Towson University
Department of Economics
Working Paper Series

Working Paper No. 2009-01

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http://www.towson.edu/econ/workingpapers/2009-01.pdf

October 5, 2009

Transfers and Labor Market Behavior of the Elderly in Developing Countries:

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28th August 2009

Abstract

In this paper we argue that the strategic interaction between the labor supply decision of the elderly and private transfers from their children lowers the opportunity cost of leisure of the elderly. This in turn magnifies the crowding-out effect of public pensions on the labor supply of the elderly. We show that this mechanism has implications for evaluating the crowding-out effect of public pensions in developing countries. That is, a misspecified econometric model that does not control for the endogeneity of private transfers leads to a biased estimate of the crowding-out effect of public pensions. Using data from a household survey in Vietnam we find that the effect of public pensions on the probability of retirement is 2.5 times larger when explicitly accounting for the interaction between private transfers and the labor supply decision of elderly individuals.

JEL Classification: H31, H55, I38, J14, J22, J28

Keywords: Altruism, Crowding-out, Social Security, Retirement, Transfers.

*We would like to thank Gerhard Glomm, Kim Huynh, Michael Kaganovich, Willard E. Witte, Pravin K. Trivedi, and two anonymous referees for many helpful discussions and suggestions. All remaining errors are ours.

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1 Introduction

Elderly individuals in developing countries are exposed to a high degree of income risk due to underdeveloped institutionalized risk-sharing mechanisms like public social security or private annuity markets. The elderly therefore rely to a large extent on support from their family. It is widely observed that substantial sums are being transferred from children to elderly parents in developing countries (compare table 1). Young workers who move into urban areas or even abroad send remittances back to their parents who generally stay in the rural areas where they grew up (e.g. Cox and Jimenez (2006), Cox (2004) and World-Bank (1994)). However, the family support system provides only partial insurance against longevity risk as it fails to pool risk efficiently across different families. It is therefore very vulnerable to economic and social changes like recessions, migration and population aging. As a consequence, many of the elderly who do not have sufficient funds and support from their family continue to work as long as they are physically capable which has been referred to as "ceaseless toil" in the development literature. There is evidence that large numbers of people are working at very high ages in developing countries such as Indonesia (McKee (2006)) and Vietnam (see figure 1).

The failure of the private sector in providing adequate social insurance in developing countries creates demand for government run programs to protect people at older ages from income risk. Recently, several developing countries have reformed their social security systems and extended the coverage of public transfer programs to include uncovered elderly workers. In addition, it is reported that a growing number of developing countries consider instituting similar programs (compare ILO (2002) and Palacious and Sluchynsky (2006)).

The effects of the introduction of a publicly provided insurance program depend crucially on how the elderly adjust their funding from other sources of income like private transfers, labor income and savings. A large body of literature documents the crowding-out effects of public transfer programs in dynamic general equilibrium models (e.g. see Diamond (1965), Barro (1974), Becker (1974), Auerbach and Kotlikoff (1987), Imrohoroglu, Imrohoroglu and Joines (1999), Fuster (1999), and more recently Fuster, Imrohoroglu and Imrohoroglu (2007) and Jung and Tran (2007)). A particular branch of the empirical literature examines the crowding-out effects of public transfers in the context of developing countries. Cox and Jimenez (1992), Cox and Jimenez (1995) and Jensen (2003) report that public transfers crowd out private transfers in Peru, the Philippines and South Africa. Filho (2004) finds evidence that public pension programs crowd out labor supply of the elderly in Brazil. There is also a strand of literature that analyzes the relationship between private transfers and labor supply of the elderly. Cameron and Cobb-Clark (2001, 2002, 2008) study to what extent cash transfers within

the family and living arrangements influence the labor market behavior of elderly Indonesian men and find only a weak influence.

Even though the pairwise relationships between public transfers and private transfers, public transfers and labor supply, and private transfers and labor supply have been studied in the empirical literature on developing countries, the dynamics between all three, public transfers, private transfers and labor supply are usually neglected. To our knowledge McKee (2006) is the first attempt to study public transfers, family support and labor supply of the elderly together in a dynamic framework. He finds that family support and public pension benefits have significant effects on the labor market behavior of older men in Indonesia, which contradicts the findings of Cameron and Cobb-Clark.

Very little is known about the role of these interactions and their implication for evaluating the effects of public transfers on the labor market decision of the elderly in developing countries. Part of the problem is an unawareness of the importance of these interactions in the empirical literature on developing countries. The more limiting factor though is the lack of adequate data that would allow for studying these dynamic interactions. Very few data sets contain information about public transfers, private transfers, and labor supply.

This paper makes two key contributions to the literature. First, we use a simple model to demonstrate the interactions between private transfers and labor market behavior of the elderly. We show that these interactions lower the opportunity cost of not working and therefore magnify the wealth effect on demand for leisure. Consequently, the interaction between private transfers and the labor market decision of the elderly magnifies the crowding-out effects of public transfers on the labor supply (or retirement choice) of the elderly. The economic intuition is as follows. As young individuals observe that their old parents are still healthy and able to work, they transfer less to their parents. On the other hand, the elderly know that their labor supply decision will affect the amount of transfers they will be able to receive from their children. By working longer, the elderly individual can increase her labor earnings but loses not only forgone leisure time but also parts of the private transfers from their children. In this environment children actually pay for part of the cost of the parent's leisure, so that the opportunity cost of not working is lower for the elderly who factor this in. In such an environment, the crowding-out effect of public transfers on the labor supply of the elderly will be larger. Our theoretical conjecture has an implication for empirical studies on public transfers and labor supply of the elderly in developing countries. That is, the dynamics of private transfers and labor supply of the elderly lead to endogeneity of private transfers in the data. If this endogeneity is not correctly controlled for, then the effects of public transfers on the labor supply of the elderly will be under-estimated.

Second, we find empirical evidence that is consistent with our theoretical prediction by estimating two separate models: *Model* 1 which ignores the endogeneity of private transfers in the retirement decision of the elderly and *Model* 2 which fully accounts for the endogeneity issue. Using data from the Vietnam Living Standard Survey in 1998, we provide estimates of the crowding out effects of public transfers (i.e. pensions) on the retirement behavior of the elderly. The model that does not control for the endogeneity of private transfers (*Model* 1) severely underestimates the crowding out effects of public transfers on the retirement behavior of the elderly. When fully accounting for the endogeneity of private transfers (*Model* 2), the marginal effect of public pensions on retirement is about 2.5 times larger than the marginal effect found in *Model* 1. More specifically we show that an increase in public pension income by 100 dollars annually increases the probability to retire by 6 percent. In addition, we find evidence for private transfers crowding out labor supply.

The paper is organized as follows. In section 2 we provide an overview of the sources of income of the elderly and present some important facts about transfers and labor market behavior of the elderly in Vietnam. In section 3 we develop a theoretical framework to analyze the interaction between private transfers and labor supply of the elderly. In section 4 we present an econometric model of retirement and specify our estimation strategy. Empirical results and discussions are presented in this section. We conclude in section 5.

2 Income Sources of the Elderly in Vietnam

2.1 The Social Security System in Vietnam

Before 1995 the social security system of Vietnam consisted of two main parts, a pension program and a health care program. The Ministry of Finance was responsible for collecting contributions and making payments to the social security agency which in turn made the payments to beneficiaries. The Ministry of Health was responsible for providing free health care to all citizens. The pension system was designed for employees in the public sector which included state owned enterprises and the military. The contribution rates were around 4.7 percent of basis wages. The social security system ran a high deficit. Benefit payments relied mainly on subsidies from the general government budget, which accounted for around 80 percent of annual social security payments.

After 1995 social security has been reformed in order to make it more sustainable and to meet the increasing needs of workers in the private sector. The new laws including the Labor Code, the Cooperatives Law, Regulations on Social Insurance, and Regulations on Social Insurance for Armed Forces and Public Security Personnel had been issued between 1994 and

1996 in order to provide a legal framework for establishing a new social security system that is aimed at gradually extending coverage to workers in the private sector. According to the reform, the social security system in Vietnam is organized into three main components. The first component is social insurance which includes public pensions, public insurance programs for health, unemployment, and disability. The second component contains all transfer payment programs to war veterans and deceased veterans' families and a social difficulty relief program. The last component consists of all social relief programs such as regular social assistance, emergency assistance and starvation relief.

The social security fund was established based on the pay-as-you-go principle and was separated from the government budget operations. Under the new laws, the public pension scheme is mandatory for (*i*) civil servants, i.e. officials of the government, party organizations, and the armed forces; (*ii*) employees of state-owned enterprises (SOEs); and (*iii*) employees of private enterprises with ten or more employees. Employers contribute 10 percent of their payroll and employees contribute 5 percent of their monthly basic wage for pensions and survivor benefits.

Retirement pensions are not means tested and usually paid to men and women at the age of 60 and 55, respectively, with at least 20 years of contributions. The benefit formula is determined by a base earnings rate and a replacement rate. Base earnings is defined as the average monthly basic salary over the last five years before retirement. The replacement rate is calculated by accumulating 3 percent for the first fifteen years, and 2 percent thereafter, or minus 1 percent for each year of early retirement. The maximum replacement rate is 75 percent. The other pensioners, i.e. the survivors, the injured and the disabled are paid when they meet certain criteria. All kinds of pensions are adjusted to the statutory wage (or minimum wage), and the minimum pension is equivalent to the minimum wage.

The coverage rate of the public pension scheme is low. According to Vietnam-Social-Insurance (2000), 86 percent of the active contributors are public sector workers, who make up only 10 percent of the labor force, while the rest, 14 percent, are private sector workers, who account for 90 percent of the labor force. The coverage is almost universal in the public sector (95 percent for civil servants and 93 percent for employees in SOEs).

2.2 Public vs. Private Transfers

The coverage of the social security system is relatively low compared to that of the family support system. Since pension coverage is not universal, it is not surprising that only a small fraction of the elderly population receives a pension. Table 1 summarizes public and private transfers to a representative sample of Vietnamese households based on the Vietnam Living

Standard Survey 1998.

The number of households receiving inter-household private transfers is much larger than the number receiving public transfers. About 26.3 percent of the elderly received financial support from children and relatives whereas only about 11.6 percent of the elderly received public pension payments. On the other hand, the size of public transfers is larger than that of private transfers. The average public transfer is roughly 1.4 times larger than the average private transfer. The amount of both public and private transfers increases with age.

In contrast to developed countries where public transfers dominate private family transfers as a source of income of the elderly, the data from Vietnam tell a different story. From figure 2 we see that the fraction of elderly receiving public transfers decreases with age. As a whole public pensions are not a major source of income for many elderly individuals and are therefore less likely to be a key determinant of the retirement decision in Vietnam. Second, there is a positive correlation between retirement and private transfers. The fraction of the elderly receiving private transfers increases over age and so does the fraction of retirees. Private transfers are a substantial source of income for the elderly. Finally, there is a strong negative correlation between public and private transfers (crowding out). The fraction of elderly individuals receiving private transfers increases with age while the fraction receiving public transfers decreases. Households are substituting missing public transfers with private transfers from within their family.

2.3 Labor Supply of the Elderly

Only a third of the elderly population receives support from either the government or their family in the form of either public or private transfers. The other two thirds of the elderly population rely on their own savings and labor earnings. Since income is low and financial markets are not well developed in Vietnam, income from savings in limited. Labor earnings are therefore the most important source of income for the elderly.

The overall picture of labor market behavior in Vietnam is described in figure 1. Individuals in the age 30 to age 40 bracket are the most active group in the labor force. As expected, the Vietnamese population participates in the labor force until very high ages. Figure 2 and table 2 summarize the labor market behavior of the elderly in Vietnam. Overall, only 49.6 percent of the Vietnamese elderly choose to retire at mandatory retirement ages. The retirement rate increases quickly with age. Particularly, the retirement rate rises from 36.4 percent at the age of $60-64$ to 72.2 percent at the age of $75-80$. It is striking that almost 37 percent of the elderly at age 70 and above cannot afford to retire and remain in the labor force.[1] This confirms

[1] In 2002 life expectancy in Vietnam at birth was 69/74 years respectively for men and women. (source:

that for many individuals labor earnings are the main source of income at higher ages. There are several reasons why an elderly individual does not retire. First, the individual may not be eligible to receive a public pension. Second, public pensions are not means-tested so that many of the public pensioners with minimum pensions remain in the labor force. Third, family transfers may be absent or not enough to cover the cost of living. The retirement decisions also differ by gender as women retire much earlier than men.

3 Theoretical Framework

3.1 A Simple Model

In this section, we develop a simple model to explain the relationship between public pensions, private transfers, and labor supply of the elderly in Vietnam. We consider a static model with two agents: a child and a parent in a partial equilibrium environment.

The Child. The child is altruistic towards the parent and values the parent's leisure.[2] The child supplies one unit of labor inelastically, chooses her consumption c^c, and the amount of funds T to be transferred to the parent. The agent maximizes

$$\begin{aligned} & \max_{c^c, T} \ \{\ln c^c + \theta \ln l^p(T)\} \\ & s.t. \\ c^c + T &= wh^c, \end{aligned} \tag{1}$$

where the parent's reaction function is assumed to be linear

$$l^p(T) = a_0 + a_1 T, \tag{2}$$

with $a_0, a_1 > 0$. These conditions ensure that as the child transfers more funds to the parent, the parent can enjoy more leisure time. Variable c^c is the child's consumption, l^p is the parent's leisure, and $\theta \geq 0$ is an altruism parameter that determines the extent to which the child cares about the parent. The child knows that she cannot directly control the parent's consumption and leisure but she can indirectly affect her parent's leisure via transfers T. We assume one-sided altruism towards the parent so that private transfers are non-negative. In order to keep the model simple we do not model the cohabitation decision of parents with their children.[3]

http://www.who.int/countries/vnm/en/)

[2] Alternative explanations for why children give transfers to their parents could be based on service exchange models. However, we do not observe the service flows within households in our data, so that we simplify our analysis using the pure altruism assumption. We discuss in implications of this assumption in section 4.4.

[3] We do provide robustness checks for our results with respect to the likely endogeneity of the cohabitation

The Parent. The parent derives utility from consumption and leisure. The parent receives public transfers from the government (a pension) and private transfers from the child. The agent chooses consumption and leisure to solve

$$\begin{aligned} & \max_{c^p, l^p} \ \{\ln c^p + \kappa \ln l^p\} \\ & s.t. \\ c^p &= y + wh^p(1 - l^p) + G + T, \\ 0 &< l^p \leq 1, \end{aligned} \tag{3}$$

where c^p is consumption, l^p is leisure, κ is a weight on the parent's utility from leisure, w is the market wage rate, y is non-labor income including investment income and within-household transfers, G are government transfers, and T are private transfers from the agent's child.

In addition, the parent can take the following transfer rule into account,

$$T = T\left[l^p\right]. \tag{4}$$

By appropriately choosing the amount of leisure, the parent can influence the amount of transfers received from her children.[4] We assume that w, y and G are exogenously given to the parent. We abstract from within-household transfers that are part of income y and that might be responsive to c^p and l^p. T is endogenously determined when the parent optimally decides consumption and leisure.

3.2 Optimal Allocation, Interactions and the Effects of Public Transfers

The child's supply of (private) transfers. Solving the child's problem yields the child's consumption as a function of the parent's consumption $c^c = \frac{c^p}{\theta a_1}$ and the child's transfer reaction function becomes

$$T\left[l^p\right] = wh^c - \frac{l^p}{(\theta a_1)}. \tag{5}$$

The first derivative $\frac{\partial T[l^p]}{\partial l^p} = -\left(\theta a_1\right)^{-1}$ measures how strongly the child responds to a change in the parent's leisure choice. Whenever $a_1 > 0$ then $\frac{\partial T[l^p]}{\partial l^p} < 0$ and there is a negative relationship between the child's transfer and the parent's leisure choice (*endogenous private transfers*). The logic behind assumption $a_1 > 0$ is that the child's decision on transfers is responsive to the parent's leisure choice. The child tends to transfer less (or more) if the parent

decision in section 4.5.

[4] On can interpret these two scenarious as either a Stackelberg leader-follower game when transfers are treated as exogenous or a simultaneous Nash game when transfers are treated as endogenous.

increases (decreases) the consumption of leisure. When $(\theta a_1)^{-1} = 0$, then $\frac{\partial T[l^p]}{\partial l^p} = 0$ and the child's transfer is independent of the parent's leisure choice (*exogenous private transfers*).

The parent's demand for leisure. When private transfers are treated as endogenous the optimal decision rules for consumption and leisure are

$$c^p[T] = \frac{1}{1+(1+\kappa)\left(1-\frac{\partial T[l^p]}{\partial l^p}\right)}\left(wh^p + y + G + T[l^p]\right) \text{ and} \tag{6}$$

$$l^p[T] = \frac{\frac{\kappa}{wh^p}\left(1-\frac{\partial T[l^p]}{\partial l^p}\right)}{1+(1+\kappa)\left(1-\frac{\partial T[l^p]}{\partial l^p}\right)}\left(y + wh^p + wh^c + G + T[l^p]\right). \tag{7}$$

When private transfers are independent of the parent's choice of leisure, the parent ignores the transfer rule so that $\partial T[l^p]/\partial l^p = 0$ and $T[l^p]$ becomes a constant T.

Interactions and the effects of public transfers. After replacing the derivative $\frac{\partial T[l^p]}{\partial l^p} = -(\theta a_1)^{-1}$ in (7) the equilibrium outcome of the parent's leisure choice and the child's transfers are determined simultaneously by the following system of structural equations

$$l^p[T] = \frac{\frac{\kappa}{wh^p}\left(1+\frac{1}{\theta a_1}\right)}{1+(1+\kappa)\left(1+\frac{1}{\theta a_1}\right)}\left(y + wh^p + G + T[l^p]\right), \tag{8}$$

$$T[l^p] = wh^c - \frac{1}{\theta a_1} l^p[T]. \tag{9}$$

The first equation is derived from the parents optimization problem (3) and describes the determinants of the parent's optimal leisure choice. The parent's demand for leisure is a function of exogenous variables (i.e. the market wage rate, the parent's human capital, income, public transfers) and an endogenous variable (private transfers from children).

The second equation is derived from the child's optimization problem (1) and characterizes the determinants of the child's supply of private transfers. The supply of private transfers is a function of exogenous variables (i.e. the market wage rate, the child's human capital and the parent's human capital) and an endogenous variable (parent's leisure).

Endogenous and exogenous private transfers

Depending on our assumptions on how the parent reacts to transfers from the child, there are two possible cases. First, there is no interaction between leisure and transfers (*exogenous private transfers*). In this case, the child's decision on private transfers is not responsive to the

parent's leisure decision. This implies that the parent cannot manipulate the decision of the child in order to get more transfers so that the parent treats private transfers as exogenously given when deciding on leisure

$$l^p = \frac{\kappa}{(2+\kappa)\, wh^p} \left(y + wh^p + G + T\right). \tag{10}$$

There is a positive relationship between the total amount of public transfers and the optimal amount of leisure due to income effects. A parent will choose a higher level of leisure when she receives more public transfers. This crowding-out effect of public transfers on labor is measured by factor $\frac{\kappa}{(2+\kappa)wh^p}$. Changes in private transfers have similar marginal effects on leisure.

Second, we model the situation with interactions between private transfers from the child and the labor supply of the parent (*endogenous private transfers*). In this case, the parent is fully aware that the child is altruistic and transfers money to support the parent. The rule that the child follows to determine the transfers is known by the parent. The parent takes the transfer rule into account when solving her household maximization problem so that the parent's demand for leisure is now determined by a system of two simultaneous equations (8) and (9) rather than a single equation for leisure (10). The effects of public transfers on the parent's equilibrium level of leisure are now more complex. A change in public transfers results in direct and indirect effects on the demand for leisure. From (8) we see that $\frac{\frac{\kappa}{wh^p}\left(1+\frac{1}{\theta a_1}\right)}{1+(1+\kappa)\left(1+\frac{1}{\theta a_1}\right)}$ captures the direct effect of public transfers, whereas the term $(\theta a_1)^{-1}$ describes the feedback effect of leisure on private transfers. When private transfers are purely exogenous that feedback effect is ignored and the term $\frac{1}{\theta a_1}$ vanishes. The marginal effect then reduces to $\frac{\kappa}{(2+\kappa)wh^p}$ as in equation (10).

Proposition 1 *The marginal effect of the public pension on leisure is larger when the parent treats private transfers as endogenous.*

Proof. Let $g(x) = \frac{\frac{\kappa}{wh^p}x}{1+(1+\kappa)x}$ where $x = \left(1+\frac{1}{\theta a_1}\right)$. Since $\frac{1}{\theta a_1} > 0$ then $x > 0$. Since $\frac{\partial g(x)}{\partial x} = \partial\left(\frac{\frac{\kappa}{wh^p}x}{1+(1+\kappa)x}\right)/\partial x > 0$, then $g(x)$ is an increasing function in $x > 0$. Hence, for every $x > 0$, it is always true that $g(x) > g(0)$. As a result, the following inequality always holds

$$\frac{\frac{\kappa}{wh^p}\left(1+\frac{1}{\theta a_1}\right)}{1+(1+\kappa)\left(1+\frac{1}{\theta a_1}\right)} > \frac{\frac{\kappa}{wh^p}}{2+\kappa}.$$

■

When the child's transfer is endogenous, the price of leisure is lower than when transfers are exogenous. The intuition is simple. The opportunity cost of leisure time of the parent is

forgone labor earnings. Since the child is altruistic, her transfer decision is responsive to the parent's leisure choice. The child will increase transfers to the parent in order to compensate the parent for income losses that the parent experiences when she reduces her labor supply. In this environment, the child actually pays for a part of the cost of the parent's leisure. The parent's opportunity cost of not working when old is lower when private transfers are endogenous rather than exogenous. Consequently, the direct effect of public transfers on the parent's demand for leisure is magnified when there are strategic interactions between private transfers and labor supply.

However, the *total (equilibrium) effect* of public transfers on the demand for leisure depends on how the child's private transfers respond. In our model public and private transfers are linked by the interaction between the parent's consumption and leisure choice and the child's transfers. When the child's transfers are responsive to the parent's consumption and leisure choice, then changes in public transfers subsequently result in changes of private transfers. For example, an increase in public transfers decreases the parent's labor supply and increases the parent's demand for leisure, which in turn reduces private transfers from the child. This link between public transfers and equilibrium private transfers can be obtained by substituting (8) into (9) which results in the following reduced form equation

$$T^* = \frac{\left[1 + (1+\kappa)\left(1 + \frac{1}{\theta a_1}\right)\right]}{(2+\kappa)\left(1 + \frac{1}{\theta a_1}\right)} wh^c - \frac{\left(\frac{1}{\theta a_1}\right)}{(2+\kappa)\left(1 + \frac{1}{\theta a_1}\right)} \left(wh^p + y + G\right). \tag{11}$$

Proposition 2 *Public transfers crowd out private transfers when private transfers are endogenous.*

Proof. *It is easy to see that* $\frac{\partial T^*}{\partial G} < 0$. *Hence, there is a negative relationship between private transfers and public transfers.* ■

Note that when there is no strategic interaction, the crowding out effect disappears as the term $(\theta a_1)^{-1}$ vanishes. This stresses the importance of the interactions between the transfer decision of the child and the labor/leisure decision of the parent when analyzing the effects of public transfers. In this environment, the final effect of public transfers on leisure depends on the responses of the child's private transfers.

Our theoretical results have implications for empirical studies analyzing the crowding-out effects of public transfers on the labor supply of the elderly. In developed countries the flows of private transfers from children to parents are relatively small and therefore do not play a significant role in the labor/leisure choice and the retirement decision of the elderly. It may therefore be justified to ignore the strategic interaction between private transfers and the labor

market behavior of the elderly. However, in developing countries we observe large flows of private transfers within households and across generations. Therefore it becomes important to take the strategic interaction between private transfers and the labor market decision of the elderly into account when evaluating the effects of public transfer programs. Ignoring these interactions will most certainly underestimate the crowding out effects of public transfers.

4 Empirical Investigation

As documented in the literature, the motives for private transfers may not be purely altruistic (e.g. see Hurd (1987), Cox (1987) and Altonji and Kotlikoff (1997)). Private transfers could also be used as a means to secure an inheritance from parents, they could be part of an exchange of services, they could simply be given for the joy of giving, or be part of a social norm or a risk-sharing agreement. In addition, interactions between parents and children and even among children are dynamic rather than static as assumed in our theoretical model. As a consequence, interactions between parent's labor/leisure choice and private transfers are very complex.

However, as long as old agents can act strategically to attract more transfers from their children, private transfers are endogenously determined. The cost of leisure is lower when private transfers are endogenous. As a result, it is necessary to control for endogeneity of private transfers when estimating the effects of public transfers on the labor supply decision of the elderly in developing countries. Otherwise, according to our theoretical prediction these effects would be under-estimated.

This section aims to explore that problem with data from a household survey in Vietnam. We focus on two questions: First, is there any evidence that the interaction between the labor choice of the elderly and inter-household transfers leads to the endogeneity of inter-household transfers received by the aged parents? Second, to what extent are the crowding-out effects of public transfers underestimated when the endogeneity issue is ignored?

4.1 An Empirical Model of Retirement Choice [5]

In this section we develop an empirical model of retirement, based on the simple model in the theory section.[6] We assume that every old agent i has a latent demand for leisure l_i^*

[5] We define *retirement* as an individual who stopped participating in the labor force so that the variable can be interpreted as a direct measure of extensive margin of labor supply. Our variable *retirement* does not stand for the official state of being retired in a labor law context. The latter would depend a lot on the age of the individual and the years of contribution to the pension system.

[6] We first want to concentrate on the retirement choice instead of the labor supply decision as a whole for two reasons. First, we are more interested in how public pensions affect an individual's probability to stop working rather than its effect on them working somewhat less (the "ceaseless toil" problem). Second, the retirement choice option allows us to work with a Probit specification, which is easier to work with in the context of instrumental

that governs the retirement choice. The latent demand is assumed to be a function of public transfers, inter-household private transfers, and income. There is no restriction on the domain of latent demand for leisure and l_i^* could have any value.

On the supply side, however, the supply of leisure time is naturally limited to a maximum of 24 hours per day for 7 days a week. Agents are restricted to consume at most the natural limit $l_i^* \leq \bar{l}$ where $1 - l_i^*$ is the labor supply. When the latent demand for leisure is equal to or greater than the upper time limit, $l_i^* \geq \bar{l}$, then the agent chooses not to work. The upper time limit can be normalized to 0 so that a discrete choice model of retirement is given by

$$Retirement = \begin{cases} 1, \text{ if } l_i^* \geq 0 \\ 0, \text{ otherwise.} \end{cases} \tag{12}$$

As predicted in equation 8, the latent demand for leisure is a function of the parent's labor income, other non-labor income, public transfers, and private transfers. We use the following linear specification:

$$l_i^* = \gamma_o + \gamma_1 T_i + \gamma_2 G_i + \gamma_3 X_i^{cc} + \gamma_4 X_i^p + \gamma_5 X_i^h + \varepsilon_{1,i}, \tag{13}$$

where T_i is the amount of inter-household transfers, G_i is the amount of government transfers, X_i^{cc} is a vector describing characteristics of coresiding children, X_i^p is a vector of characteristics of the parent, X_i^h is a vector of overall characteristics of the household such as type of house and value of durable goods and finally $\varepsilon_{1,i}$ is random error term. Regressors X_i^{cc}, X_i^p and X_i^h are used to control for the elderly's non-labor income and the flow of intra-family transfers as well as other unobservable household state variables. We concentrate on parameters γ_1 and γ_2 that capture the marginal effects of inter-household transfers and public transfers on the individual retirement choice, respectively. Since transfers have positive effects on the elderly's demand for leisure, our theoretical model predicts that the coefficients γ_1 and γ_2 are both positive (compare equation (8)).

As argued in the previous section, once parents act strategically to get more transfers from their children, inter-household private transfers should be treated as an endogenous variable. In this case, the latent demand for leisure (or retirement decision) and inter-household transfers are jointly determined. According to equation (9), private transfers to the parent are a function of the child's income and the parent's income and leisure. Besides, when the elderly has more than one child there might be some strategic interactions among children when deciding the

variables estimation than a selection model a la Heckman. In an extension later, we will also consider a Tobit model of labor supply.

amount of transfers to the elderly parents. To capture this direction of effects we assume that characteristics of coresiding children X_i^{cc} also affect the amount of transfers a parent receives from children outside of the household. These relationships are formulated in the following linear equation of private transfers

$$T_i = \delta_0 + \delta_1 l_i^* + \delta_2 G_i + \delta_3 X_i^{nc} + \delta_4 X_i^{cc} + \delta_5 X_i^p + \delta_6 X_i^h + \varepsilon_{2i}, \tag{14}$$

where X_i^{nc} is a vector of characteristics of the non-coresiding (e.g. human capital and income) and ε_{2i} is a random error term.

From the theoretical model we predict that, first, inter-household transfers are not independent of the demand for leisure (or labor supply) of the parent. Children living outside of the parent's household tend to transfer more to their parent when the parent has less leisure, so that δ_1 is expected to be negative. Second, inter-household transfers are negatively related to the parent's income. Children transfer more when their parent is poor so that δ_2 is expected to be negative. Finally, children tend to transfer more to the parent when they themselves have higher income (income effect) so that δ_3 is expected to be positive.

4.2 Estimation Strategy

Assuming that all regressors are exogenous, the model of retirement can be estimated directly by any standard estimation method. That is, either linear OLS or Probit/Logit models estimated by maximum likelihood yield consistent estimates. However, as argued before, the assumption that inter-household transfers are exogenous is questionable.

Testing for endogeneity. When children's private transfers and the parent's labor supply are jointly determined, then private transfers are no longer exogenous. Endogeneity of inter-household transfers is testable. In our econometric model, if $\varepsilon_{1,i}$ and $\varepsilon_{2,i}$ are correlated, then inter-household transfers T_i are endogenous. We apply the Smith-Blundell test for testing the exogeneity of inter-household private transfers. Under the null hypothesis of the Smith-Blundell test, the model is appropriately specified with all regressors as exogenous. Under the alternative hypothesis, the suspected endogenous variable (inter-household transfers) is expressed as a linear projection of a set of instruments. The residuals obtained from the null hypothesis model are included. If private transfers are exogenous, the residuals should have no explanatory power. The result of the test is presented in section 4.4.

Identification restriction. When private transfers T_i is an endogenous variable, then labor supply of the old l_i^* and private transfers T_i are simultaneously determined by a system

of equations (13) and (14). Since we are interested in isolating the marginal effect of public transfers on the retirement decision of the elderly (crowding out), we need consistent estimates of the structural coefficients of equation (13). We therefore need an instrument for the endogenous variable inter-household transfer T_i. Our identification strategy relies on finding a set of valid instruments that are explanatory variables in equation (14) and can reasonably be excluded from equation (13) .

Instrumental variable strategy. In order to identify the parameters of equation (13) we assume that non-coresiding children can only affect their parent's labor supply decision indirectly by manipulating the amount of inter-household transfers T_i, but that the parent's labor supply decision is otherwise independent of non-coresiding children's characteristics X_t^{nc}. This assumption has also been used in Cameron and Cobb-Clark (2008) to justify a very similar exclusion restriction.

Relying on this assumption, in principle, we could use all characteristics of non-coresiding children X_t^{nc} as our instrumental variables for endogenous transfers T_i. However, this is potentially too strong as some of the characteristics of non-coresiding children are most certainly correlated with a parent's characteristics and are therefore linked directly to the parent's labor supply decision (as opposed to indirectly via private transfers).

We therefore base our choice of instruments among the non-coresiding children's characteristics on the cultural context in Vietnam. Family is very important in Vietnam. If children do not live with their parents there are two important ways to express their altruistic caring for their parents. The first is the number of visits to their elderly parents, especially when a new year comes, and the second is the amount of gifts to parents.[7] The cost associated with each visit include transportation cost, the opportunity cost of time, and money spent on gifts. The transportation and time cost per visit vary and depend on the distance between the children's home and their parent's home. In addition, children can substitute a visit with gifts or cash transfers. Therefore children usually have to consider a trade-off between the number of visits and the amount of gifts or transfers to their parents. If children are not able to visit their parents regularly they send gifts or increase the amount of transfers. We therefore argue that any measure of transportation cost would be a good instrument as it directly affects the size of transfers but is less likely to be confounded with the parental retirement decision otherwise.

In the data we have information on country and province where non-coresiding members live. We use this information to construct our two main instrumental variables: the average distance from non-coresiding members' provincial location to their parent's provincial location and the number of non-coresiding members living abroad. In order to check the robustness

[7] In addition, these are ways to establish social reputation among relatives, friends, and colleagues.

of our instrumental variable choice, we also consider other characteristics of non-coresiding members. We then run a number of statistical tests to argue for the validity and relevance of our instrumental variables.[8]

Instrument validity and relevance

Instrument validity, that is $E[\varepsilon_1|X_t^{nc}] = 0$, can be tested in models with overidentification using a test of overidentifying restrictions. This test is sometimes referred to as overidentifying restrictions (OIR) test, Hansen's test, Sargan's test, and Hansen-Sargan test. The null hypothesis is that the instruments are exogenous or valid. Rejection of the Hansen-Sargan test is interpreted as indication that at least one of the instruments is not valid. If the instruments are valid, then the instrumental variables (IV) estimator is consistent.

Our second concern is about the relevance of the instruments, so that after controlling for the remaining exogenous regressors in (14), the instruments X_t^{nc} still account for significant variation in the endogenous variable T_t. The stronger this relationship, the stronger the identification. If instruments lack in explanatory power they are referred to as weak instruments which can lead to large standard errors and large finite sample biases. We report the commonly used F-statistic for joint significance of the instruments X_t^{nc} in the first-stage regression of the endogenous regressor in equation (15) in the results section. A common target range for the F-statistic is 10. So whenever the F-statistic is smaller than 10, then the instruments are considered weak and cause the above mentioned problem.[9]

Estimation method. We apply a two-stage least square estimation method. Since we have more instrumental variables than endogenous variables we could either drop some instruments and apply an instrumental variables estimator on the just identified model or use the more efficient two-stage least squares (2SLS) estimator that uses all instrumental variables. We follow the second procedure and first regress the endogenous variable T_i on a set of exogenous variables including the above mentioned instrumental variables. To derive this reduced form equation we substitute the latent demand for leisure (13) into the equation of inter-household private transfers (14) which results in the following reduced form equation for private transfers:

$$T_i = \pi_0 + \pi_1 G_i + \pi_2 X_i^{cc} + \pi_3 X_i^{cc} + \pi_4 X_i^p + \pi_5 X_i^h + \widetilde{\varepsilon}_{2,i}, \tag{15}$$

where $\widetilde{\varepsilon}_{2,i} = \delta_1 \varepsilon_{1,i} + \varepsilon_{2,i}$. Private transfers are expressed as a linear combination of exogenous

[8] Note that we were not able to find any exclusion restrictions to identify the structural parameters of the second equation describing inter-houshold private transfers. We can therefore not distinguish between the effects of elderly labor supply and public transfers on the private transfer decision of the children. However, since we concentrate our analysis on the structural parameters of the first equation, this is only a minor issue.

[9] See Stock and Yogo (2005) and the discussion in Cameron and Trivedi (2005).

variables only. The equation of equilibrium transfer (11) provides a theoretical foundation for this regression equation and by assumption, all regressors in the reduced form (15) are exogenous. A standard OLS regression results in consistent estimates.

In the second stage, we replace inter-household transfers T_i with predicted values $\widehat{T}_i$ from the reduced form (15) in estimating the structural equation (13). The model of retirement choice with projected inter-household transfers can then be estimated by either OLS or Probit. We assume that $\varepsilon_{1,i}$ is normally distributed so that we can use a Probit model.[10]

4.3 Data

We use data from the Vietnam Living Standard Survey (VLSS) 1998. The VLSS was conducted in $1997-98$ by the General Statistic Office of Vietnam with technical assistance from the World Bank. The survey sample consists of 6000 representative households. The survey contains information on demographics, employment, income, assets, health status, and transfers. We convert all variables that are measured in terms of local currency into corresponding 1998 US-dollar values.

We concentrate our analysis on elderly individuals older than 55 for women and older than 60 for men but not older than 80 for both genders. The justification for these lower bounds is based on the labor law in Vietnam. According to the labor law, the eligibility age for pension benefits is 55 for women and 60 for men. Public pensioners are allowed to work in the private sector while receiving pension benefits. So, the ages starting from 55 for women and from 60 for men are the critical ages to realistically consider retirement. In addition, we want to avoid any problem with early retirement that makes public pensions endogenous. We rule out completely the case where elderly could manage to increase their retirement pension by delaying their retirement age. The justification for the upper bound stems from the fact that retirement and labor supply choices are not relevant at very high ages anymore. When agents are over the age of 80, they are not physically capable to work anymore so that the marginal cost of leisure is close to zero. As seen in figure 1, the labor force participation rate is almost zero after the age of 80.

Our estimation strategy relies on having information about non-coresident children in the private transfers equation. We therefore need to reduce our sample to individuals who have at least one non-coresiding child which reduces our sample by roughly 500 observations. This restriction, although common in the literature like Cameron and Cobb-Clark (2008), introduces a sample bias that can lead to misspecification problems of our empirical model. In order to verify our results we run a robustness check using an expanded model that treats the coresidence

[10] We refer to this model as *Model* 2 or IV-Probit.

decision as endogenous as well. Finally we exclude individuals with missing variables so that the sample size reduces to 2565 observations (63% are women) who live in 1811 separate households.

Characteristics of non-coresident children X^{nc} : Non-coresiding children are defined as family members not living in the household.[11] The characteristics that we include here are distance to parents, number of non-coresiding children living abroad, and total number of non-coresiding children. To investigate the robustness of our instrumental variables set we also tried other characteristics like educational levels and place of residency (city vs. rural). However, the first three variables have the strongest instrumental variables characteristics (validity and relevance) so that we restrict our IV set to these three.

Pensions G : Our pension measure includes pensions and payments from the social insurance program. The inclusion of the latter raises the issue whether our pension measure is completely exogenous. It is true that some disability insurance payments might be included in our pension variable. However, the fraction of elderly that receive disability pension income is very small. In fact, the majority of the disabled receive other forms of public transfers from different transfer programs. We do not include other public transfers like social assistance payments into our pension variable since those types of payments are likely to be endogenous with respect to an individual's labor supply. In Vietnam only elderly individuals who satisfy certain conditions such as a mandatory retirement age and prespecified years of contribution can receive a pension. Public pensions are not means-tested. In addition, we only focus on elderly who already passed the mandatory retirement age to completely rule out the case that elderly manage their retirement ages to receive more pensions. We therefore think that the assumption that public pensions are exogenous with respect to labor supply is not too strong.

Data on pension payments to each elderly member within a household are not available. We only have data on all types of public transfers to the entire household so that we cannot observe which individual within a household receives a public pension. There are maybe two ways to think about this: (1) If individuals in dual households do not receive a pension (because only their spouse is eligible), then their individual income situation does not change and they are also not likely to change their labor market behavior as much as a direct recipient of a pension would (i.e. their spouse). (2) If individuals in dual households do not receive a pension (because only their spouse is eligible), then their joint income situation with their spouse does change (assuming that the couple shares their income in some way) and they are also likely to

[11] The data is not very specific about whether these members are actually children or other relatives. Since our model does not distinguish between the two categories we continue to refer to this variabe as non-coresident children. We are primarily interested how the endogeneity of private inter-household transfers affects the estimates of the pension coefficient so that the exact family relationship of the sender of the private transfers is not crucial for our analysis.

change their labor market behavior in a similar way as a direct recipient of a pension would (i.e. their spouse).

We follow the conservative assumption and assume that elderly in a household receive an equal share of the total amount of pensions to the household regardless of their gender. That is, we total up all pension income of a household and divide it equally among all elderly members of that household. We think assumption (2) is more plausible in the context of Vietnam where families live very integrated. However, if (1) is the actual situation, then our approach would underestimate the labor supply effect of public pension if we have a large percentage of such individuals in the data.[12]

As pointed out in section 2 roughly 86 percent of pension recipients are public sector workers, the other 14 percent are private sector workers. This will somewhat limit the generalizability of our results as most of the variation in retirement behavior in reaction to public transfers will come from the group of public sector workers.

Private (inter-household) transfers T_p : We define private transfers to an elderly individual from outside the household as the sum of all transfers from non-public sources divided by the number of elderly household members and refer to this variable as inter-household transfers. Data on private transfers is more detailed so that we can track private inter-household transfers to each member of a household. However, private transfers to married couples are assigned randomly to one of the two. Again, we are not interested in the strategic interaction between the elderly members of a household. As private transfers are recorded for the individual but probably given to the entire household (we again assume that funds are shared amongst the elderly members within a household) we again sum up all private transfers that a household receives and divide it equally among its elderly members. Now both transfers (private and public) are assumed to be shared among family members and not just public transfers. We think this is a consistent treatment of transfer payments.

Retirement choice and labor supply of the elderly: The data on retirement choice are constructed as follows. The survey asks whether an individual has worked over the past 12 months, how many hours the individual worked, and if the individual didn't work the survey asks for reasons why. We partition the elderly into two groups, the ones that participate in the labor force and the ones who don't. Some of the elderly do not participate in the labor

[12] Restricting the sample to singleton households is unfortunately not feasible because we find almost no singleton elderly in the sample. Alternatively we could try to identify who in the household receives the public pension by using e.g. health insurance as a proxy. Individuals who have health insurance are more likely to have worked in some formal setting during their active work life and are therefore also more likely to be the direct recipients of public pensions. However, when treating pensions like this we would over-estimate the effects of public pension if explanation (2) was the actual situation.

force because they failed to find a job even though they want to work. These elderly are forced to retire and the data allow us to identify them. There are only nine such individuals in the survey and we therefore remove these individuals from our sample.

Characteristics of parents, coresident children, and other household characteristics X^p, X^{cc}, X^h : Vector X^p includes variables reflecting the main characteristics of the elderly such as the household position, gender, age, marital status, educational attainment, health status, and financial responsibility which is transfers given to members outside of the household.[13]

The vector of main characteristics of coresiding members (X^{cc}) consists of household size, average age, average educational attainment, number of household members older than 80, and number of household members younger than 10. About three quarters of elderly individuals coreside with at least one child.

The vector of main characteristics of the household $\left(X^h\right)$ contains variables of durable goods, housing condition, and place of residence. The vector of main characteristics of non-coresiding members (X^{nc}) includes a measure of the average distance to their parents' house, the number of non-coresiding members living abroad, and the number of non-coresiding members.

For some of our robustness checks we also include subsets of the following characteristics of non-coresiding children: average age, average educational attainment, and the number of non-coresiding members living in big cities. A full list and the definitions of all variables are presented in table 3. Summary statistics are reported in table 4.

4.4 Empirical Results

Endogeneity of inter-household transfers

The Smith-Blundell test statistic for exogeneity of private transfers T_i is 2.815717 with a P-value of .0933. We also conduct regression test and Durbin-Wu-Hausman test. Our test results rejects exogeneity of the inter-household transfer variable. It is therefore necessary to control for the endogeneity of inter-household transfers when estimating the effects of public and inter-household transfers on retirement choice.

Instrument validity and relevance

We present results from the first stage regression of the IV-Probit model in table 5. We see that the instruments (the last three variables at the bottom of the table) are highly correlated with the endogenous variable private transfers T_i. The Sargan overidentification test indicates

[13] The frequency of parental transfers to non-coresiding children is smaller than the frequency of transfers from non-coresiding children to their parents. We do not model the possible interaction of these two different types of transfers, but simply concentrate on the children's transfers to the parents.

that the instruments are uncorrelated with the error terms and therefore valid instruments. The P-value of the test is 0.8233 so that we cannot reject the null hypothesis of exogeneity of our instruments.[14] The test statistic of the Cragg-Donald Wald F-test for weak instruments (Cragg and Donald (1993)) is 11.69 and is therefore exceeding the usual benchmark of 10. The test therefore indicates that the instruments are not likely to be weak.[15] We take these test results as well as the results from the first stage regression as indicators that our instrumental variables are reasonable.

Determinants of private transfers

It is likely that children would target transfers to their parents depending on the nature of a possible income loss of an elderly parent. A child might be more susceptible to send money if the reason for the parent's low income is "external" (e.g. no pension eligibility or low public pensions) rather than "self-inflicted" (e.g. the parent decides to stop working to enjoy leisure). However, from the first stage regression (reduced form) we cannot distinguish between these effects since leisure is substituted out. We therefore have to concentrate on the reduced form effects of the exogenous regressors.

We see that children are sending smaller transfers to their parents if the number of members residing in the household is large. This could be an indicator for intra-household transfers being a substitute (or crowding out) inter-household transfers. Parents with poor health receive more transfers as do parents with higher wealth (measured in durable goods). In addition, the three instrumental variables, distance between non-coresident members (ncm) and parents, number of ncm living abroad, and number of ncm are highly predictive of private transfers. We discussed the socioeconomic reason for this phenomenon in the section on instrumental variables above.

Retirement choice

We estimate the model of retirement choice with two methods. First, we estimate the retirement choice model using a standard Probit model, treating inter-household transfers as exogenous ($Model$ 1). We then estimate the retirement choice model using the IV-Probit estimation method, treating inter-household transfer as an endogenous variable ($Model$ 2). The estimation results are reported in table 6. The estimates of the marginal effects of $Model$ 1 and 2 are reported in columns 1 and 2, respectively.

The estimates of inter-household transfers and pensions are positive and significant under

[14] We actually report the Hansen J-test which is a generalization of the Sargan test. The Hansen test becomes the Sargan test under conditional homoskedasticity.

[15] Stock and Yogo (2005) report critical values for the Cragg-Donald statistic for the presence of weak instruments based on two-stage least squares bias. Critical values are $13.91, 9.08, 6.46$ and 5.39 for the $5\%, 10\%, 20\%$ and 30% bias respectively. If the Cragg-Donald statistics is less than the critical value then the instruments are weak.

both approaches. The positive signs of the coefficients of pension and inter-household transfer variables are consistent with the crowding-out hypothesis. If the elderly receives more transfers from either public or private sources, she is more likely to withdraw from the labor force.

Interestingly, the magnitudes of the estimates across models differ substantially. The estimate of inter-household transfers using the IV Probit method (*Model* 2) is almost 7 times larger than the estimate from the standard Probit model (*Model* 1). Similarly, the estimate of the pension effect is 2.5 times larger in the IV-Probit model. This result is consistent with our hypothesis that the dynamics of private transfers and labor supply of the elderly play a role in magnifying the crowding-out effect of public transfers on labor supply (compare Proposition 1). Our result implies that when not appropriately controlling for the endogeneity of inter-household transfers, the effects of both public and private transfers are significantly underestimated. In other words, treating private transfers as exogenous creates a severe downward bias in the estimates for the pension effect and the effect of private transfers.

The coefficients of public and private transfers are not identical. *Model* 1 suggest a very large difference in the magnitude of the effects of private and public transfers on retirement. However, using the IV Probit model (*Model* 2), the effects of private and public transfers are more in line with each other. Specifically the estimates imply that an additional 100 US dollar increase (roughly a quarter of GDP per capita in 1998) in private transfers per year increases the retirement probability by 7 percent while the exact same increase in public pensions only increases the probability of retirement by 6 percent. Since public transfers play a minor role in Vietnam, it is perhaps not surprising that inter-household transfers have slightly larger marginal effects on the retirement decision than public pensions.

The theoretical model in equation (8) predicts identical marginal effects of private and public transfers on the labor supply decision of the elderly. If altruism was an incorrect assumption, the empirical results would reject the result of our theoretical model. As just explained there is only a 1 percent difference between the effect of public and private transfers on the probability of retirement. We therefore think that the altruism assumption in the theoretical model is justified and do not pursue alternative explanations for why children transfer money to their parents (i.e. service exchange models, etc.). However, we do acknowledge that this small difference is also an indication that private transfers are not given for purely altruistic reasons.

Some of the demographic characteristics of the elderly play a role in determining the retirement choice. The elderly who are the head of a household tend to have a longer work life. The elderly whose spouse is alive and coresiding are more likely to work. Health status is another important determinant of retirement choice. The elderly with bad health conditions tend to drop out of the labor force earlier. Human capital seems not to be a key determinant

of retirement choice at higher ages as the coefficient of educational attainment is positive but not significant.

The estimation results indicate that other characteristics of households including the household size, housing condition (shared housing), value of durables, and living areas are also factors that influence the elderly's retirement choice. The elderly in larger households are more likely to retire. Housing conditions and the amount of durables as proxies for asset holdings are important predictors of the retirement choice. The elderly who have to share a house with other households tend to retire late. The values of durables is also positively and significantly correlated with the probability to retire. The elderly living in urban areas, which are higher income areas, are more likely to withdraw from the labor force earlier than the elderly living in rural areas. These results imply that intra-family transfers, which are unobservable but could be inferred from characteristics of other household members, play an important role in determining the elderly's retirement behavior.

We have also implemented an IV-Tobit estimator with hours worked as the dependent variable (the intensive margin of labor supply). We report the results in table 7. We found a similar significant bias (same direction), however it is smaller in magnitude. The latter is probably reflecting the gradual change of the measure for the intensive margin of labor supply as opposed to the discrete change (or jump) of the extensive margin of our earlier result.

4.5 Robustness

Public pensions and coresidence

The core part of our empirical analysis is to find a set of instruments to correct for the bias when estimating the effects of public pensions. We base our choice of instrumental variables on previous literature, the cultural context of Vietnam, and standard statistical tests for instrumental variables. A potential limitation of our approach is that the coresidence decision could also be endogenous in which case our model would be misspecified.

The literature has identified two effects describing the interaction between pensions and the coresidence decision. First, once parents are eligible to receive a public pension, their adult children are free to move out and can start their own households, since their parents no longer rely on their support (*moving-out effect).* On the other hand, children may decide to keep living in their parents' household in order to share resources, especially when the parents have stable pension income (*moving-in effect).* The interplay between these two effects will determine the residency decision within households. Edmond and Miller (2005) find empirical evidence for an inverse hump-shaped coresidence status along the age dimension for South Africa.[16]

[16] We would like to thank an anonymous referee for pointing this fact out.

To determine the impact of the pension on the likelihood of having a non-coresident member in Vietnam, we first consider a simple discrete choice model of child coresidence. If an elderly individual has at least one family member not living in their household, we assume that children have migrated and a non-coresidence indicator variable is set to 1, otherwise 0. Specifically, we have

$$\text{Non-coresidence} = \begin{cases} 1 \text{ if } nc_i^* > 0, \\ 0 \text{ otherwise,} \end{cases}$$

where nc_i^* is the number of non-coresiding children. The empirical model of the reduced form is therefore

$$nc_i^* = \eta_o + \eta_1 G_i + \eta_2 X_i^{cc} + \eta_3 X_i^p + \eta_4 X_i^h + \eta_5 hprice_c + \widetilde{\varepsilon}_{3,i}, \tag{16}$$

where G_i is a public pension, and X_i^{cc}, X_i^p, and X_i^h are vectors describing characteristics of coresident members, of parents, and of the household in general. Error $\widetilde{\varepsilon}_{3,i}$ is a composite of the structural error terms $\varepsilon_1, \varepsilon_2$, and ε_3 from a system of structural equations that we will discuss in the next section. The additional variable $hprice_c$ is a measure of local housing prices, which is included to capture the cost of moving out.[17]

We are interested in the reduced form coefficient of public transfers η_1. If η_1 is positive (negative) then public pensions have a positive (negative) effect on the likelihood of having a non-coresident member. We estimate this model and present results in table 8. We find that the estimate of η_1 is negative, which indicates that the *"moving-in effect"* is dominant, but not statistically significant. From the reduced form we find that there is no significant evidence that public pensions influence children's migration decision. However, this could again mean that the endogenous private transfers could cause a downward bias. We therefore analyze a fuller specification in the next section.

Endogeneity of coresidence and public pension

Our main result earlier was that when estimating the effect of pensions on the retirement choice, we find no significant effect. However, after we control for the endogenous private transfer decision, pensions do have a significant effect on the retirement choice. So we identified a downward bias in the specification that ignores the endogeneity problem. We only used households with children living on their own in order to identify that model. We now ask whether we have created a similar bias by having treated the coresidence decision as exogenous?

To verify whether our earlier result is still valid once we also account for the endogeneity of the coresidence decision, we extend our model and analyze the joint decision of retirement,

[17] The local housing price is computed from average dwelling price per square meter for each village.

private transfers and coresidence. We modify equation (13) and include the coresidence decision

$$l_i^* = \omega_o + \omega_1 T_i + \omega_2 G_i + \omega_3 nc_i^* + \omega_4 X_i^{cc} + \omega_5 X_i^p + \omega_6 X_i^h + \widetilde{\varepsilon}_{1,i}. \tag{17}$$

Ideally, we want to estimate a system of three structural equations with three endogenous variables: retirement, private transfers and coresidence. However, in order to identify the structural parameters of the entire system of equations, we would need additional exclusion restrictions, which we could not find. Instead, we consider a system of three equations (17), (15), and (16), where only the first equation (17) is structural and the second and third are reduced form. We refer to this specification as *Model* 3. Since our analysis is concentrated on the structural parameters of the retirement choice we are not interested in identifying the structural parameters of the private transfer or the coresidence equation. The structural parameters of the retirement equation are identified because the model has enough exclusion restrictions. That is, characteristics of non-coresident members X^{nc} and local housing price $hprice_c$ do not appear in the first equation.

Our strategy to determine the role of the coresidence decision is as follows. If coresidence is really endogenous and its interactions with private transfers and retirement are important, then the estimate of the effect of public pensions on the retirement choice will be biased and should therefore vary significantly between a model with exogenous coresidence and a model with endogenous coresidence. We therefore first estimate the Probit model of retirement with endogenous private transfers and exogenous coresidence (*Model* 2). Then, we estimate the Probit model of retirement with endogenous private transfers and endogenous coresidence, that is a Probit model with two endogenous regressors (*Model* 3). We use characteristics of non-coresident members X^{nc} as instruments for private transfers and local housing price $hprice_c$ as an instrument for coresidence. We conduct tests of relevance and validity and find that our instrument variables are valid and relevant. We then follow a two step procedure to estimate the model. We present our estimation results in table 9.

Our estimation results suggest that not including the coresidence decision as endogenous variable creates a downward bias on the estimates of the pension coefficient similar to not including the private transfers as endogenous variables in our earlier result. However, the bias is extremely small. The reason is that the coresidency is not strongly correlated with the error term of the first equation and the estimate of the coresidence coefficient is not significant. We conclude that endogeneity of coresidence is not an issue in our model and that our previous results are robust.

The just described two-step procedure is, admittedly, an ad hoc method to test whether the

potential endogeneity of the coresidence decision is a factor in our model. We therefore check the robustness of this result using a maximum likelihood procedure that allows us to estimate the entire model of one structural and two reduced form equations simultaneously.[18] We now consider the following model

$$
\begin{aligned}
l_i^* &= \gamma_o + \gamma_1 T_i + \gamma_2 G_i + \gamma_3 nc_i^* + \gamma_4 X_i^{cc} + \gamma_5 X_i^p + \gamma_6 X_i^h + u_{1,i}, && (18)\\
T_i &= \max\left\{0, \pi_0 + \pi_1 G_i + \pi_2 X_i^{cc} + \pi_3 X_i^{nc} + \pi_4 X_i^p + \pi_5 X_i^h + u_{2,i}\right\}, && (19)\\
nc_i^* &= \beta_o + \beta_1 G_i + \beta_2 X_i^{cc} + \beta_3 X_i^p + \beta_4 X_i^h + \beta_5 hprice_c + u_{3,i}. && (20)
\end{aligned}
$$

The first equation is a Probit model of the elderly's retirement choice. The second equation is a Tobit model of inter-household transfers. The third equation is again a Probit model of coresidence. Ideally, we want to estimate our original system so that our results are comparable. However, the aML maximum likelihood procedure does not work well with linear regression models so our original system with a linear model of private transfers exhibits very poor convergence. To avoid convergence problems we instead use the Tobit model in the second equation. The downside with Tobit is that we have to impose a stronger assumption on the error term. We assume that the error terms of the new system follow a trivariate normal distribution such that

$$
\begin{pmatrix} u_1 \\ u_2 \\ u_3 \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho_{u_1u_2}\sigma_{u_2} & \rho_{u_1u_3}\sigma_{u_3} \\ \rho_{u_1u_2}\sigma_{u_2} & \sigma_{u_2}^2 & \rho_{u_2u_3}\sigma_{u_3} \\ \rho_{u_1u_3}\sigma_{u_3} & \rho_{u_2u_3}\sigma_{u_3} & \sigma_{u_3} \end{pmatrix}\right].
$$

We first estimate the model with exogenous coresidence (a two equation system consisting of (18) and (19)) using a maximum likelihood estimator. Then, we estimate the model with three equations and include coresidence as additional endogenous variable using equation (20). We present the estimation results in table 10.[19] We find that not including the coresidence decision as endogenous variable creates a downward bias on the estimates of the pension coefficient similar to not including the private transfers as endogenous variables in our earlier result. However, the bias is small and not statistically significant. We therefore believe that our results based on the IV-estimation on the skewed sample of households with non-coresident members are valid.

[18] Cameron and Cobb-Clark (2008) use a very similar technique. We use the aML software package to estimate the model. See Lillard and Panis (2003) for more details on this estimation method.

[19] Marginal effects can be approximated by dividing the coefficient estimates in table 10 by 2.5 (see (Cameron and Trivedi, 2005, p. 473)). Also, we abstain from comparing the results from the IV-Probit from the earlier section directly with the results from the ML estimates from the three equation system, as that model framework requires different assumptions on the variables and the error structure. Using the same estimation framework and the same equation setup in the comparison of the 2 vs. 3 equation system seems to be more appropriate.

5 Conclusion

In this paper we investigate the role of public pensions on the retirement choice of elderly individuals in developing countries. We investigate this effect in the context of developing countries because the share of private transfers in total household income of the elderly is large. We show how not accounting for the dynamics of private transfers and labor supply of the elderly will lead to a downward bias in the estimated effects of public pensions.

We first present a theoretical model that shows how this downward bias is created and explore the economic mechanisms behind it. That is, interactions between private transfers and labor decisions of the elderly do affect the opportunity cost of leisure and therefore magnify the crowding-out effects of public transfers. This implies that private transfers are endogenous in the data.

Next, we use data from the Vietnam Living Standard Survey 1998 to test our theoretical conjecture. We demonstrate that a model that does not account for the interaction and treats private transfers wrongly as exogenous, will produce much smaller estimates of the effects of public pensions on the retirement choice of the elderly. We show that this downward bias is due to a misspecified econometric model. After we correct for the endogeneity of private transfers using an proper instrumental variables estimator, we show that the downward bias is alleviated and that public pensions have a bigger effect on the retirement choice of elderly people in Vietnam. In addition, we find evidence supporting the hypothesis that public transfers crowd-out the labor supply of the elderly and therefore do affect their retirement choice.

Our results have an important implication for evaluating the effects of public pensions in developing countries. Applied researchers, who do not properly control for the interaction between the labor supply of the elderly and other sources of income such as private transfers, run the risk of severely underestimating the crowding out effects of public transfers.

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6 Appendix A: Solving the Theoretical Model

In this section we provide more details about solving the household problem of the child and the parent.

The Child. The child solves the maximization problem (1) which results in the following Lagrangian

$$L = \frac{(c^c)^{1-\sigma}}{1-\sigma} + \theta \frac{(l^p(T))^{1-\sigma}}{1-\sigma} + \lambda \left(wh^c - c^c - T \right),$$

so that the FOCs after using a linear reaction function for parental leisure (2) become:

$$\begin{aligned} \partial c &: (c^c)^{-\sigma} = \lambda, \\ \partial T &: a_1 \theta (l^p)^{-\sigma} = \lambda, \\ \partial \lambda &: wh^c - c^c - T = 0. \end{aligned}$$

Some algebra results in

$$\begin{aligned} l^p &= (a_1 \theta)^{\frac{1}{\sigma}} c^c, \\ c^c &= \frac{1}{(a_1 \theta)^{\frac{1}{\sigma}}} l^p. \end{aligned}$$

Using the budget constraint we can rewrite private transfers as

$$T = wh^c - (a_1 \theta)^{-\frac{1}{\sigma}} l^p,$$

so that the marginal effect of parental labor supply on the child's transfer is

$$\frac{\partial T}{\partial l^p} = -(a_1 \theta)^{-\frac{1}{\sigma}}.$$

The Parent. The parent maximization problem (3) together with the transfer rule of the child (8) results in the following Lagrangian:

$$L = \frac{(c^p)^{1-\sigma}}{1-\sigma} + \kappa \frac{(l^p)^{1-\sigma}}{1-\sigma} + \lambda \left(y + wh^p + G + T(l^p) - c^p - wh^p l^p \right).$$

The FOCs are

$$\begin{aligned} \partial c^p &: (c^p)^{-\sigma} = \lambda, \\ \partial l^p &: \kappa (l^p)^{-\sigma} = \lambda \left(1 - \frac{\partial T(l^p)}{\partial l^p} \right), \\ \partial \lambda &: c^p + wh^p l^p = y + wh^p + G + T. \end{aligned}$$

Some algebra results in

$$\begin{aligned} l^p &= \left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{1}{\sigma}} c^p, \\ c^p &= \left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{-1}{\sigma}} l^p. \end{aligned}$$

Substituting these expressions back into the budget constraint of the parent we can now solve for consumption and leisure

$$\begin{aligned} c^p &= \frac{1}{1+wh^p\left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{1}{\sigma}}}\left(y+wh^p+G+T\right), \\ l^p &= \frac{\left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{1}{\sigma}}}{1+wh^p\left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{1}{\sigma}}}\left(y+wh^p+G+T\right). \end{aligned}$$

Consumption and leisure are expressed in terms of exogenous variables

Using $T = wh^c - (a_1\theta)^{-\frac{1}{\sigma}} l^p$ from the children's maximization problem in the parent's budget constraint we get

$$\begin{aligned} c^p + wh^p l^p &= y + wh^p + G + \overbrace{wh^c - (a_1\theta)^{-\frac{1}{\sigma}} l^p}^{T} \rightarrow \\ c^p + \left(wh^p + (a_1\theta)^{-\frac{1}{\sigma}}\right) l^p &= y + wh^p + wh^c + G. \end{aligned}$$

Replacing $l^p = \left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{1}{\sigma}} c^p$ and $\frac{\partial T(l^p)}{\partial l^p} = -(a_1\theta)^{-\frac{1}{\sigma}}$ we have

$$c^p = \frac{y + wh^p + wh^c + G}{1+\left(wh^p + (a_1\theta)^{-\frac{1}{\sigma}}\right)\left(\frac{\kappa}{1+(a_1\theta)^{-\frac{1}{\sigma}}}\right)^{\frac{1}{\sigma}}}.$$

Replacing $c^p = \left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{-\frac{1}{\sigma}} l^p$ and $\frac{\partial T(l^p)}{\partial l^p} = -(a_1\theta)^{-\frac{1}{\sigma}}$ in the parent budget constraint we

have

$$\begin{aligned}
\left(\frac{\kappa}{1-\frac{\partial T(l^p)}{\partial l^p}}\right)^{\frac{-1}{\sigma}} l^p + wh^p l^p &= y + wh^p + G + \overbrace{wh^c - (a_1\theta)^{-\frac{1}{\sigma}} l^p}^{T} \rightarrow \\
l^p &= \frac{y + wh^p + wh^c + G}{\left(\frac{1-\frac{\partial T(l^p)}{\partial l^p}}{\kappa}\right)^{\frac{1}{\sigma}} + wh^p + (a_1\theta)^{-\frac{1}{\sigma}}} \rightarrow \\
l^p &= \frac{(y + wh^p + wh^c + G)}{\left(\frac{1+(a_1\theta)^{-\frac{1}{\sigma}}}{\kappa}\right)^{\frac{1}{\sigma}} + wh^p + (a_1\theta)^{-\frac{1}{\sigma}}}.
\end{aligned}$$

7 Appendix B: Tables and Figures

	PRIVATE			PUBLIC		
AGE	Transactions	%	Amount	Transactions	%	Amount
$55-59$	101	23.5%	$ 173.7	64	12.9%	$ 203.9
$60-64$	151	21.2%	$ 189.9	105	14.8%	$ 297.3
$65-69$	181	27.1%	$ 204.6	67	10.0%	$ 305.9
$70-74$	140	31.5%	$ 270.9	42	9.4%	$ 309.6
$75-80$	101	32.5%	$ 283.9	20	6.4%	$ 329.7
Average		26.3%	$ 224.6		11.6%	$ 306.0

Unit: US dollar in 1998

Table 1: Private and public transfers to the elderly in Vietnam 1998.

	MALE			FEMALE			ALL			N
AGE	No	Yes	Yes(%)	No	Yes	Yes(%)	No	Yes	Yes(%)	
$55-59$	0	0		282	147	34.3%	282	147	34.2%	429
$60-64$	225	102	33.2%	228	157	40.8%	453	259	36.4%	712
$65-69$	169	147	46.5%	159	193	54.8%	328	340	50.9%	668
$70-74$	92	96	51.1%	72	185	72.0%	164	281	63.1%	445
$75-80$	42	81	65.9%	30	158	84.04	72	239	72.2%	311
Sum	528	426	44.7%	771	849	52.14	1299	1266	49.4%	2565

Table 2: Retirement by age and gender in Vietnam 1998.

Variables	Definition
Retirement	Dummy variable = 1 if retired, = 0 otherwise
Inter-household transfers	Private transfers received by the elderly
Pension	Public transfers including pensions and other government subsidies
Characteristics of the Elderly (X^p)	
Head	Dummy variable for household head
Female	Dummy for female
Age	Age of the elderly
Age2	Age squared
Marital status	Dummy variable for marital status = 1 if married and = 0 otherwise
Coresiding spouse	Dummy variable = 1 if spouse is alive and a coresident '
Educational attainment	Dummy variable: primary = 1, secondary = 2 , tertiary = 3, and = 0 otherwise
Poor health	Dummy variable = 1 if health condition is poor
Transfers out	Dummy variable =1 if the elderly transfers to household members living outside
Characteristics of Co-residing Members (X^{cc})	
Average Education of others	Average educational achievements of coresiding members
Household size	Number of household members
Number of young	Number of household members younger than 10 years old
Number of old	Number of household members older than 80 years old
Number of unemployment	Number of household members unemployed
Overall Characteristics of Household $\left(X^h\right)$	
Sharing house	Dummy =1 if sharing a house with others
Durable	Money value of key durable goods
Urban	Dummy =1 if living area is urban
Characteristics of Independent Children(X^{nc})	
Average age of non-coresiding members (ncm)	Average age of family members living outside of the elderly's household
Average education of ncm	Average educational attainment of the non-coresiding member
Number of ncm	Total number of family members living outside
Number of ncm living abroad	Number of family members living abroad
Distance	Average measure of distance to parents' household
Number of ncm living in cities	Number of family members living in cities

Table 3: Variable Definitions

Variable	Mean	(Std. Dev.)	Min.	Max.	N
Retirement	0.494	(0.5)	0	1	2565
Inter-household transfer	59.01	(283.166)	0	5499.962	2565
Pension	35.558	(119.663)	0	991.826	2565
Head	0.481	(0.5)	0	1	2565
Female	0.628	(0.483)	0	1	2565
Age	65.939	(6.449)	55	80	2565
Age squared	4389.495	(861.847)	3025	6400	2565
Marital status	0.706	(0.456)	0	1	2565
Co-residing spouse	0.686	(0.464)	0	1	2565
Educational achievement	0.898	(0.77)	0	3	2565
Poor health	0.071	(0.256)	0	1	2565
Transfers out	0.074	(0.263)	0	1	2565
Household size	4.669	(2.126)	2	19	2565
Number of old (> 80)	0.059	(0.251)	0	2	2565
Number of young(< 10)	0.538	(0.908)	0	5	2565
Number of unemployment	0.273	(0.609)	0	5	2565
Average education of others	0.994	(0.867)	0	3	2565
Sharing house with other households	0.913	(0.282)	0	1	2565
Value of durables	697.298	(1211.706)	1.528	18442.441	2565
Regions	5.544	(2.975)	1	10	2565
Income quintiles	3.387	(1.341)	1	5	2565
Number of non-coresiding members(ncm)	4.148	(2.131)	1	12	2565
Average age of ncm	34.505	(6.108)	4	61.5	2565
Average education achievement of ncm	1.72	(1.05)	0	3	2565
Number of ncm living abroad	0.094	(0.433)	0	5	2565
Number of ncm living in cities	0.861	(1.53)	0	12	2565

Table 4: Summary Statistics

	FirstStageOLS
	Coeff/se
Pension	–.089081
	(.088211)
Head of household	30.730678
	(17.159142)
Female	11.211637
	(18.407273)
Age	–3.652346
	(22.705983)
Age squared	.019115
	(.166549)
Married	163.120018
	(100.681156)
Co-residing spouse	–129.147925
	(97.673429)
Level of education	–1.976143
	(10.617527)
Poor health	115.142507**
	(39.291862)
Household size	–17.338303***
	(4.511997)
Number of old (>80)	25.958897
	(28.174459)
Number of young(<10)	12.232809
	(6.825972)
Average education of others	7.173609
	(10.075764)
Sharing house with other households	.482668
	(21.548769)
Log value of durables	41.508617***
	(6.072075)
Urban area	46.556102**
	(16.949349)
Distance between ncm and parents	5.694127**
	(1.938043)
Number of ncm living abroad	186.405916***
	(33.361711)
Number of non-coresiding members(ncm)	–11.122438***
	(3.174757)
-	26.788492
	(776.057967)
No. of observations	2564

Source: Vietnam Living Standard Survey 1998

Table 5: First stage OLS of endogenous transfers on exogenous variables and instruments

	Probit Marginal Eff. Coeff/se	IV-Probit-Marginal Eff. Coeff/se
Inter-household transfer	.000098*	.000693*
	(.000039)	(.000284)
Pension	.000240*	.000617*
	(.000118)	(.000298)
Head of household	–.151318***	–.393770***
	(.028198)	(.071979)
Female	.008603	.012253
	(.031430)	(.078809)
Age	–.010349	–.019785
	(.037160)	(.093113)
Age squared	.000289	.000672
	(.000279)	(.000700)
Married	–.045051	–.182168
	(.083720)	(.227415)
Co-residing spouse	–.224354**	–.512714*
	(.076896)	(.221968)
Level of education	.002383	.006146
	(.015820)	(.039647)
Poor health	.099883*	.196018
	(.044041)	(.117007)
Household size	.041200***	.109399***
	(.007746)	(.019659)
Number of old (>80)	–.075138	–.204154
	(.048718)	(.123152)
Number of young(<10)	–.016729	–.047673
	(.016362)	(.040997)
Average education of others	.012346	.027767
	(.015623)	(.039171)
Sharing house with other households	–.079752*	–.199025*
	(.038963)	(.098069)
Log value of durables	.036740***	.067564*
	(.009256)	(.026987)
Urban area	.362736***	.916676***
	(.023473)	(.079395)
No. of observations	2565	2564

Source: Vietnam Living Standard Survey 1998

Table 6: Marginal effects of a Probit estimate of $Model1$ and $Model2$. Dependent variable is *Retirement*.

	Tobit Model Coeff/se	IVTobit Model Coeff/se
Inter-household transfer	–.212335*	–.522111
	(.108107)	(.306313)
Pension	–.636331*	–.651584*
	(.287291)	(.289687)
Head of household	3.26e+02***	3.37e+02***
	(72.254941)	(73.706145)
Female	–6.85e+01	–6.26e+01
	(79.628708)	(80.212812)
Age	96.674447	91.998292
	(88.658141)	(89.276504)
Age squared	–1.338205*	–1.304299
	(.670361)	(.674655)
Married	1.22e+02	1.72e+02
	(2.26e+02)	(2.39e+02)
Co-residing spouse	5.00e+02*	4.60e+02*
	(2.18e+02)	(2.29e+02)
Level of education	–2.33e+01	–2.32e+01
	(39.127122)	(39.375058)
Poor health	–1.98e+02	–1.60e+02
	(1.08e+02)	(1.13e+02)
Household size	–9.79e+01***	–1.03e+02***
	(18.197887)	(18.972253)
Number of old (>80)	2.54e+02*	2.66e+02*
	(1.18e+02)	(1.20e+02)
Number of young(<10)	83.851905*	88.132757*
	(41.224671)	(41.550910)
Average education of others	–5.83e+01	–5.59e+01
	(38.748496)	(39.128027)
Sharing house with other households	2.47e+02**	2.48e+02**
	(90.728515)	(90.438746)
Log value of durables	–7.98e+01***	–6.42e+01*
	(21.107362)	(25.192268)
Urban area	–9.53e+02***	–9.26e+02***
	(73.465291)	(76.287066)
No. of observations	2565	2564

Source: Vietnam Living Standard Survey 1998

Table 7: Tobit and IV Tobit estimates of the labor supply of the elderly. Dependent variable is annual hours worked.

	Probit Non-Coresident Member (Marginal Eff.)
	Coeff/se
Inter-household transfer	.000003
	(.000016)
Pension	−.000074
	(.000046)
Head of household	.040700***
	(.011269)
Female	.017156
	(.013131)
Age	.002831
	(.014167)
Age squared	−.000026
	(.000106)
Married	.073130
	(.044172)
Co-residing spouse	.026656
	(.037438)
Level of education	−.007678
	(.006327)
Poor health	−.004375
	(.020210)
Household size	−.008786**
	(.003121)
Number of old (>80)	.016689
	(.020102)
Number of young(<10)	−.017997**
	(.006232)
Average education of others	−.000933
	(.006220)
Sharing house with other households	−.061285***
	(.009289)
Log value of durables	.010350**
	(.003958)
Urban area	−.081000***
	(.017051)
Average house price: village	−.008732*
	(.004399)
No. of observations	2846

Source: Vietnam Living Standard Survey 1998

Table 8: Reduced form Probit with non-coresident member indicator variable as dependent variable.

	Marginal eff-Model 3 Coeff/se	Marginal eff-Model 2 Coeff/se
Inter-household transfer	.000694*	.000693*
	(.000283)	(.000284)
Pension	.000623*	.000617*
	(.000306)	(.000298)
Pr(ncores)	.076784	
	(.986088)	
Head of household	–.397442***	–.393770***
	(.086782)	(.071979)
Female	.010185	.012253
	(.082917)	(.078809)
Age	–.020180	–.019785
	(.093251)	(.093113)
Age squared	.000676	.000672
	(.000702)	(.000700)
Married	–.188740	–.182168
	(.243875)	(.227415)
Co-residing spouse	–.514047*	–.512714*
	(.222660)	(.221968)
Level of education	.006785	.006146
	(.040215)	.
Poor health	.196705	.196018
	(.117738)	(.117007)
Household size	.110069***	.109399***
	(.021425)	(.019659)
Number of old (>80)	–.205393	–.204154
	(.124222)	(.123158)
Number of young(<10)	–.045832	–.047673
	(.048606)	(.040997)
Average education of others	.027664	.027767
	(.039143)	(.039172)
Sharing house with other households	–.195812	–.199025*
	(.110364)	(.098069)
Log value of durables	.066802*	.067564*
	(.028373)	(.026987)
Urban area	.923038***	.916676***
	(.121525)	(.079395)
No. of observations	2564	2564

Source: Vietnam Living Standard Survey 1998

Table 9: Marginal effects of a Probit estimate of $Model3$ and $Model2$. Dependent variable is *Retirement*.

	Probit 2 Eqns Variable/se	Probit 3 Eqns Variable/se
Constant	-3.81628	-4.14318
	(2.92284)	(3.04280)
Inter-household transfer	0.00009	0.00013
	(0.00011)	(0.00011)
Pension	0.00038	0.00041
	(0.00028)	(0.00027)
Non-coresident member	-0.03176	0.35128
	(0.09625)	(0.78254)
Head of household	-0.37485 ***	-0.39332 ***
	(0.06617)	(0.07046)
Female	0.04593	0.03461
	(0.07303)	(0.07387)
Age	0.03456	0.03489
	(0.08791)	(0.08786)
Age squared	0.00025	0.00025
	(0.00066)	(0.00066)
Married	-0.20457	-0.24402
	(0.20620)	(0.21598)
Co-residing spouse	-0.49046 **	-0.48859 **
	(0.20176)	(0.19993)
Level of education	0.00852	0.01137
	(0.03725)	(0.03699)
Poor health	0.20062 *	0.19822 *
	(0.10801)	(0.10704)
Household size	0.09343 ***	0.09746 ***
	(0.01822)	(0.01879)
Number of old (>80)	-0.13049	-0.13771
	(0.11588)	(0.11568)
Number of young(<10)	-0.04795	-0.03945
	(0.03822)	(0.04224)
Average education others	0.03265	0.03223
	(0.03727)	(0.03692)
Sharing house w.other HHs	-0.20986 **	-0.19150 *
	(0.09699)	(0.10596)
Log value of durables	0.09668 ***	0.08962 ***
	(0.02204)	(0.02620)
Urban area	0.95704 ***	0.98184 ***
	(0.06701)	(0.07834)
σ_{ϵ^1}		1.00000
σ_{ϵ^2}		561.50709 ***
		(49.75795)
σ_{ϵ^3}		7.04016
		(58.12000)
$\rho_{\epsilon^1\epsilon^2}$		0.03706
		(0.06585)
$\rho_{\epsilon^1\epsilon^3}$		-0.20598
		(0.40420)
$\rho_{\epsilon^2\epsilon^3}$		0.89579 ***
		(0.04504)
ln-L	-9993.89	-10776.44
No. of observations	2846/2564	2846/2564

Source: Vietnam Living Standard Survey 1998

Table 10: Maximum likelihood system estimation of retirement and private transfers in the first column, and retirement, private transfers, and non-coresident child in the second column.

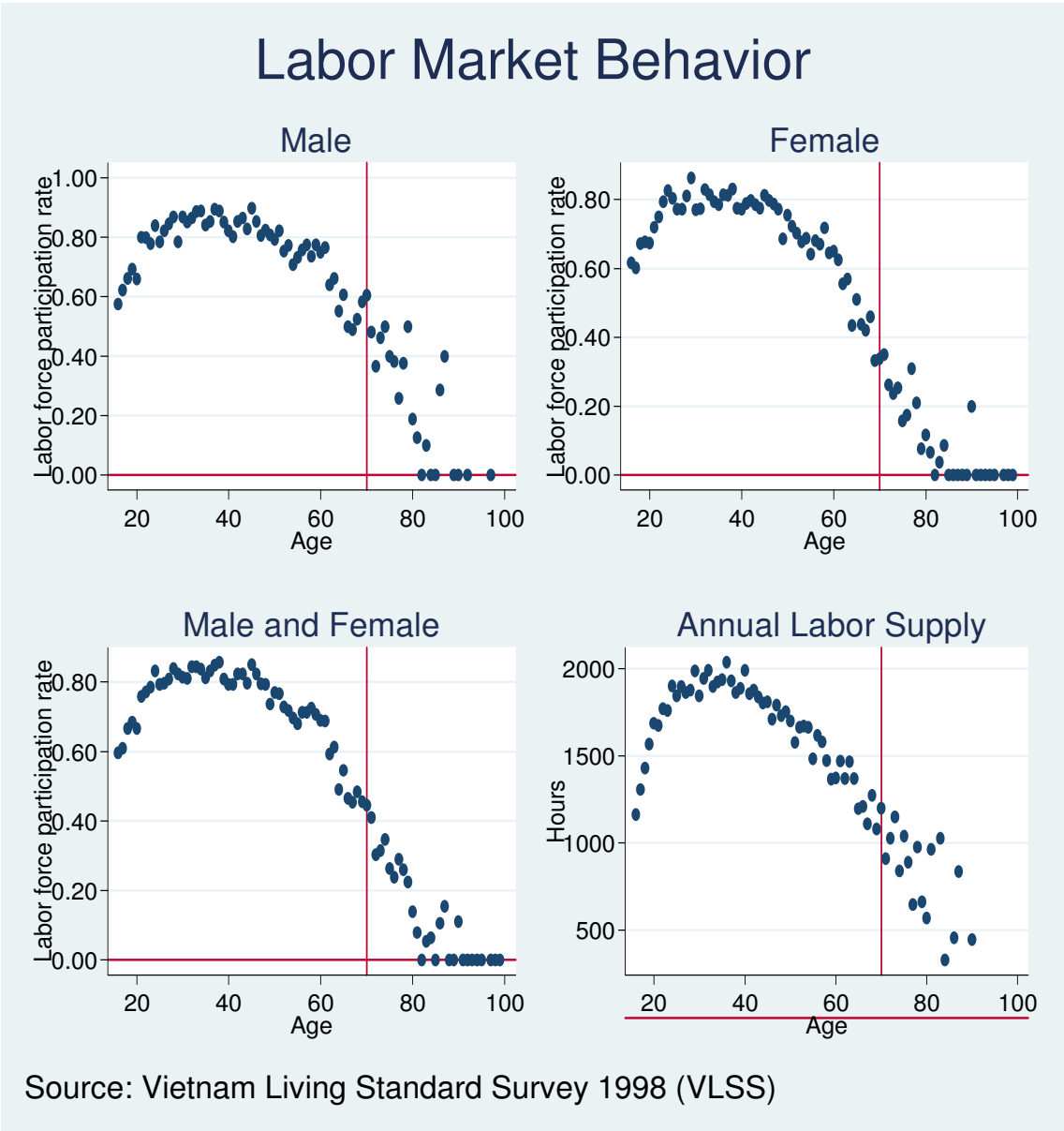

Figure 1: Labor force participation in Vietnam by gender and age.

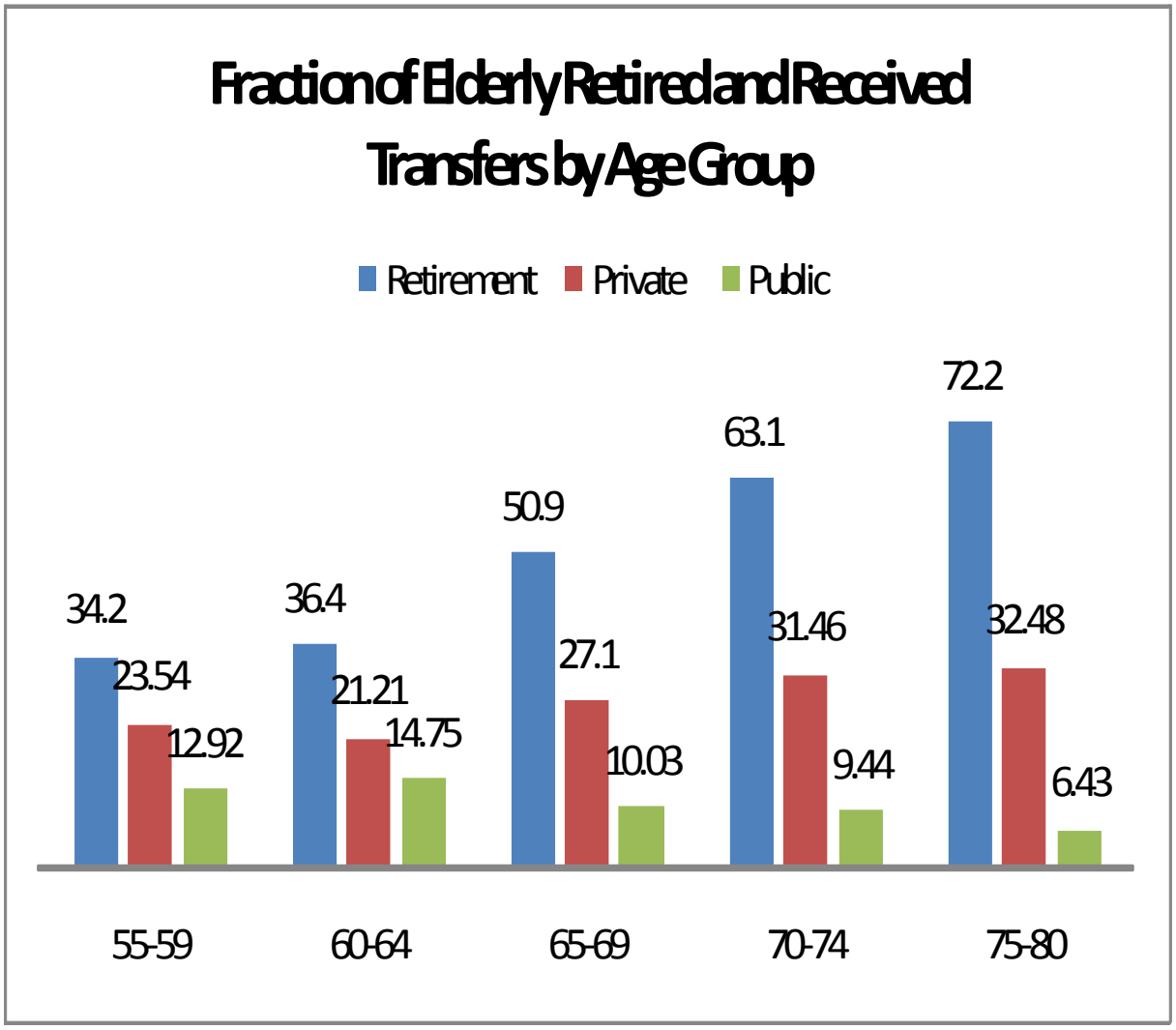

Figure 2: Fraction of elderly retired population, fraction of elderly receiving private transfers, and fraction of elderly receiving public transfers per age group.