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Do coresidency and financial transfers from the children reduce the need for elderly parents to works in developing countries?

Abstract Do elderly parents use coresidence with or financial transfers from children to reduce their own labour supply in old age? This paper is one of only a few studies that seeks to formally model elderly labour supply in the context of a developing country while taking into account coresidency with and financial transfers from children. We find little evidence that support from children—either through transfers or coresidency—substitutes for elderly parents' need to work. Thus, as in developed countries, there is a role for public policy to enhance the welfare of the elderly population.

1 Introduction

Like the populations of industrialized nations, the populations of many developing countries are also ageing rapidly. However, the experience of industrialized nations may tell us very little about the consequences of population ageing for developing countries because the policy context differs so dramatically. Pension plans, for

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example, are rare, and when they do exist, are generally only available to the elite. Without widely available pension schemes, the majority of the elderly in developing countries must depend on their own labour market income—in combination with often meager asset stocks, financial transfers from children or coresidency with children—to support them in old age. Unfortunately, any reliance on support from children may become strained as elderly dependency ratios increase.

Little is known about the determinants of elderly individuals' labour supply or about the link between transfer behaviour and coresidency patterns on the one hand and labour supply behaviour on the other. In particular, what drives the labour supply decisions of the elderly in developing countries? To what extent do elderly parents use coresidence with or financial transfers from children to reduce their labour supply in old age? Finally, are transfers and coresidency targeted in the sense of being responsive to the needs of parents and the ability of children to give? As labour supply, coresidency and financial transfers are not likely to be determined in isolation, we adopt an empirical estimation strategy in which labour supply is determined, taking into account coresidency and the receipt of transfers. The use of particularly detailed data on Indonesia's elderly population from the Indonesian Family Life Survey (IFLS) makes estimating such a model possible. The IFLS is unique in that it provides information on all of the living children of elderly individuals—whether they live with the parent or not—including the amount of financial transfers from non-coresident children.

Indonesia provides an especially interesting case study of the labour supply of the elderly. Indonesia has the third-largest population older than age 65 in the world, and the number of elderly Indonesians is projected to increase by 400% between 1990 and 2025, resulting in an expected doubling of the dependency ratio (Adlakha and Rudolph 1994). At the same time, both public and private pensions are virtually non-existent outside of the government sector. The majority of elderly Indonesians live with one or more adult children, and more than half receive financial transfers from non-coresident children. Despite these forms of support, labour force participation remains high well into old age. Labor supply, coresidency and financial transfers all appear to be important mechanisms through which elderly Indonesians maintain their living standards in old age.

An understanding of these alternative forms of support is crucial to the development of policies that seek to improve the welfare of elderly populations in developing countries. Calls for governments to provide support for the elderly in lower-income countries are likely to increase as the elderly become a larger proportion of the total population especially if economic growth and modern markets weaken traditional systems of family support.[1] Making sensible choices about potential policy strategies, for example, public pension schemes or the provision of old-age care, requires an understanding of the linkages between different forms of support. This is one of only a few studies of which we are aware that seeks to formally model elderly labour supply in the context of a developing country and the only one of which we are aware to examine labour supply in conjunction with coresidency and financial transfers from children.

Our results indicate that coresidency and the provision of financial transfers do not reduce the elderly parent's own labour supply. The exception is non-coresiding women

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[1] The impact of modernization on support for the elderly is a point of empirical debate, for example, see Frankenberg and Kuhn (2003) and Beard and Cartmill (2003, unpublished data).

who do decrease their labour supply slightly as their children's transfers increase. Rather than an explicit form of old-age support, coresidency with adult children appears to be a form of household structure that simply evolves over the life cycle. Moreover, financial transfers also do not appear to be motivated primarily by the desire to provide old age support in that they are not strongly related to parental need or the ability to give. Overall then, our results provide little support for the view that traditional family support mechanisms in developing countries substantially reduce the need for additional policies directed at improving the living standards of the elderly.

2 Existing literature and the Indonesian context

Despite a growing interest in the welfare of the elderly in developing countries, and an established literature on retirement in developed countries, very little has been written on the labour supply of the elderly in the developing world.[2] We are aware of only two other studies that seek to formally model elderly labour supply in a developing country. Mete and Schultz (2002) examine elderly labour supply in Taiwan. Their main focus is the responsiveness of labour supply to the introduction of a national health insurance scheme, and they do not examine other forms of support for the elderly. Kochar (2000) is closer to our study in that she examines the relationship between days worked by coresiding fathers and the incomes of their coresiding sons in Pakistan. She finds that these are negatively correlated and concludes that one of the main benefits of coresidency is the provision of household public goods by children. A number of other studies provide descriptive accounts and statistics of elderly labour supply. For example, Adlakha and Rudolph (1994) provide some descriptive statistics of average hours worked by Indonesian elderly that show that two thirds of older men and one third of older women remain economically active[3] (see also Cain 1991; Hugo 2000; Chen and Jones 1989). Economic activity among the elderly remains high in other Asian countries as well. Although the availability of public pensions (mainly to civil servants) does contribute to retirement in some cases, the primary factor underlying retirement is poor health (Hermalin 2000).

More has been written on the other forms of support for the elderly—that is, coresidency and transfers. There is a small but expanding literature on coresidency, particularly in Asia. DaVanzo and Chan (1994) examined coresidency in Malaysia, and Cameron (2000) and Frankenberg et al. (1999) examined coresidency for Indonesia. Frankenberg et al. (2002a) examine transitions in and out of coresidency in three Asian countries: Indonesia, Singapore and Taiwan. Martin (1989) also conducts a cross-country comparison of coresidency behaviour in Fiji, Korea,

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[2] There is a literature that assesses the impact of familial transfers on labour supply in developed countries. For example, Joulfaian and Wilhelm (1994) and Holtz-Eakin et al. (1993) study the effect of inheritances on labour supply, whereas Rosenzweig and Wolpin (1993) model the effect of parental support—through both coresidence and financial transfers—on the human capital investment and labour supply decisions of young, adult sons.

[3] Niehof (1995), although not dealing directly with labour supply, presents an interesting overview of the experiences of elderly Indonesians.

Malaysia and the Philippines, whereas Frankenberg et al. (2002a) study living arrangements in Indonesia, Singapore and Taiwan.[4]

Whereas DaVanzo and Chan (1994) find that coresidency responds to economic variables such as the parent's income and housing prices, Cameron (2000) and Martin (1989) find only very small effects of economic variables on coresidency. Frankenberg et al. (1999), using panel data, also found that economic factors did not play a significant role in the transition to coresidency in Indonesia.[5] At the same time, Frankenberg et al. (2002a) find that only two characteristics of the respondent are associated with living with a child: health and work status. Individuals who live independently are more likely to be in excellent or good (as opposed to fair or poor) health and to work.

The literature on intergenerational transfer behaviour in developing countries is the most developed. Research on transfers for both developed and developing countries has, to a large extent, focused on differentiating between various theories of transfer behaviour and examining whether public pensions crowd out private transfers.[6] In addition to old-age income support, the main motives that have been invoked to explain transfer behaviour are altruism amongst family members (Becker 1974, 1991), payments for services (such as child care) provided by family members (Bernheim et al. 1985) as an insurance mechanism to promote consumption smoothing across family members, and repayment to parents for their earlier investment in the child, for example, educational expenditure.[7]

The attempts to empirically differentiate between these theories have met with limited success. Lillard and Willis (1997) find strong evidence of the parental repayment hypothesis in Malaysian data but weak evidence of all of the other motives. Frankenberg et al. (2002b) find similar evidence of the parental repayment hypothesis for Indonesia, and that transfers serve as a form of insurance for family members. Secondi (1997) and Hoddinott (1992) find evidence that transfers are consistent with the exchange motive in China and Kenya, respectively. Other studies of Kenya (Knowles and Anker 1981) and Botswana (Lucas and Stark 1985) have been inconclusive.[8] Finally, Ravallion and Dearden (1988) find that transfers on the Indonesian island of Java are generally targeted towards the disadvantaged, that is, the sick, elderly or unemployed, although there are large and important differences between transfers in rural and urban areas.

This study, although shedding some light on this debate, does not aim to differentiate between possible motives for intergenerational transfers. Instead, the

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[4] Special issues of the *Asia-Pacific Population Journal* were devoted to coresidency in September 1992 and December 1997. These papers are largely descriptive. See also Hermalin (2002), who reports the results of a 10-year study of ageing in Taiwan, Singapore, Thailand and the Philippines.
[5] See Hoerger et al. (1996) and Pezzin and Schone (1999) for papers that examine elderly living arrangements in the USA.
[6] See Cox and Jimenez (1992) and Jensen (2004) for example. Khemani (1999) takes a different approach and examines whether intergenerational transfers in Indonesia are explained by bargaining between husbands and wives over how much to transfer to their respective parents.
[7] Lillard and Willis (1997) provide more extensive descriptions of each of these motives.
[8] Results from developed countries have been just as indecisive. For example, Cox (1987) and Cox and Rank (1992) reject altruism on the basis that transfers in the USA are positively correlated with recipient's incomes, whereas McGarry and Schoeni (1995) and Altonji et al. (1997) find the opposite correlation and conclude in favour of altruism. There have also been attempts to examine transfers within households (see Kochar 1999; Pezzin and Schone (1997).

focus is on elderly labour supply, which is jointly determined with both transfers and coresidency, and thus, we model them simultaneously.[9]

2.1 The Indonesian context

Indonesian society consists of hundreds of different ethnic groups with their respective cultural practices. For example, the Javanese (who are the dominant Indonesian ethnic group) prefer to live with their adult children in extended households, whereas, in contrast, the Batak Karo of North Sumatra consider it important for children to establish separate households (Beard and Kunharibowo 2001). It is thus not straightforward to generalize about social norms with regard to the elderly in Indonesia. Further, unlike South Asia, parental support is not uniformly assigned to children of a specific gender or birth order.[10] Nevertheless, traditional law for almost all ethnic groups in Indonesia obligates children to care for their older parents (Frankenberg and Kuhn 2003). Our aim in this study is to uncover the relationships that determine the level of support and the extent to which elderly individuals support themselves. By aggregating across households as we do here, we will identify the "average" relationships between the variables of interest. This information is important in terms of characterizing relationships relevant to national policy but does not negate the usefulness of studies at a more micro level.[11]

3 The Indonesian family life survey

The IFLS is a general household survey collected by RAND and Lembaga Demografi of the University of Indonesia. The survey provides data for 1993 on a random sample of 7,224 households across the Indonesian provinces in Java, Sumatra, Bali, West Nusa Tenggara, Kalimantan and Sulawesi.[12] This study will focus on Indonesians aged 60 years or older, and within these 7,224 households, there are 2,625 individuals in this age category. Information was gathered on all household members; however, more detailed information was collected for selected householders (respondents). These more detailed data are available for 1,891 elderly individuals.[13] Because we are interested in examining the relationship between the labour supply of the elderly and the amount of financial

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[9] In a previous paper (Cameron and Cobb-Clark 2002) we modeled labour and transfers jointly but treated coresidency as being exogenous.

[10] Most Southeast Asian countries are like Indonesia in this respect (Friedman et al. 2003).

[11] We have no direct way of controlling for ethnicity given our data. We initially included provincial dummies in the estimating equations as a proxy for ethnicity but found that they were statistically insignificant. This is not particularly surprising because there are normally several ethnic groups within a single province.

[12] A second round of the survey was conducted in 1997, but the data on labour supply were not available at the time of writing. A third round was collected in 2000.

[13] In 1993, the average life expectancy in Indonesia was 63 (World Bank 1995). Each household has a maximum of four adult respondents. Where this maximum was binding, the selection rules resulted in a relatively high probability that the elderly household members would be chosen. The final sample consists of elderly individuals who can answer the questions about their non-coresiding children themselves. Our sample may thus underrepresent the elderly who were particularly frail or disabled.

support they receive from their children, we will focus on the sample of 1,507 individuals who report having at least one living child older than the age of 18. Dropping observations that have missing values for one or more of the explanatory variables results in a sample size of 1,429 elderly parents.

The IFLS asks respondents how many hours they worked last week, how many hours they usually work per week and how many weeks they usually work per year. We thus have three potential measures of the elderly parent's labour supply: hours last week, normal hours per week and a constructed measure of annual hours (normal hours per week multiplied by normal weeks per year). All three measures produced very similar results. In the empirical results discussed below, we focus on normal weekly hours because this measure is less sensitive to any seasonality effects reflected in hours last week and does not confound the effects of hours per week with weeks worked per year.[14]

The IFLS also provides information about the labour market sector (self-employed, government, private industry and not employed) in which the parent worked 20 years ago. This variable is useful because unlike current sector of employment, it is not a function of current labour supply but is likely to reflect both the availability of current employment opportunities and aspects of the elderly individual's taste parameters that may not be captured by education and the other demographic variables in the analysis.

The most unusual and attractive feature of the IFLS is that it provides relatively detailed data on all of the living non-coresiding children of respondents, including information about the amount of money children have transferred to their parents in the 12 months preceding the survey (including monetized in-kind transfers).[15] It is this information, which is not available in any other survey of which we are aware, that makes this study possible. Most previous studies have examined parent/child pairs and ignored the existence of other children. In contrast, the IFLS allows us to examine how parental labour supply responds to total transfers from non-coresiding children, not just those from an individual child. In addition, the IFLS includes data on the age, gender, marital status, educational attainment of the non-coresiding children and whether they live in the same province as the parent.[16] These general demographic data are also available for the parent, and all members of the parent's household, including coresiding children. We are thus able to construct variables that reflect the number of coresiding and non-coresiding children in gender, marital status and educational status categories for each elderly individual in our sample. Summary statistics and variable definitions are shown in Tables 6 and 7 in the Appendix 1.

Table 1 shows the living arrangements of the elderly in Indonesia. Most (62.5%) Indonesian parents older than the age of 60 are living with one or more of their children. These are the parents who we will designate as "coresiding". Of those that are not coresiding, 21.3% are living with their spouse, 9.0% are living with others

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[14] The IFLS asks people about the hours they normally worked on their primary job and their secondary job. We summed these two figures to arrive at the total hours normally worked. A small but not insignificant percentage of the sample reported working long hours on both jobs such that the total hours worked was not feasible. As a result normal hours worked was top-coded at 84 hour/week. We experimented with allowing for this upper censoring in the estimation and found that it made little difference. The MLE results below control for lower censoring only.
[15] Respondents are asked the monetary value of help received in the form of money, tuition, health care, food or other goods.
[16] Indonesia had 27 provinces in 1993.

Table 1 Living arrangements of the Indonesian elderly

Living arrangement (N=2,625)	Elderly (%)
Living with adult children	62.51
Living with spouse and others (not children)	7.60
Living with others (not spouse or children)	9.02
Living with spouse only	13.67
Living alone	7.03

Appropriate sampling weights were used to derive the figures in this table (source: Cameron 2000).

(this includes other relatives, friends and servants) and only 7.0% are actually living alone. Thus, our definition of non-coresiding is not synonymous with living alone. Ideally, one may want to differentiate between elderly individuals who live alone and those who live with others. However, to evaluate the attractiveness of living with others requires information on all of the possible "others". Our data do not provide us with information about the friends and more extended family members with whom an elderly individual might potentially reside. Thus, in the interests of empirical tractability, we focus here on residency with and financial transfers from children for whom we do have data. This seems appropriate because children are the most important source of residency options and financial transfers.

Table 2 provides summary statistics of transfers from non-coresiding children to elderly parents. Overall, more than half of the elderly parents in the sample received a positive transfer from their children in the previous year, with mothers more likely to receive them than fathers. Although, on average, the sums of money transferred are not very large (on average, the equivalent of US $71), they are a large proportion of mean household income and an even larger proportion of mean personal income.

Table 2 also provides information about the normal weekly hours of work of Indonesian elderly. These results indicate that many Indonesian men and women remain economically active into their old age. Not surprisingly, elderly men work on average more hours than elderly women, and younger age cohorts are working slightly more hours than older age cohorts (Fig. 1). Men who do not live with one

Table 2 Transfers and labour supply by coresidency status and gender

	Women		Men	
	Coreside		Coreside	
	No	Yes	No	Yes
Mean annual transfers (Rp000)	217.2	160.0	186.2	185.4
Proportion receiving transfers (%)	70.2	52.9	66.6	48.9
Mean transfers/Mean household income (%)	35.6	6.8	28.2	9.9
Mean transfers/Mean individual income (%)	115.5	34.9	33.8	16.9
Proportion working (%)	55.6	39.0	83.4	72.0
Mean normal weekly hours worked	17.6	13.4	34.0	30.3
Mean normal weekly hours worked if >0	31.6	34.4	40.1	42.1

Unless otherwise indicated, these means are calculated over the full sample, including zero values.
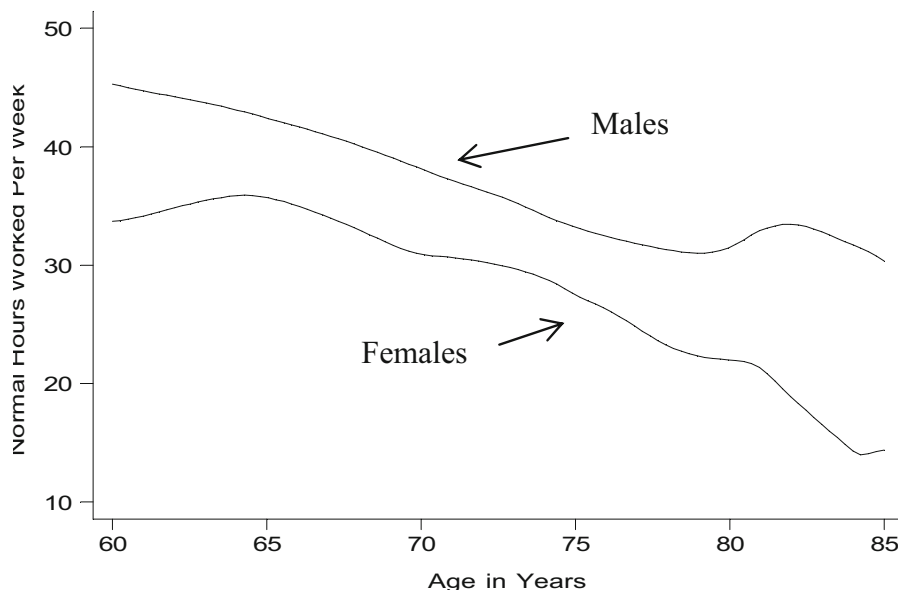
Fig. 1 Labour supply by age and gender

or more of their children normally work an average of 34.0 hour each week, slightly more than coresiding men, who work 30.0 hour on average. Indonesian women work on average about half the hours worked by men. Coresiding women work 13.4 hour/week on average, and non-coresiding women average 17.6 hour/week.

4 The empirical framework

Our objective is to formally examine the labour supply of elderly Indonesians, taking into account coresidency with and financial transfers from children. In particular, we are interested in understanding whether coresidency and transfers are complements to or substitutes for the elderly person's own labour income and in establishing whether transfers and coresidency are "targeted" in the sense of being responsive to the needs of the parents and the ability of the children to give.

4.1 The estimation strategy

Equations 1– 6 below set out the system of estimating equations to be jointly estimated using maximum likelihood estimation. We estimate a structural labour supply equation and, thus, are able to identify the direct effect of transfers from children on elderly labour supply. At the same time, the difficulty of finding valid exclusion restrictions restricts us to estimating reduced-form transfers and coresidency equations. The effect of coresidency status on labour supply is captured by the estimation of separate labour supply equations that depend on coresidency status. Similarly, the transfer equation also depends on whether or not the parent coresides with one of his or her children. Finally, we allow the errors in all three equations to be correlated with one another.

4.2 The labour supply model

We begin by considering the labour supply decision. The labour supply decisions of elderly Indonesians are assumed to depend on both market and reservation wages in the standard way. Given this, transfers from non-coresiding children, a form of unearned income, may affect parental labour supply decisions by altering the parent's budget constraint. Parents who coreside with one or more of their children may make household, rather than individual, labour supply decisions, and thus, it is important to take the characteristics of those coresiding children into account. Consequently, the labour supply of parents (LS_i^p) is given by:

$$LS_i^p = \max\left(\beta_{0n} + \beta_{1n}Z_i^P + \gamma_{1n}TR_i + \varepsilon_{1i}, 0\right) \quad if \ C_i = 0 \tag{1}$$

$$LS_i^p = \max\left(\beta_{0n} + \beta_{1r}Z_i^P + \beta_{2r}Z_i^{CC} + \gamma_{1r}TR_i + \varepsilon_{2i}, 0\right) \quad if \ C_i = 1, \tag{2}$$

where Eqs. 1 and 2 are the labour supply equations for coresiding and non-coresiding parents, respectively. Z^P is a vector of parental characteristics associated with market and reservation wages, the characteristics of coresiding children are given by Z^{CC}, and TR_i are transfers from non-coresiding children.[17]

Given that the provision of transfers is likely to be motivated by concerns about parental welfare, which in turn depends on the parent's ability to work, we are unable to find an exclusion restriction that would allow us to identify the structural parameters of the transfer equation. Instead, we estimate the following reduced-form equation:

$$TR_i = \max\left(\pi_{on} + \pi_{in}Z_i^{NC} + \pi_{2n}Z_i^P + u_{1i}, 0\right) \quad if \ C_i = 0 \tag{3}$$

$$TR_i = \max\left(\pi_{or} + \pi_{ir}Z_i^{NC} + \pi_{2r}Z_i^P + \pi_{3r}Z_i^{CC} + u_{2i}, 0\right) \quad if \ C_i = 1, \tag{4}$$

which can be thought of as the reduced form of a structural transfers equation that includes labour supply as an explanatory variable.[18] As parents' coresidency status is likely to affect transfers, we estimate separate transfer equations for coresiding

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[17] Consistent with standard labour supply models, labour market conditions influence the labour supply decision through market wages, that is, through the return to productivity-related characteristics (like education) that are captured in Z^P. In Indonesia, demand-side constraints are likely to be relatively unimportant because most elderly individuals are not employees but are engaged in some form of self-employment.

[18] The IFLS also provides information on transfers to children from parents. These are quantitatively much less important. We experimented with subtracting this amount from transfers from children and using a net measure of transfers in the estimation. It, however, seems that the motivations for these two types of transfers differ significantly. Using the net measure of transfers instead of the gross measure significantly reduced the predictive power of the transfers equation. We hence elected to use gross transfers to parents as our measure of transfers. Lee et al. (1994) similarly focus just on transfers flowing towards parents, and Frankenberg et al. (2002c) recognise that the determinant of these two types of transfers differ and estimate separate equations for provision and receipt of transfers.

and non-coresiding parents, allowing us to include different explanatory variables in the two equations. In particular, it seems likely that if the parent lives with one or more children, the total transfers the elderly parent receives from her non-coresiding children will be affected by the resources that coresiding siblings are able to provide. Transfers (either financial or in kind) from coresiding children are not observed in the data; however, we use coresiding children's characteristics to act as a proxy for these resources. Thus, the sum of transfers received from non-coresiding children (TR) is modeled as being a function of the parent's characteristics (Z^P), the non-coresiding children's characteristics (Z^{NC}) and, in the case of coresiding parents, also the characteristics of coresiding children (Z^{CC}).

Finally, we turn to consider the issue of coresidency itself. When an elderly individual chooses whether or not to coreside, s/he compares the utility derived from living alone to that received from living separately. This involves consideration of both transfers from non-coresiding children and one's own labour supply behaviour under each residency scenario. Our coresidency equation is reduced form, and like the transfer equation, can be thought of as deriving from a structural equation that includes both labour supply and transfers. Hence, the propensity to coreside (C^*) is modeled as a function of all of the exogenous variables in the system as follows:

$$C_i^* = \eta_0 + \eta_1 Z_i^P + \eta_2 Z_i^C + \eta_3 H_i + \nu_i \tag{5}$$

$$\begin{aligned} C_i &= 1 \; if \; C_i^* > 0 \\ &= 0 \; if \; C_i^* \leq 0 \end{aligned} \tag{6}$$

where i indexes individuals, Z^P is a vector of parental characteristics, and Z^C is a vector of all children's (i.e. both coresiding and non-coresiding) characteristics. Specifically, we control for the parents' demographic characteristics, non-labour income, asset levels, disability status, and previous work status, as well as the number of children in each marital status and education (primary, secondary and tertiary) category.[19] Moreover, we control for the transactions costs associated with switching between residency states. In Indonesia, home ownership rates are high, and the transaction costs associated with alternative living arrangements are likely to be correlated with house prices, H. Although the underlying propensity to coreside (C^*) is not observed, we do observe whether an elderly parent does in fact coreside with at least one adult child (C).[20]

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[19] We considered a number of alternative ways of characterizing children and found marital status and education to be the most appropriate for our analysis. We do not specifically consider the age of the children because the "children" of our sample of elderly Indonesians are in fact themselves adults. Only 2.2% of the sample have children younger than 18, and only 27.6% have children between the ages of 18 and 25. Consequently, the age of these children is unlikely to be the most important factor driving parental labour supply. We originally also controlled for the gender of children but found it to be insignificant. This is not so surprising because unlike South Asia, for example, gender roles are less well defined in Indonesia and elsewhere in Southeast Asia.

[20] In models of developed countries, nursing home care might be included as an additional potential living arrangement, for example, as in Pezzin and Schone (1999). Such care is very rarely available in Indonesia and so is not considered here.

4.3 Identification

The structural labour supply equation is identified by the exclusion of housing prices (which proxy the cost of changing residency state in the coresidency equation) and non-coresiding children's characteristics from that equation.[21] Whereas the characteristics of the children who are providing the transfers would clearly be expected to be a major determinant of transfers, it would be unusual to include non-coresiding family members' characteristics in the labour supply equation. It seems more reasonable to assume that non-coresiding children affect their parent's propensity to work via their provision of financial support, but having taken that into account, their other attributes would be irrelevant to the parent's labour supply decision.

4.4 Estimation

Equations 1–6 form the basis of our estimation model. In particular, the error terms in these three equations are assumed to be jointly distributed as follows:

$$\begin{pmatrix} \nu_i \\ u_i \\ \varepsilon_i \end{pmatrix} \sim N \begin{pmatrix} 0 & 1 & \sigma_{vu} & \sigma_{v\varepsilon} \\ 0, & & \sigma_u^2 & \sigma_{u\varepsilon} \\ 0 & & & \sigma_\varepsilon^2 \end{pmatrix},$$

where $\sigma_{vu} = \rho_{vu}\sigma_u$, $\sigma_{u\varepsilon} = \rho_{u\varepsilon}\sigma_u\sigma_\varepsilon$, and $\sigma_{v\varepsilon} = \rho_{v\varepsilon}\sigma_\varepsilon$. Joint estimation of Eqs. 1–6, taking this error structure and the censoring into account, requires estimation of a complex likelihood function that is derived in the Appendix 2. Estimation is performed separately for men and women because we expect the determinants of various forms of old-age support to vary by gender.

5 The effect of coresidency and transfers on labour supply

We examine the labour supply results first and then go on to briefly discuss the determinants of coresidency and financial transfers. Note that for ease of discussion, the results will be presented in separate tables, although they result from a joint estimation of the entire model.[22]

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[21] Our approach is not dissimilar to that of Pezzin and Schone (1999), who model elderly living arrangements, daughters' provision of informal care to elderly parents and daughters' labour supply in the context of the USA. They similarly include a proxy for the costs of moving between residency states in their residency equation as a means of identifying their system of equations.
[22] Initial estimation of the full model failed to converge. The convergence problem appeared to be due to the likelihood function being relatively flat around the optimum owing to the large number of discrete variables in the model. We therefore estimated the parameters in the coresidency equation in a separate step, plugged these parameters into the full likelihood function shown in the Appendix 2 and maximised it over the remaining parameters. Whereas this two-step process results in some loss of efficiency, the resulting estimates are consistent.

5.1 The labour supply of Indonesian elderly

The labour supply results are presented in Table 3. They show that, as one would expect, the labour supply behaviour of the Indonesian elderly is related to the capacity for market work. Disabled individuals also work as many as 20.8 fewer hours per week.[23] Normal hours of work decline between 1.5 and 0.4 hours/week with each year of age. Gender differences in the effects of age on labour supply suggest a convergence in the hours of work of elderly men and women as they age.

At the same time, to the extent that market wages increase with the level of education, our results imply that among non-coresiding parents, it is those individuals facing the lowest returns to market work (but perhaps the greatest need) who continue to work into their old age. Specifically, non-coresiding men with no education at all are predicted to work 12.0 hours more per week than non-coresiding men with at least a secondary school education. Among non-coresiding women the difference is even higher (18.0 hours). In contrast, coresiding parents' hours of work do not vary significantly with education. Thus, the support offered by coresidency might be important in allowing elderly individuals to lower their hours of work.

With regard to the other main source of support considered here—transfers—the results show that financial transfers from Indonesian children do not seem to be a substitute for the income provided by the elderly parent's own labour supply. Transfers from children are an insignificant determinant of parental labour supply for coresiding and non-coresiding men and for coresiding women. Transfers are negatively and significantly related to normal weekly hours of work only for non-coresiding mothers (p value=0.056), and this effect is small—increasing transfers by Rp100,000 (mean transfers are Rp217,200) leads to a 1.7-hours reduction in normal weekly hours.

Like transfers, asset levels and unearned income also appear to play little part in the labour supply decisions of elderly Indonesians. Elderly individuals with higher asset levels or with more unearned income do not enjoy significantly more leisure in their old age. To some extent these results may reflect that in Indonesia, access to pension income is restricted almost exclusively to government officials. The impact of pension income on hours worked might thus be captured by the coefficients on the previous work status variables. Being a government employee 20 years ago significantly reduces the hours worked in old age for both men and women. Coresiding women (men) who were previously employed in the government work on average 12.5 (21.4) hours/week less in their old age than women who were self-employed and 8.2 (18.5) hours less than women who were private employees. Previous labour market sector may also proxy for access to opportunities for continued employment. For example, self-employed individuals may be able to continue running their businesses into their old age, whereas public- and private-sector employees may find themselves forced to retire. Rural/urban status is likely to further capture both the opportunity for and returns to employment. Everything else equal, non-coresiding elderly women and coresiding elderly men work more hours in rural labour markets than in urban areas.

For both men and women the characteristics of coresiding children have no effect on the number of hours their parents work each week. This is particularly

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[23] Individuals are classified as disabled if they report having difficulty standing from sitting, dressing or going to the bathroom by themselves. Mete and Schultz (2002) similarly found that elderly labour supply in Taiwan was responsive to health status.

Table 3 Determinants of weekly normal hours of work for joint model of coresidence, transfers and labour supply (marginal effects and *t* statistics)

	Coreside Women (N=418)		Non-coreside Women (N=302)		Coreside Men (N=407)		Non-coreside Men (N=302)	
Parental resources								
Transfers (Rp000)	−0.001	−0.19	−0.017	−1.94	−0.007	−0.80	−0.042	−0.54
Other income (Rp000,000)	1.592	1.47	0.733	0.26	0.024	0.02	9.365	0.49
Assets (Rp000,000)	−0.002	−0.08	−0.005	−0.06	0.043	1.13	−4.722	−0.62
Parental characteristics								
Age	−0.653	−3.35	−0.447	−1.69	−1.413	−5.47	−1.468	−6.73
Education[a]								
Primary	0.520	0.26	2.309	0.79	−4.046	−1.22	−5.065	−1.81
Secondary	4.481	0.96	−17.962	−2.32	−8.175	−1.38	−11.950	−2.14
Married	3.083	1.86	−1.306	−0.48	5.683	1.06	7.656	1.65
Disabled	−6.748	−2.32	−13.560	−2.62	−20.819	−3.48	−6.074	−1.08
Rural	−0.216	−0.12	5.866	1.93	5.307	1.70	0.889	0.29
Previous work status[b]								
Self-employed	15.818	7.19	14.308	5.22	14.422	3.23	18.828	4.02
Government	3.362	0.38	24.072	1.91	−6.963	−1.17	−3.679	−0.52
Private	11.557	3.79	19.548	4.59	11.525	2.58	11.412	2.22
Coresiding children's characteristics[c]								
Married	0.360	0.18			−0.916	−0.34		
Not married	0.732	0.52			−0.567	−0.24		
Secondary education	−1.863	−1.35			−0.246	−0.13		
Tertiary education	−0.835	−0.31			−5.491	−1.49		
Constant	30.567	2.45	36.133	1.59	102.763	4.64	103.765	5.98
$\rho(LS^P, TR)$	0.24	1.37	−0.07	−0.35	0.17	0.92	0.16	0.66
$\rho(C^*, LS^P)$	0.42	3.87	0.68	2.47	−0.12	−0.41	0.98	8.63
$\rho(TR, C^*)$	0.01	0.02	−0.19	−0.54	−0.41	−2.51	0.09	0.36

[a] Relative to no education
[b] Work status 20 years ago. The omitted category is not at work.
[c] Number in each category

striking because it seems to suggest that overall household resources, as reflected by the numbers of adult children and their education levels, are unrelated to the labour supply decisions of elderly parents. Controlling for the number of adult coresiding children (i.e. the number of married and non-married children), elderly parents who live with children who are relatively better educated (and therefore presumably have higher earnings) do not work less in their old age.[24]

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[24] Interactions between children's marital status and gender were insignificant. We also experimented with including the number of grandchildren living in the household of coresiding elderly parents in the labour supply equations. (This information is available, whereas the number of children of non-coresiding children is not.) We had hypothesised that elderly women might be involved in child care and so less likely to work. However, the number of grandchildren coresiding was consistently insignificant.

6 The interdependencies between various forms of old-age support

The estimated correlations between the error terms in each of the equations are shown at the bottom of Table 3. The significance of some of the correlations validates the effort to jointly model the forms of old-age support.[25] The degree of correlation differs across the pairs of equations though. In no case is the correlation between the errors in the labour supply and transfers equation significant. This adds further support to our previous finding that transfers are not an important determinant of labour supply. Transfers and labour supply do not appear to be as closely related as might initially have been expected.

In contrast, the correlation between the errors in the coresidency and labour supply equations are positive and significant (except for coresiding men). Hence, for example, a woman whose unobservable characteristics make her more likely to coreside is also more likely to be working. This is not what one would expect from the descriptive data, which shows that before controlling for the observed characteristics of parents and children, coresidency was associated with lower working hours. It is, however, consistent with coresidency having more to do with adult children's decisions to move out than being an explicit form of support for the elderly, which is what is suggested by the findings from the coresidency equation below. Hence, many coresiding parents may need to work to support the household.[26]

6.1 Coresidency among Indonesian elderly

We define elderly individuals to be coresiding ($C=1$) if they live with one or more adult children and non-coresiding ($C=0$) otherwise.[27] For ease of interpretation we focus on the resulting marginal effects (calculated at the means) rather than the coefficient estimates.

In Indonesia coresidency seems to be a household structure that evolves over the life cycle rather than an explicit form of old-age support (Table 4). In particular, elderly men and women are both more likely to be living with unmarried children than married children, and there is a strongly significant, negative effect of age on the probability that women coreside. Ageing 10 years decreases the probability of

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[25] For the purpose of comparison, results assuming these forms of support are unrelated are presented in Appendix 1 Tables 8 and 9. The marginal effects differ slightly across the jointly and independently estimated equations, as does the significance of some of the variables—most noticeably, transfers are strongly significant in the non-coresiding women's labour supply equation ($t=3.37$) but only marginally so once we allow for their endogeneity ($t=-1.91$). The effect is quantitatively small in both cases though. The qualitative results of both sets of results are largely the same.

[26] The correlation between the error in the transfer equation and coresidency equation is also insignificant in most cases for coresiding men, although it is significant and negative. Hence, men whose unobservable traits make them more likely to coreside are less likely to receive transfers. It is not unusual for Indonesian men to marry much younger women and to have relatively young children even when they are over the age of 60. Thus, this result may be explained by men who live with a young spouse who works being less likely to receive transfers and more likely to be coresiding with one of their youngish children.

[27] Similarly, children are defined to be coresiding if they live with the parent and non-coresiding if not. A non-coresiding child can thus have a coresiding parent. This simply implies that the parent lives with one of the child's siblings.

elderly women coresiding by more than 10 percentage points.[28] This negative relationship suggests that as mothers (and children) age, children are more likely to get married and move out. Indonesian children may thus be more often living with their mothers than the converse. This may not show up for men because divorce is not uncommon in Indonesia, and older men often remarry younger women and have relatively young families.[29]

That the characteristics of the elderly parent's children seem to play a greater role in determining coresidency than the parent's characteristics further suggest that coresidency is not an explicit form of old-age support. For example, parent's educational status, marital status and, for men, age are insignificant determinants of coresidency. Mothers' assets and unearned income are negatively related to their probability of coresiding, suggesting an ability to buy privacy, but the effect is very small in magnitude. An extra Rp200,000 of unearned income (approximately doubling the average) decreases the probability of coresiding by less than 2 percentage points.[30]

However, children's educational status is an important determinant of coresidency. Mothers are significantly more likely to be coresiding the more children they have with a secondary education compared with children with a lower education. This can indicate that coresidency may respond to children's income, and that more educated children are better able to afford having their parents live with them. However, Cameron (2000) examined this issue directly and found no evidence that Indonesian parents tend to live with wealthier children. This interpretation is further confounded by the fact that fathers are significantly less likely to coreside if they have children with a tertiary education.

Our results on coresidency are in line with those of Frankenberg et al. (2002a), who found that the interests of the younger generation rather than those of the older generation are often the primary motivation behind coresidence.

Importantly for the identification of the system of equations, the average house price in the parent's locality is significantly related to the probability of coresidence (at the 1% level for men and the 10% level for women) and has a positive sign. The transaction's costs associated with moving out of the parental home will be larger in regions with more expensive housing, and this may dissuade children from doing so.

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[28] We tried including a quadratic in age in the model but it was insignificant.

[29] The IFLS data tell us who owns the home in which the household lives, but this does not allow us to accurately establish who is living with whom. For example, a parent at age 85 may no longer play an active role in household decisions (and so be dependent on his or her children in this sense) but may legally remain the owner of the home. Even if we knew a lot more about the household, this would be difficult to ascertain because responsibility is likely to gradually shift from the parent to the child over time. It is also possible that—given the nature of the data—we are capturing the effects of birth cohorts rather than aging. However, Frankenberg et al. (1999) used panel data for Indonesia and similarly found age to be negatively related to the transition to coresidency.

[30] The Indonesian currency is the Rupiah. In 1993, US $1 bought approximately Rp2,500. We treat assets as a predetermined variable. It can be argued that assets are actually endogenous because the parent may run them down if s/he does not receive income support from other sources. However, we examined the asset data and found no evidence of asset values changing systematically, either increasing or decreasing, with age older than 60. We also estimated the entire system of equations without the inclusion of the asset variable and found none of the other parameters to be affected by its presence. We chose to present the results that include the asset variable because theoretically, wealth can play an important role in the choices elderly individuals make regarding their income support.

Table 4 The determinants of coresidency (probit marginal effects and t statistics)

	Women (N=720)		Men (N=709)	
	Marginal effect	t statistic	Marginal effect	t statistic
Parents' income				
Other income (Rp000,000)	−0.096	−3.71	−0.022	−1.16
Assets (Rp000,000)	−0.001	−1.91	0.001	1.39
Parents' characteristics				
Age	−0.011	−3.41	−0.001	−0.16
Married	−0.067	−1.57	−0.005	−0.08
Disabled	0.083	1.24	−0.046	−0.50
Primary education	−0.029	−0.58	−0.018	−0.42
Secondary/Tertiary education	−0.074	−0.72	0.008	0.09
Rural	−0.083	−1.73	−0.028	−0.54
Previous work status				
Self-employed	−0.068	−1.57	−0.140	−2.17
Government	0.037	0.21	−0.109	−1.04
Private	−0.100	−1.40	−0.084	−1.14
Children's characteristics				
Married	−0.002	−0.17	0.016	1.53
Not married	0.150	6.45	0.177	8.69
Secondary education	0.037	2.61	0.003	0.20
Tertiary education	−0.023	−0.93	−0.054	−2.16
Local housing market				
Average house price (Rp000,000)	0.036	1.73	0.080	3.80

6.2 Transfers to Indonesian elderly from non-coresiding children

The transfer equation provides some clues as to why transfers are not an important determinant of elderly labour supply. Although there is evidence that transfers are targeted to the elderly population as a whole (Secondi 1997; Ravallion and Dearden 1988), our analysis suggests that within the elderly population, financial transfers from children are not in general related to parental need as measured by the elderly parent's own characteristics (Table 5). Disabled and older parents do not receive any more in transfers than their able-bodied, younger counterparts. Older coresiding fathers actually receive less, with transfers falling by approximately Rp10,000 for each year the father ages, although this effect is significant at only the 10% level.[31] Furthermore, wealthier parents (as measured by assets and unearned income) receive significantly more transfers from their non-coresiding children. Non-coresiding men are the only exception.

Finally, there is generally a positive relationship between transfers and parental education among those mothers and fathers coresiding with adult children. Only among non-coresiding parents does it appear to be the case that transfers are targeted towards less educated—and perhaps more disadvantaged—parents.

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[31] Given the cross-sectional nature of our data, this pattern may reflect differences across birth cohorts rather than the effects of ageing per se.

Table 5 Transfers (Rp000) from non-coresiding children from joint model of coresidence, transfers and labour supply (marginal effects and *t* statistics)

	Coreside Women (N=418)		Non-coreside Women (N=302)		Coreside Men (N=407)		Non-coreside Men (N=302)	
Parental resources								
Other income (Rp000,000)	46.4	1.95	105.4	2.49	51.8	2.56	37.6	0.91
Assets (Rp000,000)	1.9	3.51	2.6	1.82	−0.1	−0.12	2.4	1.32
Parental characteristics								
Age	0.8	0.23	3.1	0.69	−10.4	−1.94	−3.1	−0.66
Education[a]								
Primary	88.0	2.04	8.7	0.12	130.6	2.36	−146.8	−2.52
Secondary/Tertiary	313.3	2.92	−376.4	−2.41	6.4	0.05	−222.0	−1.77
Married	−108.7	−2.74	−175.7	−2.72	−2.0	−0.02	15.4	0.15
Disabled	−1.5	−0.03	−19.1	−0.18	−74.9	−0.56	7.2	0.06
Rural	83.5	2.14	−46.0	−0.74	125.0	2.10	119.5	1.62
Outside province	−2.4	−0.14	22.1	0.89	28.8	1.09	13.1	0.56
Previous work status[b]								
Self-employed	7.9	0.19	−71.1	−1.17	135.2	1.54	−8.2	−0.08
Government	−310.5	−1.69	559.9	2.35	−86.5	−0.53	−43.6	−0.28
Private	−41.4	−0.58	−204.2	−1.94	50.3	0.53	1.2	0.01
Coresiding children's characteristics[c]								
Married	21.6	0.49			55.1	0.84		
Not married	−5.9	−0.19			−213.8	−4.97		
Secondary education	−13.6	−0.43			−27.2	−0.57		
Tertiary education	79.9	1.80			179.3	1.86		
Non-coresiding children's characteristics[c]								
Married	77.9	6.45	63.2	4.09	49.5	2.85	33.9	2.18
Not married	52.0	1.71	164.3	3.84	−23.5	−0.65	−53.7	−0.97
Secondary education	2.6	0.19	2.2	0.10	29.8	1.13	70.7	3.09
Tertiary education	42.1	1.43	62.2	1.69	98.6	1.81	52.6	1.29
Constant	−59.4	−0.24	291.0	0.87	1,079.2	2.54	166.5	0.44

[a] Relative to no education
[b] Work status 20 years ago. The omitted category is "not at work".
[c] Number in each category

For coresiding parents there is further evidence that transfers respond little to parental need as measured by the characteristics (number and education level) of coresiding children. Transfers from non-coresiding children to their fathers are lower as the overall number of unmarried coresiding siblings increases, but otherwise, there is little relationship between the number of coresiding siblings and transfers.

The main difference between the transfers received by elderly men and women is that women who are currently living with their spouse receive significantly fewer transfers than women who are either divorced, separated, widowed or never married. Men are more likely than women to work into old age. They are likely also to have more assets at their disposal. Hence, women with partners are less often in need of support from children.

Transfers also appear to be only loosely related to the ability of children to give. Whereas unmarried children (who most likely have fewer dependents) transfer more each year to their non-coresiding mothers than do their married siblings, they make smaller transfers to their fathers and coresiding mothers.[32] There is little relationship between non-coresiding children's education levels and the transfers they provide mothers and fathers. Although the coefficients on the variable indicating the number of children with a tertiary education is large and positive in each case, it is never significant at the 5% level (and is significant at the 10% level only for coresiding men).

The results above are consistent with some of the findings from the work of Lillard and Willis (1997) on the motives for intergenerational transfers in Malaysia. With the elderly couple the unit of analysis, they find only limited support for the view that the provision of old-age security is the motive behind the transfers received from non-coresiding children. This suggests that other cultural factors like filial piety may be the main motivating force behind transfers.

7 Conclusions

In this paper we estimate the determinants of elderly labour supply, taking into account the receipt of transfers from and coresidency with children, thus formally acknowledging the interdependency of these alternative forms of support in old age. Our goals were to (1) identify the determinants of elderly labour supply, (2) examine the relationship between these three forms of support, and (3) establish whether transfers and coresidency are responsive to the needs of the parents and the ability of the children to give.

Our results indicate that coresidency, financial transfers and labour supply are all quantitatively important forms of old-age support for elderly Indonesians. However, coresidency appears to be a result of a household structure that evolves over the life cycle rather than an explicit form of support for elderly parents. Transfers from non-coresiding Indonesian children to their elderly parents do not seem to be strongly related to parental need, as captured by the parent's own characteristics and the characteristics of coresiding siblings, nor do transfers appear to be strongly related to the ability to give as measured by non-coresiding children's characteristics.

Possibly the most important finding is that financial transfers from Indonesian children do not appear to be a substitute for the income support provided by the elderly parent's own labour market work. Only non-coresiding women reduce their hours of work as their children's transfers become more generous, and this effect is relatively small. The labour supply of coresiding elderly parents is also unrelated to the characteristics of their coresiding children. This suggests that the labour supply decision of elderly parents may be unrelated to overall household resources.

We can only speculate as to why transfers from children do not result in parents devoting less hours to the labour market. It may be that transfers are too unpredictable to be relied upon or that they are not large enough to affect an elderly

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[32] Ideally, we would have also controlled for the number of children that each of the non-coresiding children have (that is, grandchildren of the elderly individual) because they may constitute a competing demand on the non-coresiding child's resources. However, the IFLS does not provide these data for all non-coresiding children.

person's labour supply. Alternatively, there may be either cultural or emotional motivations for continuing to work into old age.

There is little to suggest that the pressure for elderly individuals to continue to work to support themselves in Indonesia and in other developing countries will decrease in the future. As the size of the elderly population increases, the resources needed to support them also increases. Many developing nations are banking on traditional family support mechanisms to take the strain, thus negating the need for the public pension schemes seen in most developed countries. Some countries (Malaysia and Singapore, for example) are using tax incentives to children to shore up these forms of support. Our results suggest that these transfers are not a substitute for parents' own earnings. Similarly, coresidency does not seem to reduce elderly parents' need to work. The increasing internal migration seen in many developing countries, driven by greater labour market mobility, will also put downward pressure on coresidency rates. Thus, we predict the public provision of old-age support will become an increasingly important issue for policy makers in the developing world.

Appendix 1

Table 6 Variable definitions

	Definition
Dependent variables	
Coresidency	Equal to 1 if parent lives with a child older than 18, 0 otherwise
Transfers	Sum of transfers received from all non-coresiding children in the 12 months before the survey
Labor supply	Normal weekly hours of work (including wage and non-wage work)
Parental characteristics	
Other income	Sum of pension income, asset income and any other non-labour income received by the individual in the 12 months before the survey (other than transfer income)
Assets	The asset owned by the individual (including the appropriate percentage of shared assets). Includes houses/buildings, land, animals, savings, stocks, receivables, jewelry and any other assets
Age	Age in years at time of survey
Married	Dummy variable =1 if currently married, 0 if never married, divorced, separated or widowed
Disabled	Equal to 1 if the individual has difficulty standing from sitting, dressing or going to the bathroom by themselves, 0 otherwise
Education categories	Dummy variables reflecting the highest level of schooling attended. For example, primary =1 if highest level of schooling attended was primary school, 0 otherwise. Omitted category is "no schooling"
Rural	Equal to 1 if parent lives in a rural area, 0 otherwise

Table 6 (continued)

	Definition
Previous work status	Dummy variables reflecting the sector of employment 20 years ago. Omitted category is "not working 20 years ago"
Outside province	The number of children who live in a different province from the parent
Average house price	Average house price in the parent's village as reported by the village head
Children's characteristics	
Married	No. children who are currently married
Not married	No. children who have never been married, are separated, divorced or widowed
Education categories	No. children in education categories. For example, secondary = no. children whose highest level of education attended is secondary school. Omitted category is "no. children with primary school education or less"

Table 7 Mean parental and child characteristics by gender and coresidency

	Women		Men	
	Non-coresiding (N=302)	Coresiding (N=418)	Non-coresiding (N=302)	Coresiding (N=407)
Parental income/Wealth				
Other income (Rp00,000)	1.270	1.650	1.412	2.757
Assets (Rp000,000)	3.838	5.255	3.723	7.866
Parents' characteristics[a]				
Age (years)	67.3	65.1	66.9	66.0
Primary education	0.23	0.26	0.55	0.55
Secondary/Tertiary education	0.05	0.04	0.07	0.12
Married	0.42	0.46	0.91	0.91
Disabled	0.09	0.10	0.05	0.05
Rural	0.66	0.54	0.74	0.58
Previous employment sector[a]				
Self-employed	0.42	0.31	0.65	0.53
Government	0.01	0.01	0.06	0.10
Private	0.10	0.08	0.19	0.23
Not employed	0.47	0.60	0.10	0.14
Non-coresiding children's characteristics[b]				
Married	3.3	2.7	3.3	2.8
Not married	0.4	0.3	0.6	0.4
Primary education	2.5	1.7	2.5	1.7
Secondary education	0.9	1.1	1.1	1.2
Tertiary education	0.3	0.2	0.3	0.2
Out of province	0.9	0.7	1.0	0.7

Table 7 (continued)

	Women		Men	
	Non-coresiding (N=302)	Coresiding (N=418)	Non-coresiding (N=302)	Coresiding (N=407)
Coresiding children's characteristics[b]				
Married		0.6		0.5
Not married		0.8		1.2
Primary education		0.7		0.8
Secondary education		0.6		0.7
Tertiary education		0.1		0.1
Local housing market				
Average house price (Rp000,000)	8.275	13.400	6.173	14.200

[a] Unless otherwise specified, these are dummy variables.
[b] Numbers of children in each category.

Table 8 Transfers from non-coresiding children based on single-equation model (Tobit marginal effects and t statistics)

	Coreside Women (N=418)		Non-coreside Women (N=302)		Coreside Men (N=407)		Non-coreside Men (N=302)	
Parental resources								
Other income (Rp000,000)	24.712	0.86	157.681	3.22	35.999	2.04	28.573	0.81
Assets (Rp000,000)	1.907	2.21	2.988	1.90	0.326	0.44	1.844	1.48
Parental characteristics								
Age	−3.898	−1.06	6.746	1.30	−6.871	−1.52	−3.163	−0.66
Education[a]								
Primary	82.558	1.71	30.436	0.37	70.216	1.24	−153.667	−2.63
Secondary	278.218	2.81	−330.425	−1.84	−30.896	−0.31	−213.905	−1.69
Married	−118.664	−2.76	−110.894	−1.51	84.425	0.90	8.940	0.09
Disabled	29.374	0.45	−42.426	−0.34	−58.448	−0.51	3.880	0.03
Rural	62.667	1.44	15.122	0.20	14.087	0.25	111.318	1.60
Outside	3.855	0.20	24.796	0.86	−6.014	−0.26	15.899	0.67
Previous work status[b]								
Self-employed	2.272	0.05	−27.456	−0.39	28.855	0.38	−13.692	−0.14
Government	−293.847	−1.47	504.717	1.78	−53.855	−0.50	−43.171	−0.28
Private	−39.443	−0.52	−94.005	−0.81	42.740	0.52	4.143	0.04
Coresiding children's characteristics[c]								
Married	16.736	0.36			70.637	1.43		
Not married	33.251	0.99			12.922	0.38		
Secondary education	−9.929	−0.29			−16.499	−0.43		
Tertiary education	59.763	0.92			93.943	1.54		
Non-coresiding children's characteristics[c]								
Married	71.633	5.67	67.844	3.82	59.779	3.94	33.216	2.17

Table 8 (continued)

	Coreside		Non-coreside		Coreside		Non-coreside	
	Women (N=418)		Women (N=302)		Men (N=407)		Men (N=302)	
Not married	79.218	2.51	102.731	2.10	79.903	2.50	−43.883	−1.22
Secondary education	3.626	0.22	4.522	0.17	26.080	1.21	77.383	3.53
Tertiary education	21.109	0.58	22.629	0.50	37.295	0.95	41.694	1.06
Constant	−9.780	−0.04	−408.573	−1.10	19.110	0.05	213.975	0.58

[a] Relative to no education
[b] Work status 20 years ago. The omitted category is "not at work".
[c] Number in each category

Table 9 Determinants of weekly normal hours of work based on single-equation model (marginal effects and t statistics)

	Coreside		Non-coreside		Coreside		Non-coreside	
	Women (N=418)		Women (N=302)		Men (N=407)		Men (N=302)	
Parental resources								
Transfers (Rp000)	−0.001	−0.80	−0.007	−3.37	0.001	0.47	0.003	0.78
Other income (Rp000,000)	2.403	2.04	−0.606	−0.36	−0.300	−0.33	0.087	0.05
Assets (Rp000,000)	0.004	0.10	−0.023	−0.45	0.039	1.02	−0.039	−0.68
Parental characteristics								
Age	−0.690	−3.89	−0.462	−2.61	−1.317	−5.84	−1.601	−6.85
Education[a]								
Primary	0.736	0.37	1.612	0.62	−4.771	−1.75	−4.926	−1.75
Secondary	5.687	1.37	−15.148	−2.21	−8.083	−1.64	−11.162	−1.88
Married	3.642	2.11	−0.440	−0.19	4.617	1.03	8.078	1.62
Disabled	−7.934	−2.46	−12.400	−2.67	−19.682	−3.12	−6.141	−1.02
Rural	−0.012	−0.01	5.285	2.10	5.066	1.83	−0.950	−0.29
Previous work status[b]								
Self-employed	18.068	9.29	13.545	5.63	13.342	3.48	18.713	3.75
Government	3.624	0.48	16.414	1.56	−6.761	−1.19	−3.610	−0.47
Private	13.131	4.57	19.355	5.24	10.849	2.59	12.535	2.27
Coresiding children's characteristics[c]								
Married	0.487	0.26			−1.086	−0.43		
Not married	0.443	0.31			0.138	0.09		
Secondary education	−2.346	−1.70			−0.503	−0.29		
Tertiary education	−0.932	−0.37			−6.437	−2.04		
Constant	32.969	2.74	31.115	2.51	92.827	5.28	119.268	6.71

[a] Relative to no education
[b] Work status 20 years ago. The omitted category is "not at work".
[c] Number in each category

Appendix 2 Joint maximum likelihood estimation of the coresidency, transfers and labour supply equations

The estimation is conducted separately by coresidency status and gender. We present the likelihood function for a non-coresiding mother or father below. The procedure for coresiding parents is analogous to this.

We begin by simplifying the notation used in Eqs. 1–6 in the text. This will make it easier to write out the likelihood expressions. The simplified coresidency equation is:

$$
\begin{aligned}
C_i &= 1\left(\eta_0 + \eta_1 Z_i^P + \eta_2 Z_i^C + \eta_3 H_i + \nu_i > 0\right) \\
&= 1(\eta Z_i + \nu_i > 0)
\end{aligned}
\tag{7}
$$

where $1(\ )$ is an indicator function that equals 1 if the expression in the brackets is true and 0 otherwise, and Z_i is the column vector $\left[1, Z_i^P, Z_i^C, H_i\right]$.

For transfers, we have:

$$
\begin{aligned}
TR_i &= \max\left(\pi_{0n} + \pi_{1n} Z_i^P + \pi_{2n} Z_i^{NC} + u_{1i}, 0\right) \\
&= \max\left(\pi X_i + u_{1i}, 0\right)
\end{aligned}
\tag{8}
$$

where X_i is the column vector $[1, Z_i^P, Z_i^{NC}]$. Finally, labour supply is given by:

$$
\begin{aligned}
LS_i^P &= \max\left(\beta_{0n} + \beta_{1n} Z_i^P + \gamma_{1n} TR_i + \varepsilon_{1i}, 0\right) \\
&= \max\left(\beta W_i + \gamma TR_i + \varepsilon_{1i}, 0\right)
\end{aligned}
\tag{9}
$$

where W_i is the column vector $\left[1, Z_i^P\right]$.

We assume that the error terms are jointly normally distributed such that:

$$
\begin{pmatrix} \nu_i \\ u_{1i} \\ \varepsilon_{1i} \end{pmatrix} \sim N \begin{pmatrix} 0 \\ 0 \\ 0, \end{pmatrix} \begin{pmatrix} 1 & \rho_{\nu u_1}\sigma_{u_1} & \rho_{\nu \varepsilon_1}\sigma_{\varepsilon_1} \\ & & \rho_{u_1 \varepsilon_1}\sigma_{u_1}\sigma_{\varepsilon_1} \\ & & \sigma_{\varepsilon_1}^2 \end{pmatrix}
$$

2.1 Deriving the likelihood function

The elderly non-coresiding individual can be in one of four states. Below, we list the states and the expression for the associated probability of being in each state.

2.1.1 Coresiding ($C_i = 1$)

The probability associated with being in this state is written as:

$$L_{1i} = \Pr\left(C_i = 1\right)$$
$$= \Pr\left(\nu_i > -\eta z_i\right)$$
$$= 1 - \Phi(-\eta z_i)$$

where Φ is the normal cumulative distribution function. Note that we are following the convention of using uppercase letters to represent the random variables and lowercase to represent the realization of the variables.

2.1.2 Non-coresiding, receiving positive transfers and having positive labour supply

$$\left(C_i = 0,\, TR_i > 0,\, LS_i^P > 0\right)$$

$$L_{2i} = \Pr\left(C_i = 0,\, TR_i = tr_i,\, LS_i^P = ls_i\right)$$
$$= \Pr\left(TR_i = tr_i,\, LS_i^P = ls_i\right) \times \Pr\left(C_i = 0 | TR_i = tr_i,\, LS_i^P = ls_i\right)$$
$$= \Pr(u_{1i} = tr_i - \pi x_i,\, \varepsilon_{1i} = ls_i - \beta w_i - \gamma tr_i)$$
$$\times \Pr(\nu_i < -\eta z_i | u_{1i} = tr_i - \pi x_i,\, \varepsilon_{1i} = ls_i - \beta w_i - \gamma tr_i)$$
$$= \varphi_2(tr_i - \pi x_i,\, ls_i - \beta w_i - \gamma tr_i) \times \Phi(-\eta z_i | tr_i - \pi x_i,\, ls_i - \beta w_i - \gamma tr_i)$$

where φ_2 is the bivariate normal density function.

2.1.3 Non-coresiding, receiving positive transfers and not working

$$\left(C_i = 0,\, TR_i > 0,\, LS_i^P = 0\right)$$

$$L_{3i} = \Pr\left(C_i = 0,\, LS_i^P = 0,\, TR_i = tr_i\right)$$
$$= \Pr\left(TR_i = tr_i\right) \times \Pr\left(LS_i^P = 0,\, C_i = 0 | TR_i = tr_i\right)$$
$$= \Pr\left(u_{1i} = tr_i - \pi x_i\right) \times \Pr\left(\nu_i < -\eta z_i,\, \varepsilon_{1i} < -\beta w_i - \gamma tr | u_{1i} = tr_i - \pi x_i\right)$$
$$= \phi_2(tr_i - \pi x_i) \times \Phi_2(-\eta z_i,\, -\beta w_i - \gamma tr_i | tr_i - \pi x_i)$$

where ϕ is the normal probability density function, and Φ_2 is the bivariate normal cumulative distribution function.

2.1.4 Non-coresiding, receiving no transfers and working

$$\left(C_i = 0, \ TR_i = 0, LS_i^P > 0\right)$$

$$
\begin{aligned}
L_{4i} &= \Pr\left(C_i = 0, TR_i = 0, LS_i^P = ls_i\right) \\
&= \Pr\left(LS_i^P = ls_i\right).\Pr\left(TR_i = 0, C_i = 0 \big| LS_i^P = ls_i\right) \\
&= \Pr\left(u_i = ls_i - \beta w_i - \gamma tr_i\right) \times \Pr\left(u_{1i} < -\pi x_i, \nu_i < -\eta z_i, |\varepsilon_{1i} = ls_i - \beta w_i - \gamma tr_i\right) \\
&= \phi(ls_i - \beta w_i - \gamma tr_i) \times \Phi_B(-\pi x_i, -\eta z_i | ls_i - \beta w_i - \gamma tr_i)
\end{aligned}
$$

2.1.5 Non-coresiding, receiving no transfers and not working

$$\left(C_i = 0, \ LS_i^P = 0, \ TR_i = 0\right)$$

$$
\begin{aligned}
L_{5i} &= \Pr\left(C_i = 0, LS_i^P = 0, TR_i = 0\right) \\
&= \Pr\left(\nu_i < -\eta z_i, \varepsilon_{1i} < -\beta w_i - \gamma tr_i, u_{1i} < -\pi x_i\right) \\
&= \Phi_3(-\eta z_i, -\beta w_i - \gamma tr_i, -\pi x_i),
\end{aligned}
$$

where Φ_3 is the trivariate normal cumulative distribution function.

2.2 Log likelihood function

The log likelihood is thus written as:

$$
\begin{aligned}
\log L_i ={}& 1(C_i = 1) \times \log L_{1i} + 1(C_i = 0, TR_i > LS_i > 0) \times \log L_{2i} \\
&+ 1(C_i = 0, TR_i > 0, LS_i = 0) \times \log L_{3i} \\
&+ 1(C_i = 0, TR_i = 0, LS_i > 0) \times \log L_{4i} \\
&+ 1(C_i = 0, TR_i = 0, LS_i = 0) \times \log L_{5i}.
\end{aligned}
$$

The analogous states for the coresiding case are the probabilities associated with (1) non-coresiding; (2) coresiding, receiving positive transfers and working; (3) coresiding, receiving positive transfers and not working; (4) coresiding, receiving no transfers and working; and (5) coresiding, receiving no transfers and not working. The set of explanatory variables in the transfers and labour supply equations differ in the coresiding case, as shown in Eqs. 1–4.

References

Adlakha A, Rudolph D (1994) Aging trends: Indonesia. J Cross Cult Gerontol 9:99–108

Altonji JF, Hayashi F, Kotlikoff L (1997) Parental altruism and inter vivos transfers: theory and evidence. J Polit Econ 105(6):1121–1166

Beard V, Kunharibowo Y (2001) Living arrangements and support relationships among elderly Indonesians: case studies from Java and Sumatra. Int J Popul Geogr 7:17–33

Becker G (1974) A theory of social interactions. J Polit Econ 82(6):1063–1093

Becker G (1991) A treatise on the family. Harvard University Press, Cambridge

Bernheim D, Shleifer A, Summers L (1985) The strategic bequest motive. J Polit Econ 93:1045–1076

Cain M (1991) The activities of the elderly in rural Bangladesh. Popul Stud 45:189–202

Cameron L (2000) The residency decision of elderly Indonesians: a nested logit analysis. Demography 37(1):17–27

Cameron L, Cobb-Clark D (2002) Old-age labour supply in the developing world. Appl Econ Lett 9(10):649–652

Chen AJ, Jones G (1989) Ageing in ASEAN: its socio-economic consequences. Institute of Southeast Asian Studies, Singapore

Cox D (1987) Motives for private income transfers. J Polit Econ 95(3):508–543

Cox D, Jimenez E (1992) Social security and private transfers in developing countries: the case of Peru. World Bank Econ Rev 6(1):155–169

Cox D, Rank M (1992) Inter-vivos transfers and intergenerational exchange. Rev. Econ Stat 74(2):305–314

DaVanzo J, Chan A (1994) Living arrangements of older Malaysians: who coresides with their children? Demography 31(1):95–113

Frankenberg E, Kuhn R (2003) The implications of family systems and economic context for intergenerational transfers in Indonesia and Bangladesh. Institute of Behavioral Science Working Paper No. PAC2003-0003. University of Colorado at Boulder, Boulder

Frankenberg E, Beard V, Saputra M (1999) The kindred spirit: the ties that bind Indonesian children and their parents. Southeast Asian J Soc Sci 27(2):65–86

Frankenberg E, Chan A, Ofstedal MB (2002a) Stability and change in living arrangements in Indonesia, Singapore, and Taiwan, 1939–99. Popul Stud 56:201–213

Frankenberg E, Lillard L, Willis R (2002b) Patterns of intergenerational transfers in Southeast Asia. J Marriage Fam 64(3):627–641

Friedman J, Knodel J, Cuong BT, Anh TS (2003) Gender dimensions of support for the elderly in Vietnam. Res Aging 25(6):587–630

Hermalin A (2000) Ageing in Asia: facing the crossroads. Comparative study of the elderly in Asia research report no. 00-55. Population Studies Center, University of Michigan, Ann Arbor

Hermalin A (ed) (2002) The well-being of the elderly in Asia: a four country comparative study. University of Michigan Press, Ann Arbor

Hoddinott J (1992) Rotten kids or manipulative parents: are children old age security in western Kenya? Econ Dev Cult Change 40:545–566

Hoerger T, Picone G, Sloan F (1996) Public subsidies, private provision of care and living arrangements of the elderly. Rev Econ Stat 78(3):428–440

Holtz-Eakin D, Joulfaian D, Rosen HS (1993) The Carnegie conjecture: some empirical evidence. Q J Econ 108(2):413–435

Hugo G (2000) Lansia—elderly people in Indonesia at the turn of the century. In: Phillips D (ed) Ageing in the Asia-Pacific region: issues, policies and future trends. Routledge, London

Jensen R (2004) Do private transfers 'displace' the benefits of public transfers? Evidence from South Africa. J Pub Econ 88(1–2):89–112

Joulfaian D, Wilhelm MO (1994) Inheritance and labor supply. J Hum Resour 29(4):1205–1234

Khemani S (1999) Inter-generational transfers and intra-household bargaining: evidence from Indonesia. In: Khemani S (ed) Empirical studies in public economics in developing countries. Ph.D. thesis, Department of Economics, MIT, Cambridge

Knowles J, Anker R (1981) An analysis of income transfers in a developing country: the case of Kenya. J Dev Econ 8(2):205–226

Kochar A (1999) Evaluating familial support for the elderly: the intra-household allocation of medical expenditures in rural Pakistan. Econ Dev Cult Change 47(3):620–656

Kochar A (2000) Parental benefits from intergenerational coresidence: empirical evidence from rural Pakistan. J Polit Econ 108(6):1184–1209

Lee YJ, Parish W, Willis R (1994) Sons, daughters, and intergenerational support in Taiwan. Am J Sociol 99:1010–1041

Lillard L, Willis R (1997) Motives for intergenerational transfers: evidence from Malaysia. Demography 34(1):115–134

Lucas R, Stark O (1985) Motivations to remit: evidence from Botswana. J Polit Econ 93(5):901–918

Martin L (1989) Living arrangements of the elderly in Fiji, Korea, Malaysia and the Philippines. Demography 26:627–644

McGarry K, Schoeni R (1995) Transfer behavior in the health and retirement study: measurement and the redistribution of resources within the family. J Hum Resour 30(5):S186–S226

Mete C, Schultz TP (2002) Health and labor force participation of the elderly in Taiwan. Discussion Paper No. 846:1–46. Yale University Economic Growth Center, New Haven

Niehof A (1995) Ageing and the elderly in Indonesia: identifying the key issues. Bijdr Taal Land Volkenkd 151(3):422–437

Pezzin L, Schone B (1997) The allocation of resources in intergenerational households: adult children and their elderly parents. AEA Papers and Proceedings. Am Econ Rev 87(2):460–464

Pezzin L, Schone B (1999) Intergenerational household formation, female labor supply and informal caregiving: a bargaining approach. J Hum Resour 34(3):475–503

Ravallion M, Dearden L (1988) Social security in a 'moral economy': an empirical analysis for Java. Rev Econ Stat 70:36–44

Rosenzweig M, Wolpin K (1993) Intergenerational support and the life-cycle incomes of young men and their parents: human capital investments, coresidence, and intergenerational transfers. J Labor Econ 11(1):84–112

Secondi G (1997) Private monetary transfers in rural China. Are families altruistic? J Dev Stud 33 (4):487–511

World Bank (1995) The world development report. A World Bank publication. Oxford University Press, New York