1997. The second wave survey was a collaborate effort between RAND, UCLA, and demographic institution of University of Indonesia. The third and fourth wave was the same collaborate effort of the same institutions with the Centre Population and Policy Studies and The University of Gajah Mada. The third and fourth waves attempted to do the same through re-interviewing the responded from the panel and adding new households member. There were approximately 87% of target individuals who responded to all the longitudinal survey. The rest of the proportion were either missing or died (Strauss; Witoelar; Sikoki and Wattie, 2009)

High re-interviewed rate was due to the system that the survey used which was by tracking down the individuals and individuals who have moved or split off from the original household were tracked by assigning them with unique identification. The high re-interview rate was also to lessen the risk of bias.

The survey on migration history were answered by individuals who were 15 years or over at the time of the first wave in 1993. These individuals were then followed until the last wave in 2007. Therefore, any migrations between those times were recorded in the data sets. However, several individuals were dropped from the sample population due to several considerations; the were no complete information on the year of birth of the individual, there were no information on the province of the individual at birth nor information on the individual at the age of 12 and as some people migrated there were individuals who responded they have migrated at the same time they did not state the year of their migration. Picture 1 shows the IFLS provinces represented in the population sample. The list of provinces that were included in the IFLS survey were: North-Sumatra, West-Sumatra, South Sumatra, Lampung, Jakarta, West Java, Central Java, Yogyakarta, East, Java, Bali, West Nusa Tenggara, and South Kalimantan.

Every individual who participated in the survey was questioned about their migration histories and answered the question on whether they have migrated for more than 6 months or over. If the individual had migrated for more than 6 months they were then treated as an individual who has done migration from their current location. However, if the individual have moved for less than 6 months they were then treated as an individual who has done circular migration. For the purpose of this study the group of individuals who migrated within more than 6 months are taken into account for the purpose of the analysis. As one individual might have migrated several times, all migrations are taken into account to analyze the response of economic stress.

Picture 1: Map of Indonesia with IFLS Provinces

Source: RAND Family Life Survey (2013)

4.2 Data sample

From the data sets out of about 8,400 individuals who answered the migration histories survey, about 4,000 individuals provided complete information on the four waves of the survey with complete information. In the sample both groups of migrants and non-migrants were taken into account. Additionally, apart from the household characteristics and migration histories that the individuals provide, they also answered the question about the reasons of their migration. The majority of the males migrant responded that the migration is due to the employment can also be related due the new job opportunity in another location or moving to a new location due to the insufficient number of jobs in the place where they were living. The pattern of migration varies across provinces in Indonesia and the lifetime migration by province in Indonesia mainly comes from the province of Java. Although, the

For the purpose of this study, the individuals that will be analyzed are individuals between 15-60 years. The justification for the age selection is done through considering the survey respondents in the panel, the people who answered the migration history questions are respondents among those age 15 and above. Additionally, the age of 60 is considered, as the maximum limit of the evaluated individual due to the age of retiring from work in Indonesia is 60.

The individuals age were constructed, therefore each individual can have several number of observations depending on the time when he entered into the time of observation until the end of the study period or the age limit set on the individual. In the summary of the full sample data sets there are 157,649 numbers of observations on both male and female after the age variable was reconstructed. The full sample datasets includes the following variables: sex, age, period, education, household size, and occupation. Table next shows

the sample summary of the variables that are used in the model for the event-history analysis. From the full sample population the mean age is 33. The majority of the highest level of education in the household from the sample are the groups with no education or has completed elementary education. The average household size is small households. And the majority of the occupation for the household from the sample population is self-employment.

Table 1: Full Population Sample Summary

Variable	Observation	Percent	Mean	Std. Dev.	Min	Max
Sex	157649	n/a	0.46	0.50	0	1
Age	157649	n/a	33.22	11.64	15	60
Education						
Secondary Education	157649	5.05	0.05	0.22	0	1
High School Education	157649	6.22	0.06	0.24	0	1
University Education or Higher	157649	2.61	0.03	0.16	0	1
Household size						
Small	157649	54.24	0.54	0.50	0	1
Medium	157649	41.85	0.42	0.49	0	1
Large	157649	2.86	0.03	0.17	0	1
Very Large	157649	0.21	0.00	0.05	0	1
Occupation						
Government Sector	157649	23.08	0.23	0.42	0	1
Private Worker	157649	23.68	0.24	0.43	0	1
Unpaid Family Worker	157649	15.16	0.15	0.36	0	1

Source: Author's data compilation from RAND Family Life Survey (2013)

Table 2 shows the result for the men population sample summary. The total number of observation for the men sample population is 72,293. The mean age for the men population is 34, the same as the full population sample. The mean education of the household is also elementary level. Observing through the household size and the Occupation categorical variable the outcome of the summary is also the same as the full sample population, where the mean household of the men sample population is small to medium. The main occupation in the sample is self-employment type of work.

The women sample population summary also indicates similar result to that of the men model and reflects the full population sample summary. The mean age for the women sample population is 32, the average highest education level in the household is also no education or primary education. The average of the household size is also small to medium. The main occupation in the household of the women population sample is again the self-employment sector. Table 3 shows the full sample summary of the women population sample from the data sets.

Table 2: Male Population Sample Summary

Variable	Observation	Percent	Mean	Std. Dev.	Min	Max
Age	72293	n/a	33.76	11.80	15	60
Education						
Secondary Education	72293	5.07	0.05	0.21	0	1
High School Education	72293	7.39	0.07	0.26	0	1
University Education or Higher	72293	3.02	0.03	0.17	0	1
Household size						
Small	72293	53.02	0.53	0.50	0	1
Medium	72293	43.25	0.43	0.50	0	1
Large	72293	2.67	0.03	0.16	0	1
Very Large	72293	0.17	0.00	0.04	0	1
Occupation						
Government Sector	72293	32.24	0.32	0.47	0	1
Private Worker	72293	29.39	0.29	0.46	0	1
Unpaid Family Worker	72293	1.29	0.01	0.11	0	1

Source: Author's data compilation from RAND Family Life Survey (2013)

Table 3: Female Population Sample Summary

Variable	Observation	Percent	Mean	Std. Dev.	Min	Max
Age	85356	n/a	32.76	11.48	15	60
Education						
Secondary Education	85356	5.04	0.05	0.22	0	1
High School Education	85356	5.23	0.05	0.22	0	1
University Education or Higher	85356	2.26	0.02	0.15	0	1
Household size						
Small	85356	55.27	0.55	0.50	0	1
Medium	85356	40.67	0.41	0.49	0	1
Large	85356	3.02	0.03	0.17	0	1
Very Large	85356	0.24	0.00	0.05	0	1
Occupation						
Government Sector	85356	15.33	0.15	0.36	0	1
Private Worker	85356	18.85	0.19	0.39	0	1
Unpaid Family Worker	85356	26.90	0.27	0.44	0	1

Source: Author's data compilation from RAND Family Life Survey (2013)

The way the data sample was collected is that each survey individuals provides information on their household characteristics. Therefore, these characteristics may change on the next survey. To avoid the sample bias and keeping the individuals for the observation all of the variables that are used as control variables are assumed constant using the 1993 information. As the information changes on the control variables the changes are taken into account to measure the changes in the propensity of migration.

5. Methodology

5.1 Statistical Model

To answer the first research question, the strategy is to use the pooled data for both men and women and observe the probability of out-migration from all the population.

To answer the second research question on how likely are an individual migrate as a response to the economic stress my method is to use the selected individuals in the family survey data and analyze individual migration histories using discrete event history analysis. (Rohwer and Blossfeld 2001).

The issue of censoring and time-varying variables can complicate the application of the standard analysis techniques for longitudinal data on the occurrence of events. However, the maximum likelihood and partial-likelihood methods solve this issue, This issue can be solved through using event history-analysis as in many cases of the data provided fell within certain intervals of time (Allison, 1982).

The methodology that would be used to estimate the probability of an individual of migrating is the complementary log-log (cloglog) discrete event-time history model (Allison, 1982). In this model as the information from the sample analysis are provided in a discrete time, which means that an individual provides information on the year they have moved however, the individual did not provide with the exact dates of their out-migration time. Therefore, the probability of migration as conditional on the covariates can be computed as follows:

$$h(t) = \Pr(T = t \mid T \geq t, X)$$

Where T is the time of the event and h(t) is the probability of an out-migration event occurring during time t. In discrete time models, the dependent variable models the risk of the probability of the out-migration event occurs on the covariates to some time t. Furthermore, the probability of an event occurring can be illustrated as the following notations:

$$\lambda_i - 1 - \exp[\exp - \exp(\beta X)]$$

To estimate the equation of the model the complementary log-log model is used and can be illustrated in the following equation:

$$\log[-\log(1 - \lambda_i) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + ... + \beta_k x_{ki}$$

To interpret the model the beta coefficients, standard errors, and the exponentiated coefficients of the beta can be used. The exponentiated coefficients of beta are interpreted as relative risk for the complementary log-log models (Allison, 1982). For the interpretations of the binary covariates, the relative risk compares the risk for an event for x=1 relative to x=0 (Allison, 1982).

To apply the model to the Indonesian Family Life Survey Data the first step to indicate is to restructure the data for discrete time modeling. Where there are approximately 4,417 samples of the Indonesian population. The data is restructured into yearly intervals for each individual, starting from the age of 15 and censoring the individual after the age of 60 and after the year 2007, as the panel data survey ended in that year. Furthermore to construct the dependent variable according to the model, the migration year is used to indicate which indicates the event of migration, this then becomes a binary outcome where a person who migrates at particular year will have the outcome of 1 and a person who did not move at particular year will have the outcome of 0.

The estimation of the discrete-event history analysis will also be estimated based on different independent variables namely age, sex, occupation, education, the size of the household, land hold status, and the occupation of the head in the household.

In the Appendix the figures illustrate the comparison of the real natural logarithm of rice price with the de-trended rice price using the Hodrick-Prescott filter. The models will be divided for male and female for comparison.

The strategy in estimating the discrete-event history analysis is by estimating the basic model that is by using migration as the dependent variable and using duration, categorical period, age, age-squared, the residuals of the natural logarithm of rice price, and the 1 year lag of the rice price. The basic model can be illustrated in the following formula:

$$\log[-\log(1-\lambda_i) = \beta_0 + \beta_{duration} + \beta_{age} + \beta_{age-squared} + \beta_{period}$$

$$= \beta_{HPR-\ln priceofrice} + \beta_{HPR-1yrlag-\ln priceofrice}$$

The model is estimated separately for male and female. The model that follows the basic model is the addition of the control variables; (1) Education, (2) occupation, (3) household size, and (4) occupation, as part of the household characteristics. The final model is as follows:

$$\log[-\log(1-\lambda_i) = \beta_0 + \beta_{duration} + \beta_{age} + \beta_{age-squared} + \beta_{period} + \beta_{education}$$

$$= \beta_{householdsize} + \beta_{occupation} \beta_{HPR-\ln priceofrice} + \beta_{HPR-1yrlag-\ln priceofrice}$$

After estimating the final model in order to see if there is an impact of short-term crisis on out-migration we look at the statistical significance. To test if short-term economic crisis had an impact on the out-migration for both male and female, the interaction terms are included for the period of years of crisis and the covariates in the multivariate model of out-migration. For the purpose of this paper robust standard errors will be used.

5.2 Definition of Variables

Dependent Variable

Variable: Migration

The migration variable indicates the year that a person has migrated for over 6 months or more, the records indicates the migration history from the age of 15. Each migration is considered as an event which will be defined by binary variables, if a person migrates in a particular year number 1 will indicate the event and if migration did not occur in a particular year, hence number 0 will indicate the event. All long-term migration is taken into account for the purpose of this study.

Independent Variables
Variable: Sex

As the sample contains both male and female population, sex variables distinguish the male and female population. Out of 4,418 sample of the population there are approximately 1,948 males and 2,470 females. For the purpose of the analysis the female sample is the reference category.

Variable: Period

The period variable was generated. The data for individual was constructed from the age of 15 until the age of 60 or the end of the study period in 2007. As the available data for the price of rice was only available from 1961, the period is split into four different periods. As the crises occur throughout the late 1990s the split period for the crises period is the year 1994, and period 1 is the reference category. The following table is the description for the categorized period.

Table 4: Categories of Period Variable

Variable	Year	Number of Years
Period 1	1961-1971	10
Period 2	1971-1982	10
Period 3	1983-1993	10
Period 4	1994-2007	13

Variable: Education

The education variable describes the highest level of education in a household. There are different types of education systems in Indonesia, where there are individuals attended the religious school and individuals attending formal secular education. Both education levels are taken into account on the same number of years on the basis that both systems are under the responsibility of the Ministry of Education and Culture and the Ministry of Religious affairs. The majority of the sample population of education level is between primary level and secondary level. For the purpose of the analysis of the paper first category of the education is the reference category. The following table shows the categorized education variable.

Table 5: Categories of Education Variable

Variable	Years of Schooling	Description
Education 1	Less than 6	Primary School or less
Education 2	More than 6 & less than or equal to 9	Secondary school
Education 3	More than 9 & less than or equal to12	High school
Education 4	More than12	Higher Education

Variable: Household size

The household size indicates the number of members of the household. The range number of members in the household in the IFLS sample in Indonesia can be from one person to 22 people in one household. The mean number of members in a household is 5 people in one household. For the household size variable the first type is the reference category. Thus, the classification of the household size variable is as follows.

Table 6: Categories of Household Size Variable

Variable	Number of Members	Description
Household size 0	Equal to 1	Very Small
Household size 1	Greater or equal to 2 & less than or equal to 5	Small
Household size 2	Greater than 6 & less than or equal to 10	Medium
Household size 3	Greater than 11 & less than or equal to 15	Large
Household size 4	Greater than or equal to 16	Very Large

Variable: Occupation

The occupation variable describes the occupation of the head of the household. For the occupation variables, the classification of the variables can be distinguished by household members who are working within the government sector, self-employed with help of householders or regular workers and without help, there are also households who are involved as a private employee and households who works within the private sector. The first type of occupation is the reference category.

Table 7: Categories of Occupation Variable

Variable	Type of Occupation
Occupation 1	Self-employed
Occupation 2	Government worker
Occupation 3	Private worker/employee
Occupation 4	Unpaid family worker

Variable: Price of Rice

The price of rice in Indonesia fluctuated for different years to take into account the variable of price of rice; the Hodrick-Prescott filter will be used for the price of rice to be used as an economic indicator. The natural logarithm of the price of rice is also taken into account for the purpose of the analysis. Furthermore, to evaluate the impact of the crisis 1-year lagged of the price of rice will be attained.

Variable: Duration

Duration variables indicates the duration each individual experience out-migration from the start of the observation period until an out-migration event occur or the study period ends. The duration resets the time each time an individual experience an out-migration event.

Table 8: Categories of Occupation Variable

Variable	Number of Years
Duration 1	10
Duration 2	10
Duration 3	10
Duration 4	13

6. Empirical Analysis

6.1 Results

After estimating the results for the complementary log-log estimates together for the male and female data sets, the results indicate that the probability of migration at the margin for the men population is higher than the women population. Together for the male and female data sets, using the existing variables as controls: period, education, household size, occupation, and land hold the results indicates that the probability of migration at the margin level the male population has higher probability to migrate compared to the female population. The figure below shows how the younger men population has the highest chance of migrating compared to the women population. As they get older the probability of migrating decreased constantly for both male and female population. There is a wider gap for the younger population compared the older age where eventually the probabilities of out-migration for the men and women population are slowly converging.

Figure 4: Adjusted Prediction of Sex - Probability of Migration by Age
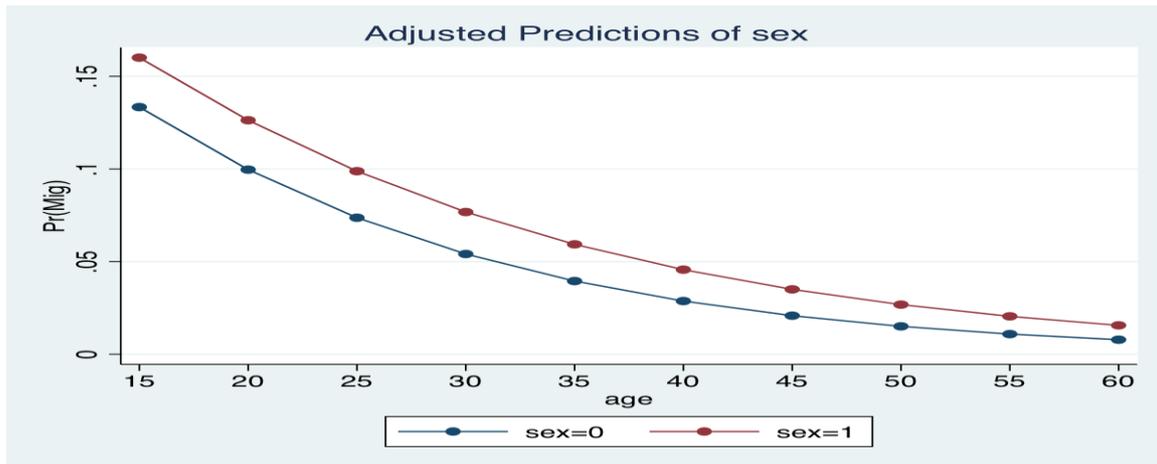
Source: Author's calculation result from data on RAND Family Life Survey (2013)

6.2 Statistical significance

Table 4 shows the results for the full model of men and women (I), only the men sample population (II), and only the women population (III). The model shows the outcome of the complementary log-log function in the exponential forms with robust standard errors. The model includes all of the control variables, which consists of; duration categories, period categories, age, age-squared variables, education categories, household size categories, and occupation categories. For the duration categories all models indicates it's statistical significant which means that if a person have migrated, this will affect their next migration. The outcome indicates that once an individual migrated during their lifetime they have relatively lower risk of migrating after their first 10 years of migration. This confirms the first results where it shows that as people gets older they are less likely to migrate at the same time it confirms the previous findings that states that selective young people are more likely at risk for migration compared to all other groups of people.

Looking at the period categorical variables the result indicates that considering both genders, the categorical period outcome shows that all period are statistically significant compared to the reference category (period 1: 1961-1971). Furthermore, all categories in the periods have higher relative risk of migration compared to the reference category, except the last period (Period 4: 1994-12007) where the result states the opposite the outcome shows that it has negative impact from the reference category. For the male model, only the second period (period 2: 1972-1982) is statistically insignificant even though the result shows that the period has higher relative risk of migration compared to the reference category period. Period 3 shows that there is also higher relative risk of migration compare to the reference category and it is statistically significant. Conversely, period 4 shows lower relative risk compared to the reference category. This follows the result of the combined model for men and women, however since this particular period is the period with the crisis dummy variable. Hence, it does not confirm that during this particular period male had higher relative risk of migration compared to the earlier years. For the women model, the period variables are all significant except for the last period where it is significant at 10% significance level. The direction of the results shows that compared to the reference category (Period 1: 1961-1971) females generally has a higher relative risk of migration. For both the second and the third period the relative risk of migration is higher where the third period (Period 3:1983-1993) indicates the highest relative risk within the categorical period. This confirms the previous research where pre-crisis period female tends to move since they have the opportunity to work outside from

the area where they come from. The fourth period also indicates that there is a higher relative risk compared to the reference category period. Yet, the numbers shows that it is relatively lower compared to other periods.

There are statistically significant results for the age variable in the combined model for males and females and in the only female model. The age variable for the only male model is statistically insignificant. The age variable for the combined model indicate negative result which means that as the population age increase by one year the have lower relative risk of migration. However, this interpretation is not valid when considering the male sample population only. For the combined model the variable is statistically insignificant. For the male model only, the variable is statistically significant at 10% level. However, the effect does not show much change as the exponential form show the result is 1. The same goes with the only female model the variable show that it is statistically significant. However there is not much change from this particular variable. This means although age might have significant impact on individual, however as they grow older it does not change their relative risk of migrating. There can be other factors that can influence the decisions of migration. Previous research show that migrant group normally comes from the selective young age group these results therefore confirms the previous findings.

Following onto the control variable, the first variable is education, which was also stated in the hypothesis. The result from the education variable is that all education variables are significant for all the models compared to the reference category (no education or primary education level). Observing through the combined model for the education variable, the result reveals that for those individuals with secondary education as the highest education in the household there is higher relative risk for the individual to migrate. Furthermore, as there is higher education level in the household the relative risk for migration increases. This result is the same for the only men and the only women models. The only difference is that for the women only model the difference between the relative risks from the secondary education to the reference category is higher than the male only model. As for the women only model the relative risk for household with higher education level is lower than that of the high school categories. The hypothesis states that individuals with higher education are more likely to migrate compared to individuals with less education level. This result confirms the hypothesis.

The household size variable is taken into account to see if people with different size of household have different risk of migrating. The theory states that people will adjust the household labor supply as one of the coping strategies. This is done through migration. The result from the model indicates that considering the combined male and female models the results are statistically significant for all categories of the variables except the very large household size. This result is also valid for the only male model. However, it is not the case for female, the household size variable for female is statistically insignificant for all categories within the variable. The result nevertheless shows that people with bigger household size have less relative risk of migration compared to the reference category where the individual is the household.

Observing through the occupation variable. As previous research have stated that generally people working within the non-government sector had higher propensities in mobility. Especially during the crisis where the unemployment level increased and informal sector increased respectively. The reference category for the occupation variable is the self-employment occupation. For the combined model, the outcome is that individual with household working in the government sector has higher relative risk that those with self-employment. This result is similar to those who those who are working within the private sector, nonetheless since the result for the private sector is very close to

1, hence the relative risk is very close to that of reference category. For the combined model the result for the unpaid family worker, the last category in the variable indicates the opposite result to the reference category and it is statistically significant. For the only male model the category variables are all significant and indicating that all occupation have higher relative risk compared to the reference category especially those with unpaid family work for the occupation of the head of household. For the only female model, the results are also statistically significant except for the private worker occupation category, but the results differ from the male model. For instance, female with unpaid family worker for the household have less relative risk to those who are in the reference category.

As for the price of rice, using residuals of the Hodrick-Prescott (HP) filter for the natural log of price of rice as an economic indicator. The result from the complementary log-log function shows that the HP residuals are statistically significant for the combined model and the female model. There is a positive relationship between the relative risk of migration and the price of rice. This means that as price of rice increase the relative risk of an individual migrating increase respectively. Furthermore, observing through the 1-year lag of the residuals of the HP for the natural log of price of rice, the result shows that as there is an increase in the price of rice, the relative risk of an individual to migrate is higher and statistically significant to the current year. The HP filter provides the short-term variation for the price of rice. Therefore, it can also be said that using the price of rice as an economic indicator is an appropriate measure for the aggregate level to be measure at the individual level. When looking at the result for the combined model, the outcome shows that the difference in the relative risk for the current year and the year after is approximately .10. When observing the only male model, the result indicate that the relative risk also increase after one year by approximately .10. However, for the male mode the result for the current year of the short-term variation price of rice is statistically insignificant. As for the only female model, the result shows the highest changes compared to the two models. Where both years are significant the current and the 1-year lag of the short-term variation of the price of rice, the relative risk increased by .32.

To look at if the price of rice has direct or indirect impact between the variables and the price of rice, the net-effects needs to be calculated by interacting the variables. The next section will provide the result of the net-effects of the interaction terms.

Table 9: Result for the full model, male model, and female model

EQUATION	COVARIATES	BOTH Migration	MEN Migration	WOMEN Migration
	DURATION			
Migration	Duration 2: 11-21 years	0.365***	0.373***	0.379***
		(0.0123)	(0.0172)	(0.0188)
	Duration 3: 22-32 years	0.228***	0.231***	0.245***
		(0.0149)	(0.0218)	(0.0226)
	Duration 4: 33-46 years	0.334***	0.335***	0.347***
		(0.0351)	(0.0546)	(0.0490)
	PERIOD			
	Period 2: 1972-1982	1.081**	1.002	1.209***
		(0.0372)	(0.0453)	(0.0653)
	Period 3: 1983-1993	1.271***	1.155***	1.483***
		(0.0465)	(0.0583)	(0.0818)
	Period 4: 1994-2007	0.836***	0.677***	1.147**
		(0.0387)	(0.0446)	(0.0772)
	AGE			
	Age	0.964***	1.001	0.917***
		(0.00693)	(0.0101)	(0.00961)
	Age-Squared	1.000	1.000**	1.001***
		(0.000112)	(0.000158)	(0.000163)
	EDUCATION			
	Secondary Education	1.221***	1.183***	1.235***
		(0.0515)	(0.0705)	(0.0739)
	High School Education	1.513***	1.364***	1.679***
		(0.0517)	(0.0635)	(0.0846)
	University Education or Higher	1.705***	1.794***	1.600***
		(0.0801)	(0.109)	(0.118)
	HOUSEHOLD SIZE			
	Small Household	0.707***	0.691***	0.761*
		(0.0623)	(0.0769)	(0.110)
	Medium Household	0.705***	0.662***	0.791
		(0.0625)	(0.0745)	(0.115)
	Large Household	0.732***	0.701**	0.821
		(0.0786)	(0.0999)	(0.137)
	Very Large Household	0.778	0.830	0.808
		(0.190)	(0.291)	(0.279)
	OCCUPATION			
	Government Sector	1.263***	1.214***	1.287***
		(0.0342)	(0.0432)	(0.0555)
	Private Worker	1.096***	1.156***	0.959
		(0.0292)	(0.0410)	(0.0399)
	Unpaid Family Worker	0.787***	1.380***	0.808***
		(0.0283)	(0.164)	(0.0328)
	HP-RESIDUALS OF LN PRICE OF RICE			
	At time (t)	1.102***	1.037	1.171***
		(0.0243)	(0.0319)	(0.0368)
	Lagged time (t+1)	1.224***	1.137***	1.323***
		(0.0293)	(0.0370)	(0.0467)
	Constant	0.299***	0.203***	0.492***
		(0.0403)	(0.0369)	(0.101)
	Observations	150,206	68,836	81,370

Note: Robust standard errors in parentheses, stars indicates statistical significance, where
*** p<0.01, ** p<0.05, * p<0.1

6.3 Net effects for the interaction terms

Table 5 shows the results for the net-effects of the interaction terms. The full table of the result is shown in the appendix. The table shows all the interaction effects on the combined model, the male only model and the female only model. This is to see if the price of rice has a direct impact on the propensity of migration or not.

Observing through the period effect, for the combined model the result for the second and third period interacted with the current HP-residuals of natural log price of rice shows that there is a negative effect on the second period and there is a positive effect for the third period with a net effect of .13 higher than the period reference. For period 4, the net effect is slightly greater than the third period. The result of the interaction terms for the period and the 1-year lagged HP-residuals reveals different results where the second and the third period had a negative effect, the fourth period the shows how the impact is strong on both the male and female population. This reveals how price of rice during the fourth-period using 1-year lag has significant impact on the migration propensities. By splitting the model of male and female, the result shows that for the male model it is the same as the combined model however the net effects between the 1-year lagged for the HP-residuals of natural log price of rice is .48 higher, for the female this number is even higher at .92. This result follows the previous studies where the economic indicators had a big influence on migration particularly during the time of the crisis. For the period variable the only variables that are significant in the interaction results are the period 4: 1994-2007, when using the short-term variation in the current price of rice and for the 1-year lagged period 3 and period 4 are statistically significant indicating that during this particular period the variation in the price of rice has a direct impact on the particular periods.

Table 10: Result for interaction terms between the periods and the HP-residuals of ln price of rice

VARIABLES	BOTH Migration	MEN Migration	WOMEN Migration
HP-RESIDUALS OF LN PRICE OF RICE			
At time (t)	0.936	0.927	0.950
	(0.0395)	(0.0500)	(0.0639)
Lagged time (t+1)	0.976	1.004	0.938
	(0.0421)	(0.0543)	(0.0663)
PERIOD*HP-RESIDUALS OF LN PRICE OF RICE (t)			
Period 2: 1972-1982	1.001	0.883	1.150
	(0.120)	(0.142)	(0.207)
Period 3: 1983-1993	1.210**	1.127	1.291**
	(0.0915)	(0.117)	(0.144)
Period 4: 1994-2007	1.238***	1.205***	1.254***
	(0.0627)	(0.0822)	(0.0969)
PERIOD*HP-RESIDUALS OF LN PRICE OF RICE (t+1)			
Period 2: 1972-1982	0.762***	0.734**	0.804
	(0.0715)	(0.0918)	(0.115)
Period 3: 1983-1993	0.876*	0.885	0.876
	(0.0668)	(0.0914)	(0.100)
Period 4: 1994-2007	1.748***	1.483***	2.047***
	(0.104)	(0.117)	(0.187)
Constant	0.313***	0.211***	0.517***
	(0.0424)	(0.0384)	(0.107)
Observations	150,206	68,836	81,370

Note: Robust standard errors in parentheses, stars indicates statistical significance, where *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The interactions between the education categorical variable and the HP-residuals of natural log price of rice shows that using the current price as an economic indicator people with higher level of education does not have a direct impact from the change of price of rice. For example, using the combined model the outcome shows how there is a positive impact, yet the impact is not much on the these variables. From the combined model the result shows how only when the 1-year lagged for the HP-residuals of natural log price of rice is interacted with the education categorical variable, for those with secondary school or high school education in the household the result is statistically significant. The net effect is just under 1 indicating lower relative risk compared to those with no education or primary education.

For the only men model the result is generally insignificant for the categorical. The man with the characteristic of household with no education or primary education has the highest relative risk when faced with the variation of the price of rice and it is statistically significant for the 1-year lagged. This is the same with the women model, the result shows that those with lower education level are more sensitive to the change of price of rice and in times of short-term economic stress after 1-year lagged the result indicates that they have higher relative risk of migrating when faced with short-term economic variation. As the highest level education in the female model is high school education, the net effects is negative indicating that they are slightly less likely to be affected by the fluctuation of the price of rice.

Table 11: Result for interaction terms between the education and the HP-residuals of ln price of rice

VARIABLES	BOTH Migration	MEN Migration	WOMEN Migration
HP-RESIDUALS OF LN PRICE OF RICE			
At time (t)	1.144***	1.062*	1.235***
	(0.0297)	(0.0382)	(0.0459)
Lagged time (t+1)	1.279***	1.161***	1.419***
	(0.0357)	(0.0435)	(0.0591)
*EDUCATION*HP-RESIDUALS OF LN PRICE OF RICE(t)*			
Secondary Education	0.917	0.866	0.971
	(0.0763)	(0.103)	(0.112)
High School Education	0.884*	0.998	0.781***
	(0.0577)	(0.0920)	(0.0722)
University Education or Higher	0.784***	0.806*	0.750**
	(0.0712)	(0.102)	(0.0983)
*EDUCATION*HP-RESIDUALS OF LN PRICE OF RICE (t+1)*			
Secondary Education	0.833**	0.950	0.722**
	(0.0756)	(0.119)	(0.0951)
High School Education	0.775***	0.865	0.691***
	(0.0542)	(0.0859)	(0.0680)
University Education or Higher	0.988	0.985	1.012
	(0.0961)	(0.136)	(0.137)
Constant	0.304***	0.205***	0.500***
	(0.0411)	(0.0373)	(0.103)
Observations	150,206	68,836	81,370

Note: Robust standard errors in parentheses, stars indicates statistical significance, where *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The household sizes when interacted with the HP-residuals of the natural log price of rice are not statistically significant. Indicating that household size does not tell much about the household characteristics when faced with short-term economic variations or crisis. The results shows that as there are more household members the higher the relative risk of migrating when face with increasing price of rice at the same time is the household size is very large the less lower the relative risk is for the individual. Considering the theory, which states that one of the coping strategy is to take migration for the household member, based from this result since it is not statistically significant, therefore it can be said that household size does not have a direct impact from the economic fluctuations.

Table 12: Result for interaction terms between the household size and the HP-residuals of ln price of rice

VARIABLES	BOTH Migration	MEN Migration	WOMEN Migration
HP-RESIDUALS OF LN PRICE OF RICE			
At time (t)	1.035	0.739	1.643*
	(0.177)	(0.162)	(0.433)
Lagged time (t+1)	1.047	0.878	1.271
	(0.209)	(0.227)	(0.413)
HOUSEHOLD SIZE*HP-RESIDUALS OF LN PRICE OF RICE (t)			
Small Household	1.062	1.445*	0.686
	(0.184)	(0.323)	(0.183)
Medium Household	1.093	1.412	0.751
	(0.190)	(0.317)	(0.201)
Large Household	0.804	0.958	0.594
	(0.175)	(0.274)	(0.193)
Very Large Household	1.806	1.183	1.906
	(1.131)	(0.908)	(1.428)
HOUSEHOLD SIZE*HP-RESIDUALS OF LN PRICE OF RICE (t+1)			
Small Household	1.156	1.284	1.024
	(0.234)	(0.337)	(0.337)
Medium Household	1.194	1.327	1.066
	(0.243)	(0.350)	(0.352)
Large Household	1.234	1.402	1.055
	(0.311)	(0.470)	(0.412)
Very Large Household	0.531	0.362	0.878
	(0.308)	(0.237)	(1.069)
Constant	0.306***	0.203***	0.490***
	(0.0414)	(0.0372)	(0.104)
Observations	150,206	68,836	81,370

Note: Robust standard errors in parentheses, stars indicates statistical significance, where *** p<0.01, ** p<0.05, * p<0.1

Following to the occupation categorical variable the net interaction result shows that when interacted with the HP-residuals of log price of rice and the 1-year lagged HP-residuals natural log price of rice, the occupation categorical variables are statistically significant when interacted with the latter. For example, the groups who are working within the government sector have the similar relative risk compared to those who are self-employed. Within the occupation categorical group the unpaid family worker are the groups with the highest relative risk when interacted with the short-term variation of the natural log price of rice.

Previous findings states that those who are involved within the manufacturing and construction sector, which is also categorized as private sector, were the ones that got hit the most during economic deterioration. From the sample datasets, when interacted with the current HP-residuals of natural log price of rice none of the categorical variables from the three models were statistically significant. These results differ when the categorical variables are interacted with the 1-year lagged HP-residuals natural log price of rice. As an illustration, for the combined model the result are statistically significant for the interaction between the occupation and 1-year lag of variation of price of rice for particular groups, which are; government sector, and private sector is statistically significant at 10% level. The net effect of interactions between the categorical occupation variable is .17. This result therefore support the previous findings that people within the private sector are more likely to be exposed to economic fluctuations.

However, when the model was tested using the male and female only, none of the variables are statistically significant the only occupation categorical variable that is significant is the government sector at 10% level. Therefore, from this result it can be said that although previous studies shows that the most vulnerable groups within the occupation classification are those who are working within the private sector, the results shows that when both male and female population sample are taken together, the outcome confirms the previous findings. Nevertheless, when each population sample are tested separately, the result shows that private sector occupation are vulnerable especially for the female population at the same time the result are statistically insignificant.

Table 13: Result for interaction terms between the occupation and the HP-residuals of ln price of rice

VARIABLES	BOTH Migration	MEN Migration	WOMEN Migration
HP-RESIDUALS OF LN PRICE OF RICE			
At time (t)	1.127***	1.057	1.187***
	(0.0417)	(0.0573)	(0.0598)
Lagged time (t+1)	1.351***	1.245***	1.444***
	(0.0559)	(0.0725)	(0.0844)
OCCUPATION*HP-RESIDUALS OF LN PRICE OF RICE (t)			
Government Sector	0.942	0.991	0.910
	(0.0523)	(0.0743)	(0.0777)
Private Worker	0.947	0.952	0.991
	(0.0543)	(0.0735)	(0.0875)
Unpaid Family Worker	1.074	0.908	1.035
	(0.0823)	(0.229)	(0.0872)
OCCUPATION*HP-RESIDUALS OF LN PRICE OF RICE (t+1)			
Government Sector	0.814***	0.854**	0.816**
	(0.0484)	(0.0670)	(0.0766)
Private Worker	0.870**	0.890	0.901
	(0.0540)	(0.0729)	(0.0882)
Unpaid Family Worker	0.963	1.122	0.888
	(0.0833)	(0.315)	(0.0866)
Constant	0.303***	0.205***	0.502***
	(0.0410)	(0.0373)	(0.104)
Observations	150,206	68,836	81,370

Note: Robust standard errors in parentheses, stars indicates statistical significance, where *** p<0.01, ** p<0.05, * p<0.1

Table 14: Summary of net effects results

BOTH	Period				Education	
HP-RESIDUALS OF LN PRICE OF RICE	2	3	4	S	HS	U E or Higher
At time (t)	0.9369	1.1326	1.1588	1.0490	0.9848	0.8969
Lagged time (t+1)	0.7437	0.8550	1.7060	0.9395	0.9912	1.2637
MEN						
HP-RESIDUALS OF LN PRICE OF RICE						
At time (t)	0.8185	1.0447	1.1170	0.9197	1.0599	0.8560
Lagged time (t+1)	0.7369	0.8885	1.4889	1.1030	1.0043	1.1436
WOMEN						
HP-RESIDUALS OF LN PRICE OF RICE						
At time (t)	1.0925	1.2265	1.1913	1.1992	0.9645	0.9263
Lagged time (t+1)	0.7542	0.8217	1.9201	1.0245	0.9805	1.4360

Table 14. (Continued) Summary of net effects results

BOTH	Household Size				Occupation		
HP-RESIDUALS OF LN PRICE OF RICE	S	M	L	VL	GW	PW	UFW
At time (t)	1.0992	1.1313	0.8321	1.8692	1.0616	1.0673	1.2104
Lagged time (t+1)	1.2103	1.2501	1.2920	0.5560	1.0997	1.1754	1.3010
MEN							
HP-RESIDUALS OF LN PRICE OF RICE							
At time (t)	1.0679	1.0435	0.7080	0.8742	1.0475	1.0063	0.9598
Lagged time (t+1)	1.1274	1.1651	1.2310	0.3178	1.0632	1.1081	1.3969
WOMEN							
HP-RESIDUALS OF LN PRICE OF RICE							
At time (t)	1.1271	1.2339	0.9759	3.1316	1.0802	1.1763	1.2285
Lagged time (t+1)	1.3015	1.3549	1.3409	1.1159	1.1783	1.3010	1.2823

Note: Period 2: 1972-1982, Period 3: 1983-1993, Period 4: 1994-2007, Education S: Secondary, Education HS: High School, Education UE or higher: University or higher, Household Size S: Small, Household size M: Medium, Household size L: Large, Household size VL: Very Large, Occupation GW: Government Worker, Occupation PW: Private Worker, Occupation UFW: Unpaid Family Worker

Source: Author's data compilation from RAND Family Life Survey (2013)

6.2 Discussion

Based from the results, by observing the statistical significance and estimating the interaction terms the male population is more likely to migrate compared to the female population. However, when faced with short-term economic crisis females are more likely to respond to the crisis and have higher relative risk of migrating. This confirms the previous findings where males are more likely to migrate to seek an opportunity for work elsewhere. In the case of this Indonesian Family Life Survey the majority of male population migrates due to opportunities to work. Observing through the covariates one-by-one reflects how different explanatory variables for the household characteristics has statistically significant results when being interacted with the natural log for price of rice. These variables which had significant results were; period, education, and occupation. The household size variable, were not statistically significant when being interacted with the HP-residuals of natural log price of rice and the 1-year lagged HP-residuals of natural log price of rice.

Furthermore, taking into account the 1-year lag for price of rice to evaluate the impact of the crisis also shows how some covariates have statistically significant positive and negative net effect. This means for some groups of households they are more vulnerable to the changes in price of rice and the effect takes 1-year. Therefore, this answers the research question that out-migration was one of the methods to cope during the time of short-term economic crisis for individuals with certain households characteristics, which also confirms the hypothesis that there is a positive relationship between short-term economic crisis and the probability of out-migration in Indonesia.

7. Conclusion

Numerous authors concluded that migration is based on collective household strategy especially in developing countries. Migration if considered in a household in order to minimize the exposure of uncertainty and numerous market failures (Stark & Bloom, 1985; Lucas & Stark, 1985; Rosenweig & stark, 1989; Lauby & Stark; 2000; Stark, 1991).

The aim of this paper was to answer two research questions that were; what are the patterns of migration in Indonesia and in times of short-term economic crisis did the Indonesian Family use migration as a coping strategy.

Three á priori expectations for the propensities of migration were formulated based on gender, education level, and the impact of short-term economic crisis. These expectations were that based on the gender difference, first, men are generally more likely to migrate compared to the female population, based on the assumption from the literature review that young males are more likely to migrate to seek for job opportunity. However, based from the previous studies the women are more likely to migrate when they are faced with short-term economic crisis. Second, people with higher education level are more likely to migrate since they are more equipped to find jobs than those with no education or primary education, this expectation was formulated based on the theory from Todaro which states that individual in developing countries are more likely to migrate due to the expected earnings not the actual earnings. Last, the expectation of seeing a positive relationship between short-term economic crisis and migration.

The strategy in answering the research question was to use the sample population from the Indonesian Family Life Survey taking the longitudinal data from 1993-2007, by using the information from all the individuals who have answered the four complete panels. All individuals in the panel were taken into account for those who have migrated and those who

never migrated throughout the course of their lifetime. Therefore, taking into account different controls of variables: (1) duration, (2) age, (3) education, (4) household size, and (5) occupation, where some of these variables were categorical variables The results indicate that the male population have a higher probability of migration starting from the age of 15 until the age of 60 compared to the female population. These probabilities decline eventually with age.

For the second question as the Indonesian economy was at experiencing recession post the colonial era and at a developing stage based on its GDP growth throughout the period: 1961-2007, the assumption is that the country was still facing economic and politic uncertainties and people within different income distributions will be vulnerable to the economic condition especially for those who are at the bottom of the distribution of income, when there is an increase in the food price or a decline in the income they are more likely to be sensitive to the changes and eventually led them to migrate for coping strategy of short-term economic stress.

The strategies used in answering the research questions were conducting event-history analyses using the Indonesian Family Life Survey data sets, where approximately over 4,000 people were followed both male and female and those who have migrated and who have not migrated, by observing through their migration history. The model to conduct the event history analysis was done by using the complementary log-log function. The model was then conducted for three different groups. First the basic models were the simplest model including age, age-squared, and period, with later models adding different covariates in each model. The annual natural log price of rice is used and deflated by inflation from World Bank data as an economic indicator at the community level. This value is then de-trended using the Hodrick-Prescott filter and the residuals are as the short-term variation for the price of rice. Having migration as a dependent variable there are several different micro variables to define the characteristics of the household. These variables are: period, education, age, household size, occupation, and land hold.

Education is one of the covariates that were included in the á priori expectations. The hypothesis is that people with higher education are more likely to migrate compared to those with lower education level. The result confirms the hypothesis in times of stable economic conditions male population with higher education are more likely to migrate compared to those with lower level of education. However, in times of short-term economic deterioration when the price of rice was interacted with education the result reveals that people with lower education are have higher relative risk to migrate compared to those with higher level of education. This also confirms the previous findings that during times of economic deterioration people use migration as a coping strategy.

Furthermore previous studies found that individuals working within the private sector, namely the manufacturing and construction sector were badly hit by the Asian financial crisis and evidence on the employment statistics shows that the occupation had higher relative risk of migration at 1-year lagged of the natural log price of rice variation. These variables were statistically significant at 10% level. Indication although, there is an indication that people who are working within the private sector would relocate from the sample population it the relationship is not very strong. This could also be due to the limited data that comes from the sample of the data sets.

The result for the second question is that there is a significant impact for the crisis that several groups of Indonesian households with different characteristics where migration is proven to be statistically significant with higher relative risk for different characteristics of households, therefore it can be concluded that migration was used as a coping strategy. This

confirms the hypothesis that there is an impact of short-term economic crisis on migration in Indonesia. This also means that living standards need to be improved in Indonesia.

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Appendix

Appendix A - Crude Birth Rate in Indonesia, 1960-2007
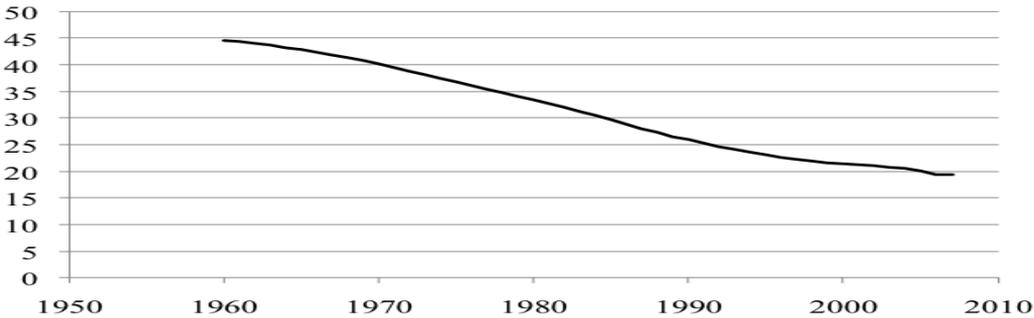
Source: World Bank Database (2013)

Appendix B - Crude Death Rate in Indonesia, 1960-2007
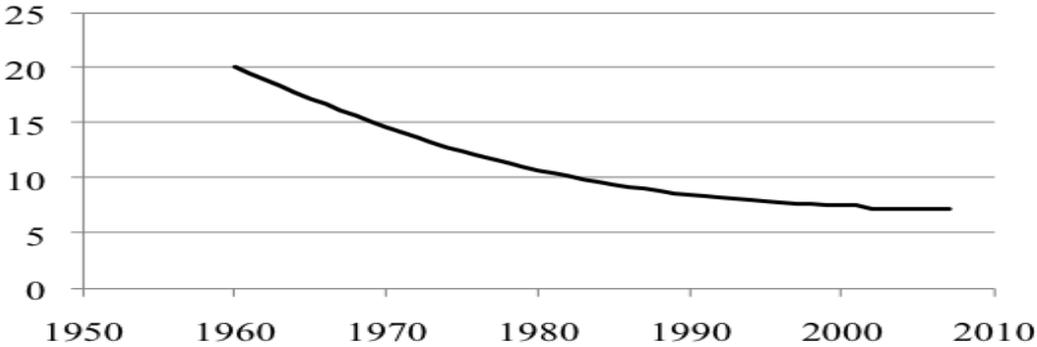
Source: World Bank Database (2013)

Appendix C - The Price of Rice and the de-trended price of rice using HP-Filter
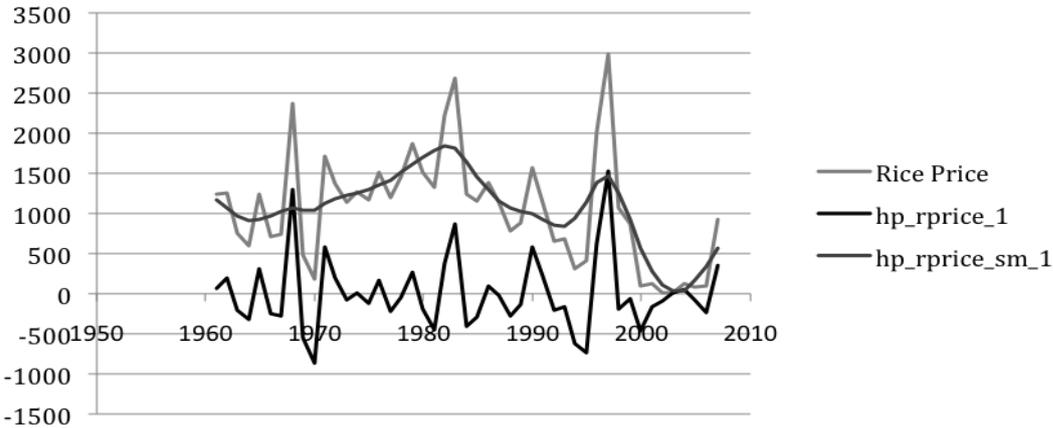
Source: International Rice Research Institute & World Bank (2013)

Appendix D - The Natural Logarithm Function for Price of Rice and the de-trended price of rice using HP-Filter
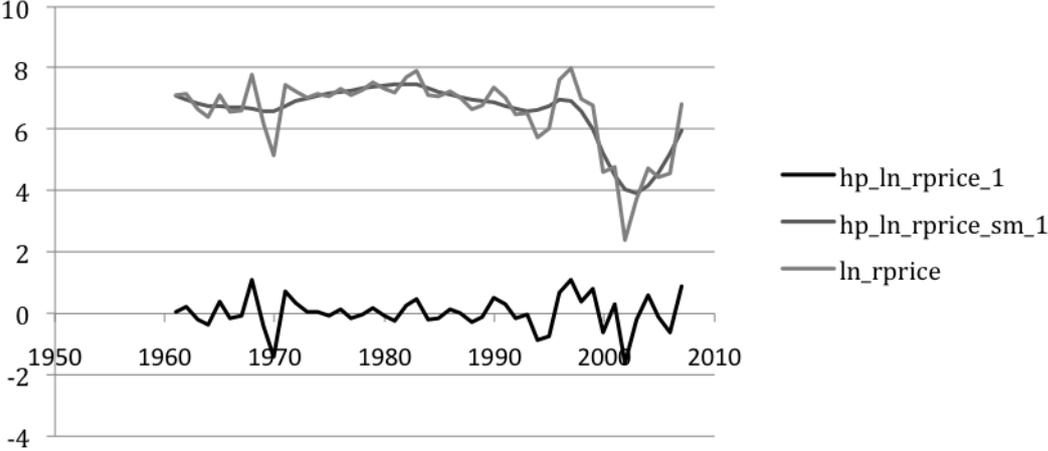
Source: International Rice Research Institute & World Bank (2013)

Appendix E –Complete model for the interaction terms with period

| EQUATION	COVARIATES	BOTH Migration	MEN Migration	WOMEN Migration
	DURATION			
Migration	Duration 2: 11-21 years	0.366***	0.373***	0.379***
		(0.0123)	(0.0172)	(0.0189)
	Duration 3: 22-32 years	0.228***	0.231***	0.245***
		(0.0149)	(0.0218)	(0.0226)
	Duration 4: 33-46 years	0.333***	0.336***	0.342***
		(0.0350)	(0.0548)	(0.0484)
	PERIOD			
	Period 2: 1972-1982	1.142***	1.046	1.291***
		(0.0404)	(0.0483)	(0.0720)
	Period 3: 1983-1993	1.350***	1.210***	1.598***
		(0.0508)	(0.0622)	(0.0912)
	Period 4: 1994-2007	0.838***	0.689***	1.135*
		(0.0405)	(0.0467)	(0.0808)
	AGE			
	Age	0.960***	0.998	0.912***
		(0.00691)	(0.0101)	(0.00956)
	Age-Squared	1.000	1.000**	1.001***
		(0.000112)	(0.000158)	(0.000163)
	EDUCATION			
	Secondary Education	1.213***	1.177***	1.226***
		(0.0512)	(0.0703)	(0.0735)
	High School Education	1.499***	1.355***	1.660***
		(0.0514)	(0.0631)	(0.0839)
	University Education or Higher	1.697***	1.789***	1.595***
		(0.0798)	(0.109)	(0.118)
	HOUSEHOLD SIZE			
	Small Household	0.705***	0.693***	0.755*
		(0.0622)	(0.0774)	(0.110)
	Medium Household	0.706***	0.667***	0.788
		(0.0628)	(0.0753)	(0.115)
	Large Household	0.734***	0.708**	0.820
		(0.0790)	(0.101)	(0.138)
	Very Large Household	0.765	0.822	0.789
		(0.187)	(0.287)	(0.273)
	OCCUPATION			
	Government Sector	1.268***	1.217***	1.293***
		(0.0344)	(0.0434)	(0.0558)
	Private Worker	1.095***	1.154***	0.959
		(0.0292)	(0.0410)	(0.0400)
	Unpaid Family Worker	0.786***	1.380***	0.808***
		(0.0283)	(0.164)	(0.0328)
	HP-RESIDUALS OF LN PRICE OF RICE			
	At time (t)	0.936	0.927	0.950
		(0.0395)	(0.0500)	(0.0639)
	Lagged time (t+1)	0.976	1.004	0.938
		(0.0421)	(0.0543)	(0.0663)

Note: Robust standard errors in parentheses, stars indicates statistical significance, where
*** p<0.01, ** p<0.05, * p<0.1

Appendix F –Complete Model for the interaction terms with education

EQUATION	COVARIATES	BOTH Migration	MALE Migration	FEMALE Migration
	DURATION			
Migration	Duration 2: 11-21 years	0.365***	0.372***	0.378***
		(0.0123)	(0.0172)	(0.0188)
	Duration 3: 22-32 years	0.228***	0.231***	0.245***
		(0.0149)	(0.0218)	(0.0226)
	Duration 4: 33-46 years	0.335***	0.335***	0.347***
		(0.0352)	(0.0547)	(0.0492)
	PERIOD			
	Period 2: 1972-1982	1.079**	1.001	1.207***
		(0.0371)	(0.0452)	(0.0652)
	Period 3: 1983-1993	1.268***	1.155***	1.480***
		(0.0464)	(0.0583)	(0.0816)
	Period 4: 1994-2007	0.832***	0.676***	1.139*
		(0.0385)	(0.0446)	(0.0764)
	AGE			
	Age	0.965***	1.001	0.917***
		(0.00693)	(0.0101)	(0.00961)
	Age-Squared	1.000	1.000***	1.001***
		(0.000112)	(0.000158)	(0.000163)
	EDUCATION			
	Secondary Education	1.230***	1.185***	1.249***
		(0.0519)	(0.0708)	(0.0751)
	High School Education	1.526***	1.367***	1.713***
		(0.0522)	(0.0636)	(0.0864)
	University Education or Higher	1.713***	1.804***	1.606***
		(0.0808)	(0.110)	(0.119)
	HOUSEHOLD SIZE			
	Small Household	0.705***	0.692***	0.754*
		(0.0621)	(0.0771)	(0.109)
	Medium Household	0.704***	0.663***	0.783*
		(0.0624)	(0.0747)	(0.114)
	Large Household	0.729***	0.700**	0.814
		(0.0784)	(0.0999)	(0.137)
	Very Large Household	0.769	0.825	0.796
		(0.189)	(0.290)	(0.275)
	OCCUPATION			
	Government Sector	1.262***	1.212***	1.289***
		(0.0342)	(0.0431)	(0.0557)
	Private Worker	1.096***	1.155***	0.961
		(0.0292)	(0.0410)	(0.0400)
	Unpaid Family Worker	0.787***	1.384***	0.809***
		(0.0283)	(0.165)	(0.0328)
	HP-RESIDUALS OF LN PRICE OF RICE			
	At time (t)	1.144***	1.062*	1.235***
		(0.0297)	(0.0382)	(0.0459)
	Lagged time (t+1)	1.279***	1.161***	1.419***
		(0.0357)	(0.0435)	(0.0591)

Note: Robust standard errors in parentheses, stars indicates statistical significance, where
*** p<0.01, ** p<0.05, * p<0.1

Appendix G –Complete Model for the interaction terms with household size

EQUATION	COVARIATES	BOTH Migration	MALE Migration	FEMALE Migration
	DURATION			
Migration	Duration 2: 11-21 years	0.365***	0.373***	0.379***
		(0.0123)	(0.0172)	(0.0188)
	Duration 3: 22-32 years	0.228***	0.232***	0.245***
		(0.0149)	(0.0219)	(0.0226)
	Duration 4: 33-46 years	0.334***	0.334***	0.347***
		(0.0351)	(0.0545)	(0.0490)
	PERIOD			
	Period 2: 1972-1982	1.083**	1.004	1.210***
		(0.0373)	(0.0455)	(0.0653)
	Period 3: 1983-1993	1.273***	1.159***	1.483***
		(0.0466)	(0.0586)	(0.0818)
	Period 4: 1994-2007	0.836***	0.677***	1.146**
		(0.0387)	(0.0447)	(0.0770)
	AGE			
	Age	0.964***	1.001	0.917***
		(0.00693)	(0.0101)	(0.00961)
	Age-Squared	1.000	1.000**	1.001***
		(0.000112)	(0.000158)	(0.000163)
	EDUCATION			
	Secondary Education	1.221***	1.183***	1.235***
		(0.0515)	(0.0706)	(0.0740)
	High School Education	1.512***	1.363***	1.681***
		(0.0517)	(0.0634)	(0.0848)
	University Education or Higher	1.705***	1.797***	1.600***
		(0.0802)	(0.110)	(0.118)
	HOUSEHOLD SIZE			
	Small Household	0.702***	0.700***	0.779
		(0.0619)	(0.0792)	(0.118)
	Medium Household	0.700***	0.671***	0.806
		(0.0621)	(0.0767)	(0.123)
	Large Household	0.724***	0.702**	0.840
		(0.0780)	(0.101)	(0.146)
	Very Large Household	0.705	0.696	0.724
		(0.189)	(0.285)	(0.268)
	OCCUPATION			
	Government Sector	1.263***	1.211***	1.289***
		(0.0342)	(0.0432)	(0.0556)
	Private Worker	1.096***	1.154***	0.960
		(0.0292)	(0.0410)	(0.0400)
	Unpaid Family Worker	0.787***	1.380***	0.808***
		(0.0283)	(0.164)	(0.0328)
	HP-RESIDUALS OF LN PRICE OF RICE			
	At time (t)	1.035	0.739	1.643*
		(0.177)	(0.162)	(0.433)
	Lagged time (t+1)	1.047	0.878	1.271
		(0.209)	(0.227)	(0.413)

Note: Robust standard errors in parentheses, stars indicates statistical significance, where *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix H –Complete Model for the interaction terms with occupation

EQUATION	COVARIATES	BOTH Migration	MALE Migration	FEMALE Migration
	DURATION			
Migration	Duration 2: 11-21 years	0.365***	0.372***	0.379***
		(0.0123)	(0.0172)	(0.0189)
	Duration 3: 22-32 years	0.228***	0.231***	0.245***
		(0.0149)	(0.0218)	(0.0226)
	Duration 4: 33-46 years	0.334***	0.335***	0.346***
		(0.0351)	(0.0546)	(0.0490)
	PERIOD			
	Period 2: 1972-1982	1.085**	1.006	1.212***
		(0.0374)	(0.0455)	(0.0655)
	Period 3: 1983-1993	1.275***	1.159***	1.485***
		(0.0467)	(0.0585)	(0.0819)
	Period 4: 1994-2007	0.837***	0.679***	1.147**
		(0.0388)	(0.0448)	(0.0772)
	AGE			
	Age	0.964***	1.001	0.916***
		(0.00693)	(0.0101)	(0.00960)
	Age-Squared	1.000	1.000**	1.001***
		(0.000112)	(0.000158)	(0.000162)
	EDUCATION			
	Secondary Education	1.221***	1.183***	1.235***
		(0.0515)	(0.0706)	(0.0740)
	High School Education	1.512***	1.363***	1.680***
		(0.0517)	(0.0634)	(0.0847)
	University Education or Higher	1.706***	1.798***	1.599***
		(0.0802)	(0.110)	(0.118)
	HOUSEHOLD SIZE			
	Small Household	0.705***	0.691***	0.755*
		(0.0621)	(0.0769)	(0.109)
	Medium Household	0.704***	0.662***	0.786*
		(0.0624)	(0.0746)	(0.114)
	Large Household	0.729***	0.700**	0.815
		(0.0783)	(0.0998)	(0.137)
	Very Large Household	0.767	0.821	0.794
		(0.188)	(0.288)	(0.275)
	OCCUPATION			
	Government Sector	1.274***	1.217***	1.307***
		(0.0347)	(0.0435)	(0.0569)
	Private Worker	1.104***	1.160***	0.967
		(0.0296)	(0.0413)	(0.0408)
	Unpaid Family Worker	0.787***	1.378***	0.813***
		(0.0286)	(0.165)	(0.0335)
	HP-RESIDUALS OF LN PRICE OF RICE			
	At time (t)	1.127***	1.057	1.187***
		(0.0417)	(0.0573)	(0.0598)
	Lagged time (t+1)	1.351***	1.245***	1.444***
		(0.0559)	(0.0725)	(0.0844)

Note: Robust standard errors in parentheses, stars indicates statistical significance, where *** $p<0.01$, ** $p<0.05$, * $p<0.1$