Migration as a Response to Intrahousehold Risk: Evidence from Indonesia

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(preliminary draft -please do not quote)

Abstract

Migration in search of better employment prospects is widely regarded as an important means of mitigating the adverse consequence of poverty, particularly in rural areas. However, in an environment where the social norms require children to support elderly parents, ill-health of elderly household members is likely to influence an individual's propensity to migrate. In this paper using the 1997 and the 2000 *Indonesian Family Life Survey* (IFLS-2 and IFLS-3), we examine the manner in which care-giving responsibilities for the household's sick elderly members' impacts on the migration decisions of working-age adults. The main dependent variable in our analysis is a binary variable indicating the migration status of a working-age adult member. We define an economic migrant as an individual between the ages of 15-49 who migrated for a period of at least 6 months in the year prior to the survey for the purpose of finding employment. An individual is described as being a care-giver if two conditions are simultaneously met: (i) they are co-residing with an elderly member aged 50 + and (ii) the elderly are in ill-health. Elderly health is measured using an array of self-reported health measures. Our analysis predicts that participating in the migrant labour market will look less attractive if the individual has an elderly household member who is not in good health.

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Introduction

Migration in search of better employment prospects is widely regarded as an important means of mitigating the adverse consequence of poverty, particularly in rural areas. The benefits of migration, both at the individual and household level are well-documented in the literature (see for example, Borjas, 1989 and Harris and Todaro, 1970). Studies by Lanzona (1998) and Agesa (2001) show that while push factors lead to "surplus" low-skilled individuals moving to urban areas due to unavailability of jobs in rural areas, "scarce" educated workers may find higher returns to their human capital in cities than in rural areas. These models treat migration as being an economic decision in response to wage differentials.

Others such as Mincer (1978) have argued that family ties may have a deterrent effect on the likelihood to migrate.[1] The influential role of family in migration decisions has been labelled the "New Economics of Family Migration" by Stark (1991) and recent studies such as Chen *et al* (2003) consider the role of family ties in influencing migration outcomes. A large literature from developing countries shows that patterns of resource flows from individuals in urban areas to families in rural areas are largely consistent with strategies of risk diversification (see for example, Lucas and Stark, 1985 for Botswana; Leinback and Watkins, 1998; Frankenberg and Kuhn, 2004 for Indonesia). These studies suggest that migration decisions are made in a familial context. In particular, Kreager (2006) points out that the migrants' contributions are a normal and important component of older people's support.

However, the focus of these studies has been on the role of remittances from adult children to family members left behind. In addition to economic support elderly family members will also require care, particularly if they fall ill. The manner in which informal care-giving responsibilities for elderly sick family members affect the propensity to migrate of working-age adults remains a less researched issue. This issue is particularly relevant in Indonesia, where there is substantial rural poverty, rural-urban migration levels are high and the household remains an important source of informal care for elderly members. In particular, co-residence between older parents and at least one adult child is a central feature of the familial support system in Asia (see Bongaarts and

[1] While there is a large literature on the network externalities from migration and the importance of social networks and family ties in fostering these networks, this issue is beyond the scope of this study.

Zimmer, 2001; Kim and Choe, 1992; Knodel *et al*, 1999), with social sanctions imposed on adult children that do not care for elderly parents (Cameron, 2000). Furthermore, this family oriented support system for the elderly has been actively encouraged by governments in many Asian countries (Chan, 1999; ESCAP, 1999), with few moves made towards setting up universal social safety nets. In Indonesia for example, Sumarto et al (2004) point out that the focus of government spending during the period of economic growth in the 1990s was on services such as health and education, with families and communities expected to provide the bulk of 'social insurance' (Sumarto *et al*, 2004).

We are aware of only two studies (Muhidin, 2006; Giles and Mu, 2005) that link migration and health in developing countries. While Muhidin (2006) studies the impact of migration on the health of household members that remain behind using the 1993 and 1997 Indonesian data, Giles and Mu (2005) examine the impact of illness among elderly parents on the propensity of children to migrate in China. Kreager (2006) points out that the impact of migration on older persons' support networks has not been systematically analysed.

Our paper is closest in spirit to Giles and Mu's (2005) study and we examine the impact of care-giving for elderly household members on the migration decisions of co-resident working-age adults using the *Indonesian Family Life Survey* (IFLS3-2000). We argue that in an environment where the social norms require children to support elderly parents, ill-health of elderly parents is likely to influence the propensity of an individual to migrate. Our focus is on migrants who have migrated in the year immediately prior to the survey for a period of at least six months. We distinguish between migration for employment purposes and migration for any reason (including those that migrated to participate in the migrant labour market). Our empirical analysis estimates a Two-stage probit model, where we first estimate the likelihood of co-residence with elderly household members, and next we estimate the propensity to migrate including among other regressors the predicted likelihood of co-residence with elderly members. We compare these results with a bivariate probit model where we jointly estimate the probability of migration and the probability that the respondent is a caregiver for an elderly sick household member.

Our analysis predicts that migration for either employment or for any other reason is likely to be lower for those respondents who are co-residing with elderly household members and whose self-reported health is described as being poor.

The rest of the paper is organised as follows: in the next section we describe the living arrangements of the elderly and the patterns of migration in Indonesia. This is followed by a description of the dataset in Section 3 and in Section 4 we present our econometric strategy. The main results from our analysis are presented in Section 5, and in Section 6 we conclude.

2. Background

Ageing Population and public pensions

Indonesia has experienced a dramatic decline in fertility rates and an increase in life-expectancy levels, and since 1980 the average number of children born per woman has declined from 4.1 in 1980 to 2.5 in 2000. At the same time, life expectancy has increased from 56 to 67 years (UNDP, 2005). Hence, the Indonesian population aged 65 years and older is expected to rise dramatically over the next few decades, from 9.3 million in 2000 to 46.9 million in 2050, representing about 20% of the Indonesian population (Edwards, 2003). It is expected that the rapid ageing of the population will induce a drop in the overall number of labour force participants. This is a concern because as Eeuwijk (2004) points out, contrary to the health transition experienced in Europe and North America during the second half of the 19th century, there are two distinct features in Indonesia's 'health transition'. This includes firstly the rapid pace of these changes and second, the large numbers of people that these changes affect. This raises several issues on the care-giving needs of a rapidly aging population, which is simultaneously occurring in a scenario of rapid economic development and increase in migration in search of better employment prospects. The care of older individuals is described by Phillips (2000) as "one of the most urgent problems arising from population ageing in the Asia-Pacific".

In terms of geographical characteristics, more than half the elderly population lives in rural areas, with Java having the largest proportion of elderly individuals. In our dataset, the elderly tend to be less educated than their younger cohorts. However, it is interesting that labour force participation among the elderly is reasonably high with nearly 43 percent of the elderly aged 70 years and above reporting working up to 32 hours per week. This is consistent with Cameron and Cobb-Clarke's (2006) findings who report

high levels of labour force participation among elderly Indonesians. United Nations estimates show that nearly one-quarter of Indonesian women and almost a half of Indonesian males aged 65 and above remain in the labour force (United Nations 2002).

Despite the rapid economic growth in the 1980s and 1990s in Indonesia, there was relatively little investment in social security programs. Although there was some subsidized health care and a compulsory social security program for formal sector employees, there was no formal safety net program until 1998. Furthermore, the focus of these programs was on the traditionally poor as well as the newly poor (Sumarto *et al*, 2004), and these programs did not specifically target the elderly. These factors may have combined to make population aging and care-giving commitments at the household level to act as a constraint on the ability of working-age individuals to migrate in search of better employment prospects. The issue of population ageing is compounded by poverty among the aged. Official statistics reveal that among those living in poverty (17.7 per cent in 1996, 24.2 per cent in 1998, 18.2 in 1999) the great majority are elderly (Do-Le and Rahadjo, 2002). The elderly have little access to public pension programs in Indonesia, which are limited to employees in the public sector.

The *Jamsostek* and the *Taspen* are the two largest pensions programs in Indonesia. While the *Jamsostek* caters for private sector workers in the formal sector, the main beneficiaries of the *Taspen* program are current and retired civil servants and their families (Arifianto, 2005). The rate of participation in the pension system is low, covering less than a fifth of the work force and less than one third of the formal sector. In 1995 approximately 12 million workers had access to formal pension plans, of which about 8 million are members of the mandatory Jamsostek program, which has a defined contribution plan with modest rates of contributions. The remaining four million are covered by a civil service program (Leechor, 1996).

However, due to its small amount of benefits and limited coverage, the Jamsostek scheme was unsuccessful in protecting many poor retirees during the1997/98 economic crisis. In recognition of these shortcomings, the Indonesian government has responded by proposing a new social security scheme that intends to provide benefits to the entire Indonesian population.

Arifianto (2005) argues that it is too early to provide an assessment of the likely impact of this new social pension program on the elderly. The benefits from the Jamsostek pension

program are limited. According to Leechor's (1996) estimates the total amount of pension received by a Jamsostek recipient at retirement is only valued at about 7% of their final basic salary after 35 years of active work. International Labour Office (ILO) figures show on average a Jamsostek pension only amounts to 5.5 months of their basic salary or 8.5 months of the current minimum wage (UMR) (ILO 2003: 90).

Given these inadequate measures to protect the elderly, older Indonesians may have no option but to rely on their adult children to look after them in their old-age and provide them with care should their health situation deteriorate. This is likely to become problematic as fertility levels decline and there is an increase in the labour market participation and the propensity to migrate among potential carers.

Migration in Indonesia

Indonesia has a large pool of surplus labour, and in 2006, approximately 11 percent of Indonesian workers were unemployed, and underemployment was over 20 percent (Hugo 2007). Hence, according to Hugo (2007) we observe two types of migration- (i) an increasing level of migration to more developed nations, particularly those belonging to the Organization for Economic Cooperation and Development (OECD). This type of migration is predominantly permanent and consists mainly of skilled migrants; (ii) is the better-known, temporary movement of largely unskilled workers to the Middle East and elsewhere in Asia. In mid-2006, the minister of labor reported that there were 2.7 million Indonesians working overseas with official permission. This represents 2.8 percent of the total national workforce.

In a recent study using Indonesian data, Miguel *et al* (2006) find that pull-factors associated with improvements in employment prospects (such as industrialization in other districts within 200 kilometres) were significantly associated with an increase in out-migration. Their study finds that just over half of all migrants moved to other districts within the same province.

In the Indonesian context, it is also possible to distinguish between two distinct types of migration patterns have emerged: transmigration (permanent migration from Java to other parts) and circular migration or *merantau* (migration of young men while the women stay behind and look after children and agriculture) (see Nas and Boender, 2003). This type of circular and seasonal labour migration is reasonably common in Indonesia. Seasonal

migrants in this case contribute to risk–sharing behaviour among family members by providing remittances to household members that are left behind.

There are also wide variations in the levels of population mobility (Rogers et al, 2004), with the urbanisation rates in the provinces of Jakarta, West Java, Yogyakarta, Bali, and East Kalimantan well above 50%. In terms of historical trends, between the period 1971-2000, the proportion of the population living in urban areas rose from 17% to nearly 42%. The significance of female migration has also increased during this time. For that reason, the child dependency ratio (ratio of population below 15 to population 15-64) has decreased and conversely the old dependency ratio (ratio of population 65 and over to population 15-64) has increased (Achmad, 1999).

Migrants' children were usually cared for in their own homes by grandmothers, aunts, older siblings and fathers. Between January 2001 and September 2004 close to 1.5 million workers were formally placed in jobs abroad (DEPNAKERTRANS 2005). Female domestic workers have continued to dominate the out-migration of formal contract labour departing from Indonesia since the beginning of the labour export programme (Hugo 2002).[2]

According to Kreager (2006), migration in Indonesia is dominated by individuals aged 20–24 years, and the majority of moves are made by those aged 15–29 years. While migration by younger family members may be part of a risk-coping strategy of that in form of remittances, migration can also increase the vulnerability among older members, for example, when remittances are not forthcoming, when grandchildren are left in the care of older people, when assets have to be sold to raise capital needed for a child's departure, or when illness creates the need for physical care (Kreager, 2006; Schröder- Butterfill, 2004b).

The focus of our research is whether migration decisions are affected by ill-health among the household's elderly. We anticipate that care-giving responsibilities for the elderly will constrain the ability of an individual to migrate.

[2] There has been growing public debate in Indonesia over the issue of women's international migration, migrant women's rights, and protection. (see Silvey, 2006). These issues are however, beyond the scope of the current study.

3. Data and measures

The empirical analysis in this paper is based on the *Indonesian Family Life Survey* (IFLS-2 and 3) collected in 1997 and 2000. The Indonesia Family Life Survey is a nationally representative continuing longitudinal socioeconomic survey, covering thirteen provinces where 83 percent of the population resides. The IFLS is unique and rich. It is ideal for our study as it has the advantage of providing a much richer picture of health than is typically available in household surveys. The survey's instruments also gather detailed information about the demographic composition of the interviewed households, the labour market status of the household members, their health and educational achievements, and various sources of household income.

We restrict the sample to individuals who were in the working age group of 15 -49 in 2000, and only include individuals for whom household, demographic and labour market data are available in the 2000 survey. For these individuals we have an estimate of their economic, individual, household and community characteristics, as well as whether they shifted sector of employment and whether they moved location. We model the migration decisions of individuals who co-reside with the elderly. The propensity to migrate will depend on whether the adults are the informal care-givers to sick elderly parents.

Tables 1a, 1b and 1c describe the variables used in the analysis for the full sample and for the sample of individuals that are co-residing with elderly members. We restrict our analysis to those individuals for whom we have data on all our variables of interest in both the 1997 and 2000 samples. There are 9575 individuals in our sample aged 15-49 years. Of these approximately 35 per cent (3338 respondents) coreside with elderly members. We note that relative to the full sample, the elderly co-residing with working age adults are more likely to report being in poor health.

Dependent variable: The main dependent variable in our analysis is a binary variable indicating the migrant status of a working-age adult member. We define as an economic migrant an individual aged 15-49 years who migrated for a period of at least 6 months in the years 1997, 1998, 1999 or 2000 for the purpose of finding employment. We have imposed this time restriction as we are interested in whether ill-health among the elderly at the time of the survey affected the propensity of the respondent to migrate.

In our dataset there are two groups that we observe (1) mig =1 if a person migrated in a given time period and (2) mig = 0 if a person never migrated. For (1) we additionally have information on the reason for migration. For example, an individual may have moved for non-economic reasons such as joining their family, marriage and so on. It is also worth emphasizing that ion our dataset, we do not observe a migrant who is not currently a member of the household, hence our definition of a migrant is someone who has migrated in the past but is currently a member of the household. Hence there is likely to be an underestimation of migration. From Table 1, we observe that approximately 14% of our respondents were migrants, and economic migrants constitute around 9% of our sample. We also note that migrant individuals were less likely to be living in households with elderly members relative to the full sample. Of course, it is possible that good health among the elderly co-resident members can have positive benefits to the migrating individual, such as informal child care for grand-children and so on.

Furthermore, we also observe the geographical location of the migrant move- once again we stress that we only observe those individuals who have returned to the household after having migrated in the past for a period of at least 6 months. From Table 1c, of the 7443 for whom data is available on geographical location of the migrant move, we note that 91% of the individuals have never migrated. While 3% have migrated outside the province or the country in the past, 5.% of the respondents have migrated outside the village but within the same province. These different locations of migration are likely to have different impacts on the propensity to migrate as distant migration may be more adversely affected by the presence of sick elderly.

*Explanatory variables***:** The decision to migrate is likely to depend on a wide array of individual, household and labour market characteristics as well as on the health of older members in the household.

We include in our models several characteristics intended to pick up heterogeneity across individuals in the returns that can be earned locally and in the migrant labour market. One of the key determinants of the decision to migrate is the expected likelihood of finding employment and the expected wage differential should the individual choose to migrate. This is likely to depend on the human capital of the migrant, since individuals with higher human capital are likely to select into migration. The human capital of the respondent is captured using variables such as the education level of the migrants, and their area of

employment. Educational attainment is measured by the highest education level attained, namely elementary, junior high, senior high and college. They correspond to 6, 9 and 12 years of schooling respectively. Those with tertiary qualification are pooled with senior high school graduates, as there are only so few of them in the sample. For employment status, using unemployed as our base, we construct dummy variables for self-employment, employment in the public sector, employment in the private sector and employment in the construction industry. According to table 1a, relative to the full sample, respondents co-residing with elderly members were less likely to be self-employed and were better educated.

The migration decision is also likely to be influenced by the prevailing local labour market conditions. Hence, we include variables for the average factory and farm wages in the village for male and female workers, whether there is a cottage industry in the village employing locals, province-level dummy variables and whether the respondent lives in a rural area. To indicate the level of development of the village we include dummy variables to indicate whether the respondent lives in an IDT village, whether the village has access to piped water for drinking and whether there is an asphalt road in the village.

A set of variables to capture the household's economic status are also included. These are the log of assets, whether the household is self-owned and whether the respondent's household experienced any economic failure in the last five years. From Table 1 we observe that relative to the full sample, respondents co-residing with elderly members were slightly wealthier and were more likely to own their own home.

We also include a set of demographic controls such as household size, number of pre-school age children, number of children in the school-going age group, dummy variables for the marital status of the respondent, their age and age-squared to control for life-cycle effects that may influence the decision to participate in the migrant labour market. We also include an indicator variable for whether the respondent has other non-co-residing siblings to indicate alternative sources of care for elderly parents should they fall ill. It is also noteworthy that individuals co-residing with elderly have fewer siblings (1.8) relative to the full sample (3.01).

4. Estimation strategy

Our goal is to examine the manner in which care-giving for elderly sick household members impacts on the working-age adult's decision to participate in the migrant market. The empirical strategy in this paper is derived from a simple theoretical model of household labour supply. We present a model in which a fixed total time endowment *T,* is allocated between alternative uses, namely "participation in the migrant labour market", care-giving *CG* and a residual "leisure time", *L*. Hours are optimally chosen by an adult household member so as to maximize a single period utility $V = V(c, L, CG, CO; H)$, where *c* is consumption, *CG* is time directly spent by the household adult to care for his/her elderly household member, *CO* is outside care, which is either purchased in the market or provided by other family members, and the term *H* indexes the need for care by the elderly.

It is reasonable to assume that the price of CG is the forgone wage that would be earned in the migrant labour market. There may also be monetary costs p_o associated with a unit of market care CO. However, given the public good nature of this type of care, a market price may not exist for all households. Therefore, we proxy the cost of CO using a set of household specific variables such as log of household assets, whether the household experienced economic failure in the last five years, household size, the presence of a maid in the household, the number of working male and female members, and the number of school and pre-school age children.

The decision to migrate can be understood by looking at whether utility increases or decreases with participation in the migrant labour market and how elderly health status, h, and the presence of siblings may influence this decision. We treat w∗ as the net wage (or returns) that may be earned through employment in the migrant market net of the costs of migrating and the opportunity cost of wages or farm profits in the home village. Our main aim is to understand to what extent, if at all, elderly health shocks determine migration decisions for economic reasons. The binary choice model is derived using underlying behavioural assumptions which imply a latent variable representation of the model. Our main variable of interest is a latent variable model for migration m_{it}^*:

$$m_{it}^* = \alpha_i + \delta w_{it} + u_{it} \qquad (1)$$

$$m_{it} = \begin{cases} 1 \; if \;\; m_{it}^* > 0 \; (if \;\; individual \; migrates) \\ 0 \quad otherwise \end{cases} \qquad (2)$$

The probit estimation assumes that there is a latent variable m_{it}^* which can be written as a linear function of variables that affect the probability of the individual migrating where w_{it} is a matrix of explanatory variables, δ is the vector of coefficients that will be estimated and u_{it} is a random error term. The latent variable is unobservable and instead we observe the dummy variable $m_{it} = 1$ if a working-age individual has migrated, and zero otherwise.

To estimate the impact of parent health on the migration decision of individual i in time t, we estimate a reduced form binary choice model:

$$mig_i = \alpha C\hat{G}_i + Z_i\beta_1 + X_i\beta_2 + C_j + Ypt + \mu_i + \varepsilon_i \qquad (3)$$

where mig_i is a binary variable equal to one if individual i participates in the migrant labour market, $C\hat{G}$ refers to the predicted probability that there is an elderly member in individual i's household who is in ill-health, Z_i and X_i are vectors of household and individual characteristics, respectively, that affect individual i's preferences or ability to participate in the migrant market.

Characteristics such as age, sex and educational attainment are included in the X vector as they influence the attractiveness of migrant employment through their impact on the potential wage premium over local employment that an individual might be able to earn as a migrant, as well as preferences for participation in the migrant market. Community characteristics such as province dummy variables, level of development of the village and local wages in factory and agriculture are included in Cj, are community-level factors that may influence the cost of migrating. A vector of province dummy variables is also included to take into account regional effects.

The objective of our analysis is to arrive at an unbiased estimate of α, which picks up the impact of parent health on the migration decision. Our goal is to identify the likely impact of care-giving for elderly sick household members on the decision to migrate. The care-giving variable however is hard to define as there is no question in the IFLS that allows us to identify a care-giving household. We therefore define a respondent as being a care-giving individual if two conditions are simultaneously met: (i) the respondent coresides with an elderly member *(HH50+) =1* and (ii) the elderly reports their health as being poor. Hence, our care-giving definition defines a population 'at risk' of being a caregiver.

$$CG = 1 \text{ if } I([HH50+]=1) \quad \text{and } H=poor \qquad (4)$$

Among the non-care-giving adults, for whom $CG = 0$, we are able to distinguish between two cases: the case in which CG=0 because of good health of elderly co-residing with them, and the case in which CG=0 because there are no co-residing elderly members (*CG*=0 if *I([HH50+]=0).* The way CG is defined allows us to identify potentially different effects of co-residence with older family members. For example, adult members in families with a healthy elderly co-resident, may be able to enter the migrant labour market because of help that the healthy elderly co-residents may provide in the household (like childcare). In terms of the empirical specification outlined above it is possible that the coefficient of the indicator variable HH50+ is statistically significant and positive. Conversely we expect that the deteriorating health of co-residing elderly has a negative impact on the migrant decision.

To test the reliability of our results, we estimate models where we analyse if ill-health of co-residing elderly has a differential effect on the geographical characteristics of the migration. For example, the individual may be less likely to migrate overseas or outside the province if there is an elderly co-resident member is ill, but may be more willing to move to a nearby village.

A priori it is difficult to predict the likely impact of elderly ill-health on the decision to migrate. On the one hand, we expect that due to the non-availability of aged-care pensions, participating in the migrant labour market will look less attractive if the individual has an elderly parent who is not in good health. Further, if the individual has no siblings available to act as potential caregivers, then choosing to participate in the migrant labour market will be even less attractive when an elderly household member is in poor health. However, controlling for these factors, it is also possible that the presence of an ill elderly member will increase the financial strain on the household, thus leading to a greater likelihood for the working-age individual to migrate for economic reasons.

4.1 Identification issues

In this set-up it is clear that several potential econometric problems should concern us: endogeneity of care-giving, bias due to error in the measurement of parent health status, and because migrants can differ fundamentally from non-migrants.

Endogeneity- The decision to coreside with elderly sick household members is likely to be endogenous if individuals with low opportunity cost of time are more likely to be co-reside and provide care for elderly. Unobservable factors potentially correlated with observations of

parent health and the migration decisions are a concern, and using predetermined household characteristics alone will not solve these problems. Several sources of bias may be present. First, the ability to observe participation in the migrant market may reflect a potentially endogenous decision for the household. For example, the presence of an elderly parent in the household may facilitate participation in the migrant market if the elderly person provides some form of informal child care. Alternatively, the adult child may be living in a parent's household because he/ she, may not have saved sufficient resources to set up a separate household. Finally, an elder parent's residence in the household may reflect the outcome of a bargaining process among siblings, with the household choosing to care for an ill parent making an implicit decision to not participate in the migrant market.

In this case, co-residence with elderly members will be related to participation in the migrant market. To deal with this issue we first estimate a probit model for co-residence with elderly (i.e. whether the respondent is co-residing with a household member aged 50 and above) and then we include the estimated probability of the co-residence as an additional regressor in our probit model for probability of migration. We estimate two alternative specifications (migration for employment purposes and migration for any purpose).

Since our endogenous variable is binary, we cannot estimate an Instrumental variables model. Hence, we estimate a biprobit model where we jointly estimate the likelihood of co-residing with elderly residents and migration. We instrument for the likelihood that the individual is at risk of being a care-giver- i.e they are co-residing with elderly members. Next we consider a two-equation biprobit model where the first equation models the probability that an individual is co-residing with an elderly member. We use a categorical variable $CG \equiv caregiving$, where *care-giving* is equal to 1 if the individual is co-residing with an elderly member and the elderly member's self-reported health is poor. Specifically, we introduce several instruments to control for the potential endogeneity of the care-giving variable. These instruments include the education levels of the respondent's mother and father, their employment status, whether or not parents are co-residing. These variables affect care-giving decisions between elderly parents and adult children, but do not directly influence their participation in the migrant market. For example, parental education is likely to act both as a proxy for the care-giving needs of elderly parents and also as an indication of their ability to purchase formal care if required. The migration participation equation is identified by the exclusion of variables relating to parental characteristics.

The second equation models the migration decision. The dependent variable, *migration* is equal to 1 if the working age individual has migrated in the last year to participate in the migrant labour market. However, the care-giving decision will also enter into a potential migrant's decision on whether or not to migrate, hence we also include the care-giving variable as an explanatory variable in the migration decision.

4.2 Robustness of health measures:

Elderly health- We define as elderly those persons who were over 50 years of age in 1997, since in the IFLS dataset, this is the age from which data on health is available for older individuals. Furthermore, given the current life-expectancy in Indonesia of 67 years, an individual at age 50 can reasonably be regarded as elderly. In our dataset there are several alternate measures of self-reported health that were asked of respondents aged 50 and above. We focus on three alternative health measures that were obtained from the 1997 dataset. These are: *(i)* Have you suffered from a serious illnesses in the last 4 years? *(ii)* In general how is your health? Those elderly who that answered yes (for i), and unhealthy or somewhat unhealthy (for ii) were assumed to be in poor health and all others were assumed to be in good health.

Objective measures of health status such as weight and height were not available for the elderly in the 1997 dataset. So to test the robustness of our health measures, we also use the height and weight measures available in the 2000 dataset to create a variable for Body Mass Index (BMI) for all the elderly in our dataset. The BMI is constructed using the standard formula for $BMI = \frac{weight(kgs)}{height^2(m^2)}$

A BMI lower than 18.5 suggests the person is underweight, this increases their susceptibility to illness. This additional measure of health helps us to test the robustness of our results.

We test the robustness of our results by estimating a probit model where we use the panel aspect of our dataset and include only those individuals who are co-residing with elderly members in both 1997 and 2000. To test if the presence of a health shock in the form of a deterioration in the health of the elderly between 1997-2000 affects migration decisions, we create 3 new variables to measure health shock: health_shock_0 = 1 if there is no change in the health status of the elderly between 1997 and 2000; health_shock_positive = 1 if there is

an improvement in the health of the elderly between 1997 to 2000 and health shock negative is if there is a deterioration in the health of the elderly between 1997-2000.

We acknowledge the problems raised in the literature on self-assessed health. In particular Lindeboom and van Doorslaer (2004) raise concerns over reference bias. This is the possibility that individuals with the same level of true health may report different self-assessed health status on a simple scale, because of differences in the interpretation of the thresholds and the categories of health levels.[i] This could potentially make the interpretation of self-assessed health status problematic. An additional problem with the use of self-assessed health status is the likelihood for measurement error (Crossley and Kennedy, 2002).

However, the results from the literature on reference bias and measurement errors are still too general to provide an unambiguous prediction of the likely bias caused by these problems in the context of our study. Furthermore, variables measuring self-assessed health measures are typically interpreted as objective measures of health and are commonly used in empirical research (see Smith, 1999; Kennedy *et al*., 1998; Deaton and Paxson, 1998).

The robustness of our health measures are tested by estimating the models separately for the three different measures of elderly health. Our analysis predicts that participating in the migrant labour market will look less attractive if the individual has an elderly parent who is not in good health. Further, if the individual has no siblings available to act as potential caregivers, then choosing to participate in the migrant labour market will be even less attractive when an elderly household member is in poor health.

5 Results

The main results of our analysis are presented in Tables 2, 3 and 4. In table 2 we present the biprobit estimation results for the propensity to migrate respectively for the full sample and male and female samples. The two dependent variables are indicators variables (0,1) for migration and for co-residing elderly. We report coefficients, standard errors and marginal effects. This is followed by Table 2 where we present our probit estimation results for migration, for the group of individuals who were co-residing with elderly members in both 1997 and 2000. This specification includes among the explanatory variables both the elderly health in 1997 as well as any shock (none, positive or negative) that may have occurred between 1997 and 2000. Finally in Table 4 we present our multinomial logit results. In all

our results, we present only a selected group of results. Robustness exercises involving more limited controls as well as different measures of elderly health are available upon request.

Biprobit results

The first point to note is the complex manner in which the care-giving variable affects the propensity to migrate. The first aspect we note from Table 3 is that there is a statistically significant and positive effect on the correlation coefficient (Rho). Thus, indeed estimating a biprobit model rather a series of probit specifications for the two dependent variables produces consistent estimates of the co-residing and care-giving effects.

The estimation of the marginal effect of co-residing elderly on the adults' migration decision illustrates that co-residing has a positive impact on migration. Such effect is larger for male adults than for male adults. The increase in probability is sizeable, ranging from 5 percent in a sample of males to 1.3 percent in a sample of females. Such results are robust to changes in specification involving a change in the way elderly health is measured (See specification II). *Propensity to migrate*: Our probit estimation results indicate that contingent on co-residing with an elderly household member, an individual with care-giving responsibilities (defined in terms of health variable 'seriously ill elderly member in 1997' is 1% less likely to migrate. Females are found to be less likely to migrate for economic reasons. This is consistent with the findings of Van Eeuwijk (2006) and Schroder-Butterfill (2005), who find that in Indonesian communities, elderly care is typically the responsibility of female members of the household.

In the group of variables that capture community characteristics, we observe that an increase in the the number of cottage industries in the village, reduces the attractiveness of migrating. Both rural residents and respondents living in the Outer islands are more likely to migrate.

In terms of the influence of household characteristics, we note that respondents from households that have experienced economic failure in the last five years are significantly more likely to migrate. Variables relating to household demographics have a mixed influence on the likelihood of migration. Here we observe that an increase in the number of non-co-residing siblings and the number of working-age males in the household, reduces the likelihood of a respondent migrating. An individual's education level has a significant impact on the likelihood of migration. In particular we observe that relative to an individual with no education, respondents with a Junior high and Senior College education were significantly

more likely to migrate. This may be to do with their greater likelihood of finding employment.

Probit results

In the probit analysis we restrict the sample to those individuals who were co-residing with elderly members in both 1997 and 2000. Our analysis shows that the effect of care-giving on participation in the migrant market is sensitive to the health measure that we use in our definition of care-giving. In particular, there is a negative and statistically significant effect of care-giving on the propensity to migrate when we use the health measure "whether the elderly household member is seriously ill" in our definition of care-giving. From Table 3 we observe that an individual with care-giving responsibilities is 2% less likely to migrate. The likelihood of migrating for economic reasons is insignificant, so we do not report these results.

Probit estimations aim to test the impact of elderly health shocks on the probability to migration. Table 2 illustrates that conditional on co-residence, migration decisions are not significantly affected by health shocks.

There are also other interesting differences in the manner in which the independent variables affect the likelihood of migration. For example, females are significantly less likely to migrate. While this may seem surprising, it is consistent with studies from Indonesia that find females taking on greater care-giving roles. Relative to individuals aged 21- 25 years, in all other age categories were significantly less likely to migrate. Education appears to have an influence on the probability of migration- with a Junior High or a Senior High educated respondent having a 7% and 8% higher probability of migrating, relative to a respondent with no education. An increase in the number of non-co-resident siblings is negatively correlated to the likelihood of migrating. Not surprisingly, our analysis predicts that rural respondents are 4% more likely to migrate.

Multinomial logit results

Table 2 has reported a positive impact of elderly co-residing on the probability of migration. The multinomial results reported in Table 4, indicate interesting ways in which the geographical characteristics of migration are affected by the presence of co-residing elderly and care-giving responsibilities for elderly. In particular it is interesting to note that in the full sample co-residing with elderly members increasing the odds of "local" migration (between

villages but within the province) by nearly 8 times relative to not migrating (the base category). However this variable is insignificant for "distant" migration (migration outside the province or overseas).

Care-giving, as defined by co-residence with elderly who are 'seriously ill', has a non-statistically significant impact on local migration, but reduces the likelihood of distant migration by a working-age adult. We note that females are significantly less likely to migrate outside the province or overseas rather than not migrate, with no significant effects observed in their likelihood of migrating within the province.

Control variables for age have the expected signs, with respondents in all age categories less likely to migrate within the province or outside the province relative to not migrate. In terms of geographical characteristics, it is worth pointing out that while respondents from the Outer islands have greater odds of migrating within the same province rather than not migrate, residence in Outer islands reduces the likelihood of a respondent migrating outside their province or overseas. It is possible that these respondents do not have migrant networks outside their provinces or may lack the skills required to migrate outside their provinces. Not surprisingly, rural residence increases the likelihood of both migrating within and outside the province, rather than not migrating.

This effect of elderly co-residence on migration in the full sample hides significant compositional effects which are evident when we decompose the sample in male adults and female adults. When we disaggregate the samples by males and females, we observe interesting differences in the ways in which care-giving and co-residence impacts on migration. For example, we observe that for male respondents co-residing with elderly members increases the odds of migrating within the province (odds ratio = exp(3.48) = 32.46). However, for male respondents, while co-residing with elderly members is not significant in the likelihood of migrating outside the province or internationally, care-giving responsibilities using the 'seriously ill in 1997' as our health measure reduces the odds of migrating (odds-ratio= exp (-0.66) = 0.51). This would suggest that co-residence with elderly facilitates migration within the same province. In the female sample on the other co-residing with elderly members is not significant, care-giving responsibilities reduce the likelihood of migrating outside the province (odds ratio = exp(-0.406) = 0.66).

6 Conclusions

Migration in search of better employment prospects is widely regarded as an important means of mitigating the adverse consequence of poverty, particularly in rural areas. However, in an environment where the social norms require children to support elderly parents, ill-health of elderly household members is likely to influence an individual's propensity to migrate. Under these circumstances even if there are economic benefits from migration, the presence of sick elderly family members can affect the affect the propensity of an individual to participate in the migrant labour market.

In this paper using two waves of the *Indonesian Family Life Survey* data, we examine the manner in which care-giving responsibilities for the household's sick elderly members' impacts on the migration decisions of working-age adults. Our results indicate a strong negative correlation between care-giving responsibilities and migration decisions. Results form our multinomial model also indicate that migration to more distant locations is more adversely affected by the presence of elderly in ill-health. This result is robust across all our three samples.

Appendix

Table 1: Descriptive statistics (for selected variables)- Biprobit model

Sample for the 15-49 years old	Full sample	HH with elderly
Sample size	9575	3338
Migration for economic reasons in 1997, 1998, 1999 or 2000	0.091	0.072
Migration for any reason in 1997, 1998, 1999 or 2000	0.1375457	0.092
Co-residing with elderly =1 if hh has a co-residing member aged 50+, 0 otherwise	0.448	1
Care-giving 1= 1 if the adult is co-residing with a member aged 50+ and the elderly member reports being seriously ill at least once in the last 4 years prior to 1997	0.243	0.277
Care-giving 2= 1 if the adult is co-residing with a member aged 50+ and the elderly member reports being unhealthy in the 1997 dataset	0.004	0.008
Care-giving 3= 1 if the adult is co-residing with a member aged 50+ and the elderly member has a Body mass Index below 18.5 in 2000	0.141	0.141
Age- in years	31.315 (9.686)	29.997 (9.944)
Female- =1 for female and 0 for males	0.533	0.539
Respondent's edu- Elementary school	0.462	0.414
Respondent's edu- Junior high school	0.170	0.169
Respondent's edu.- Senior high school or higher	0.283	0.340
Spouse employed = 1 if the spouse is employed	0.461	0.478
HH size- number of household members	6.212 (2.735)	7.318 (2.645)
# children 6 years or less	0.704 (0.790)	0.648 (0.809)
# children 7-14 years	0.870 (0.971)	0.861 (0.999)
Log of assets	16.393 (1.521)	16.678 (1.386)
Economic failure last 5 years- = 1 if hh experienced any economic hardship in the last 5 years, 0 otherwise	0.044	0.049
Maid in HH- = 1 if there is a maid in the household and 0 otherwise	0.023	0.016
HH has health card- =1 if hh has a health card, 0 otherwise	0.221	0.246
# working age females living in the household	1.325 (0.784)	1.374 (0.890)
# working age males living in the household	1.239 (0.887)	1.259 (0.933)
IDT village- = 1 if respondent lives in a village that is classified as a backward village by Indonesian govt. definition	0.260	0.263
# cottage industry that hire labourers in the village (0 if no cottage industry in the village or none that hire labourers)	1.124 (1.130)	1.144 (1.128)
male factory workers = 1 if there are no male factory workers in the village	0.677	0.673
male farm workers = 1 if there no male farm workers in the village	0.244	0.246
Female factory workers = 1 if there are no female factory workers in the village	0.7492428	0.757
Female farm workers = 1 if there are no female farm workers in the village	0.262	0.265
Outer island = 1 if respondent lives in an Outer island	0.298	0.277

Note- Standard deviations for the continuous variables and the count variables appear in parentheses. Only proportions are shown for binary 0-1 dummy variables.

Table 1b: Selected descriptive statistics for probit model- Full sample (co-residing with elderly in both 1997 and 2000)

Sample for the 15-49 years old	
Sample size	3338
Migration for economic reasons in 1997, 1998, 1999 0r 2000	0.072
Migration for any reason in 1997, 1998, 1999 0r 2000	0.092
Co-residing with elderly =1 if hh has a co-residing member aged 50+, 0 otherwise	1
Health shock 0 = 1 if there's been no change in the health status of the elderly co-residents between 1997 to 2000	0.712
Health shock 1=1 if there's been an improvement in the health status of the elderly co-residents between 1997 to 2000	0.151
Health shock 2=1 if there's been an degradation in the health status of the elderly co-residents between 1997 to 2000	0.138
Care-giving 1= 1 if the adult is co-residing with a member aged 50+ and the elderly member reports being seriously ill at least once in the last 4 years prior to 1997	0.277
Care-giving 2= 1 if the adult is co-residing with a member aged 50+ and the elderly member reports being unhealthy in the 1997 dataset	0.008
Care-giving 3= 1 if the adult is co-residing with a member aged 50+ and the elderly member has a Body mass Index below 18.5 in 2000	0.141
Age- in years	29.997 (9.944)
Female- =1 for female and 0 for males	0.539
Respondent's edu- Elementary school	0.414
Respondent's edu- Junior high school	0.169
Respondent's edu.- Senior high school or higher	0.340
Spouse employed = 1 if the spouse is employed	0.478
HH size- number of household members	7.318 (2.649)
# children 6 years or less	0.648 (.809)
# children 7-14 years	0.861 (0.999)
Log of assets	16.678 (1.386)
Economic failure last 5 years- = 1 if hh experienced any economic hardship in the last 5 years, 0 otherwise	0.049
Maid in HH- = 1 if there is a maid in the household and 0 otherwise	0.016
HH has health card- =1 if hh has a health card, 0 otherwise	0.246
# working age females living in the household	1.374 (0.890)
# working age males living in the household	1.259 (0.933)
IDT village- = 1 if respondent lives in a village that is classified as a backward village by Indonesian govt. definition	0.263
# cottage industry that hire labourers in the village (0 if no cottage industry in the village or none that hire labourers)	1.144 (1.128)
male factory workers = 1 if there are no male factory workers in the village	0.673
male farm workers = 1 if there no male farm workers in the village	0.246
Female factory workers = 1 if there are no female factory workers in the village	0.757
Female farm workers = 1 if there are no female farm workers in the village	0.265
Outer island = 1 if respondent lives in an Outer island	0.277

Table 1c: **Sample descriptive statistics for multinomial logit regressions**

Sample for the 15-49 years old	**Full sample (co-residing in both 1997 and 2000)**	**HH with elderly**
Sample size	7443	3338
No migration between 1997 & 2000	0.932	0.908
Migration outside village	0.056	0.079
Migration outside province or overseas	0.033	0.047

Table 2. Binary probit model regression results for any migration vs. no migration, selected explanatory variables and m
Various samples.

	Specification I with "unhealthy" health measure used in care-giving definition			Specification II with "seriously ill" healt care-giving definition	
	Full sample	Male adults	Female adults	Full sample	Male adults
Coresidence coefficient	-0.396**	-0.651***	-0.249	-0.387**	-0.646***
	(0.194)	*(0.228)*	*(0.315)*	*(0.194)*	*(0.228)*
Care-giving coefficient	-0.062	-5.466	0.121	-0.091	-0.090
	(0.370)	*(1.000)*	*(0.419)*	*(0.085)*	*(0.113)*
P(migration==1, coresidence ==1)	0.041	0.059	0.027	0.041	0.061
P(migration==1, coresidence ==0	0.013	0.009	0.014	0.013	0.009
Marginal effect of coresidence P11-P10	0.028	0.050	0.013	0.028	0.052
Marginal effect of care-giving	-0.005	-0.060	0.007	-0.007	-0.009
	(0.004)	*(0.003)*	*(0.005)*	*(0.079)*	*(0.082)*
Wald chi2 test	2625.98	1354.88	1348.98	2627.31	1356.85
P-Value	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Modified Rho ϱ	0.326***	0.566***	0.183	0.328***	0..570***
	(0.125)	*(0.172)*	*(0.191)*	*(0.125)*	*(0.173)*
Rho ϱ	0.315***	0.513***	0.181	0.317***	0.516***
	(0.113)	*(0.127)*	*(0.185)*	*(0.113)*	*(0.127)*
Log-L	-5164.547	-2360.904	-2732.711	-5163.980	-2361.269
LR Test rho=0 (chi2)	5.704	8.841	0.803	5.756	8.897***
P-value	*0.017*	*0.003*	*0.370*	*0.016*	*0.003*
No. observations	7443	3454	3989	7443	3454

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

Table 3. Probit model regression results for any migration vs. no migration, household with coresiding elderly in both 1 selected explanatory variables and marginal effects. Various samples.

	Full sample		Male adults		Femal
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient
Care-giving coefficient	-0.129*	-0.017*	-0.072	-0.012	-0.164
	(0.077)	*(0.009)*	*(0.107)*	*(0.017)*	*(0.118)*
Positive Health Shock	0.039	0.005	-0.060	-0.010	0.119
	(0.096)	*(0.013)*	*(0.134)*	*(0.021)*	*(0.148)*
Negative Health Shock	0.031	0.004	0.010	0.002	0.085
	(0.099)	*(0.014)*	*(0.139)*	*(0.023)*	*(0.148)*
Base Probability of success	-	0.069	-	0.092	-
LR chi2 test	**211.77**	**-**	**98.18**	**-**	**152.93**
P-Value	***(0.000)***		***(0.000)***		***(0.000)***
McFadden R2	**0.1033**	**-**	**0.091**	**-**	**0.160**
Log-L	**-919.131**	**-**	**-491.789**	**-**	**-400.513**
No. observations	3338		1538		1

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

Table 4. Selected multinomial logit regression results for local migration and distant migration relative to no m between 1997 and 2000. Various samples. Health measure is "seriously ill" in 1997 in PANEL A; health meas healthy" in PANEL B; health measure is "underweight" (BMI indicator) in PANEL C. Standard errors in pa

PANEL A

	Log odds of local migration relative to no migration			***Log odds of distant migration relative to***	
	Full sample	Male adults	Female adults	Full sample	Male adults
Elderly coresiding in HH in 1997	2.073***	1.274	3.481***	0.776	0.763
	(0.721)	*(0.931)*	*(1.119)*	*(0.553)*	*(0.678)*
Elderly seriously ill in 1997	0.003	0.089	-0.124	-0.501***	-0.406*
	(0.184)	*(0.257)*	*(0.275)*	*(0.171)*	*(0.217)*
No. observations	7354	3421	3933	7354	3421
Pseudo R2	0.133	0.144	0.177	0.133	0.144

PANEL B

	Log odds of local migration relative to no migration			***Log odds of distant migration relative to***	
	Full sample	Male adults	Female adults	Full sample	Male adults
Elderly coresiding in HH in 1997	2.099***	1.302	3.492***	0.749	0.756
	(0.724)	*(0.936)*	*(1.122)*	*(0.554)*	*(0.681)*
Elderly not that healthy in 1997	-0.126	-0.112	-0.259	-0.079	-0.175
	(0.261)	*(0.355)*	*(0.403)*	*(0.208)*	*(0.267)*
No. observations	7354	3421	3933	7354	3421
Pseudo R2	0.130	0.142	0.174	0.130	0.142

	PANEL C				
	Log odds of local migration relative to no migration			***Log odds of distant migration relative to***	
	Full sample	Male adults	Female adults	Full sample	Male adults
Elderly coresiding in HH in 1997	2.021***	1.223	3.416***	0.680	0.634
	(0.725)	*(0.931)*	*(1.135)*	*(0.556)*	*(0.680)*
Elderly underweight in 1997	0.127	0.196	0.085	0.107	0.172
	(0.214)	*(0.302)*	*(0.314)*	*(0.168)*	*(0.215)*
No. observations	7354	3421	3933	7354	3421
Pseudo R2	0.130	0.1426	0.1736	0.130	0.1426

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.

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[i] For example, individuals may increase their self-assessed health with the length of time following the diagnosis of a serious condition. Also individuals may base their reports on very different comparison groups depending on their culture, peer group, education and income level.