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Abstract

In many poor countries with high emigration rates elderly people are left behind without care when their children migrate. Without a functioning market in private care migrants face a difficult trade-off between working their way out of poverty and providing informal care once their parents become frail or sick. I develop a non-cooperative model of siblings' interactions that explains how chain migration can lead to a breakdown of traditional caregiving structures while an opposing endogenous effect increases family members' incentives to specialize as caregiver. The model's predictions are tested using novel data from Moldova and found to perform better than predictions of some established migration models. The empirical analysis suggests that migration and staying in order to provide care are strategic complements for children of elderly parents in most families. This is evidence of a promising resilience of families' informal security arrangements to large-scale migration.

Keywords: migration, elderly care, remittances, intra-family allocation, informal security networks. JEL codes: F22, J14, I19, D10

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1. Introduction

All around the world societies are aging. Traditionally adult children provide income and care to their elderly parents. In rich economies this demographic transition poses challenges to public pension funds, health insurances and families who share the burden of care. In poorer countries the consequences are often even more severe because insufficient social security systems leave families as the main providers of support to the elderly. This is not only the case in developing countries, but also in many emerging countries such as China or the post-Soviet republics.

In many of these countries migration is one of the most promising poverty reduction strategies for families. More than 200 million known international migrants and several hundred million internal migrants are trying to improve their lives through labor migration and remit well above 20 percent of GDP in some countries (Worldbank, 2011). When these migrants' parents grow old care provision becomes an important good to provide in addition to income. Often earning money abroad and buying formal care for parents domestically is not an option because markets in eldercare do not exist or are out of the financial reach for the majority of the population (Lloyd-Sherlock, 2000; Worldbank, 2007). This is often a consequence of a history of institutional failure to ensure the quality of formal care. The situation is exacerbated where migrant workers have the opportunity to provide care to the elderly in developed countries, which increases the wages that have to be paid for a domestic market to develop. Another factor contributing to little prospect of future emergence of care markets are norms and values among many countries' populations that make formal care frowned upon.

In this paper I develop a model that formalizes the trade-off between care provision, income generation and labor migration that is specifically aimed at providing a framework for the analysis of siblings' interaction when taking migration decisions. The framework can explain why some families provide care for their elderly, while others do not, even when all are altruistic towards their parents and migration is profitable. The model's main predictions regarding the determinants of care, remittances as well as siblings' strategic behavior with respect to migration are tested using a novel dataset for Moldova and cannot be falsified. In order to provide a contrast with the model's non-cooperative but altruistic view, which is motivated by the fact that adult children of the elderly most often do not share a household but have their own[2], I furthermore test

[2]For the given context family-level decisions are far more relevant than household-level decisions as the co-residency choice of adult children and the elderly is endogenous. Whereas household-level decision-making has become standard in the economics of migration, evidence at the family level is still lacking. I use a core definition of the family here according to which each family comprises of an elderly person, his or her spouse (if alive) and their descendants. Focusing on the family is particularly crucial for understanding the effects and determinants

the main channels that have been used in the literature to explain why self-interested children support their elderly parents. These are found not to matter in these data. The empirical results suggest that elderly individuals are "left behind"[3] as a consequence of insufficient scope for family members to specialize in providing care domestically and earning income abroad. In Section 2 I take the reader though the most relevant literature before Section 3 introduces the model and derives a number of testable hypotheses regarding the behavior of family members. The data is introduced in Section 4. Section 5 sets out the empirical strategy used to estimate the results which are reported and discussed in Section 6. The last section points out policy implications and concludes.

2. Literature

This paper links the literatures on care and migration in order to model the potential breakdown of informal caregiving that may arise as a consequence of migration. Before introducing the model I will briefly summarize the literature on motives behind transfers to the elderly as well as determinants of supply decisions of care and monetary transfers.

The early care literature consists of unitary models that assume a single utility function or common preferences in a family. Following a paper that rejects strongly altruistically linked models of the extended family by Altonji et al. (1992) the literature developed towards game theoretic models in which parents and children with different preferences interact. In these models family members' care provision is typically assumed to be based on either pure self-interest motives such as service exchange, the competition for bequests (Bernheim et al., 1985; Perozek, 1998; Cox, 1987; Cox and Rank, 1992) or other-regarding preferences such as altruism (e.g. Sloan et al., 1997; Pezzin and Schone, 1999). In non-cooperative game theoretic models of care provision to the elderly the level of detail regarding the number and heterogeneity of potential care providers differs widely and has been increasing over time. Pezzin and Schone (1999) model the provision of informal care of adult daughters without considering the role of other siblings because they assume that daughters are the typical caregiver for the elderly. Their model assumes one daughter and one elderly individual who have linked utility functions through a public good that is assumed to represent parental physical health as a proxy of their well-being. Such a model is however not applicable if there are several daughters or care can be provided by sons as well. Wolf et al. (1997) model interactions between siblings' care provision decisions empirically by using a set of simultaneous equations. According to their approach each sibling takes the hours of care provided by other siblings and their own individual characteristics into account when choosing how much

of migration in countries where households are small.

[3] In this paper, by "left behind" I mean the extreme case of elderly left behind without any younger adults. I will not hyphenate the term from here on.

care to supply. Using data for the US they find that daughters provide more care than sons in their sample and that the burden of caregiving is shared by siblings. Byrne et al. (2009) develop a sophisticated model in which not only several children, but also spouses of elderly persons and their children-in-law can provide care. As many of the standard care models analyze US or Western European data, adult children often have the choice to buy formal care instead of supplying it informally themselves (cf. Sloan et al., 1997)).

In developing countries that have weak pension systems and that are characterized by low levels of private savings the elderly are often far more vulnerable to poverty than their children. Their livelihoods therefore often depend on monetary transfers from their children (e.g. Cameron and Cobb-Clark, 2008). Rapoport and Docquier (2006) survey different motives for remittances sent by migrants, which can however also be used to explain transfers within a country. The subset of motives potentially applicable in the context of transfers to elderly parents go back to Lucas and Stark (1985). These comprise altruism or self-rewarding emotions, service exchange and bequest. The literature on migration and remittance decisions includes non-cooperative decisions as well as cooperative or quasi-cooperative behavior of families (the latter two most prominently in the "New Economics of Labor Migration"-literature following Stark and Bloom (1985).

The trade-off between care provision and transfers of money, which may be substitutes or complements, has first been modeled in the literatures on bequests and inter-vivos transfers, which however do not explicitly allow for migration (e.g. Cox and Rank, 1992; Bernheim et al., 1985; MacDonald and Koh, 2003). Allowing for migration adds a dimension to this trade-off and potentially increases intra-family interaction because adult children who migrate cannot personally provide physical care to their parents during the migration spell. Giles and Mu (2007) were the first to link the care and migration decisions empirically in a setting where access to care markets is lacking. They find that Chinese adult children will be significantly less likely to migrate when their parents are in poor health and provide evidence that this effect will be less influential if an adult child has siblings who can potentially substitute as caregiver. Their paper highlights that many elderly parents who would require their children's care are left behind because children self-select into migration although parents are infirm. This would suggest vastly different migration and transfer outcomes than just introducing migration into the standard care literature where a care market exists. Their paper however does not cover the role of remittances and and the amounts of care actually provided.

So far only Antman (2012) integrates migration decisions, remittances and care provision in a single framework. She uses a non-cooperative game to model family interactions, arguing that cooperative models that are helpful for the analysis of intra-household allocation are not as suitable in situations when family members live separately. Antman's model assumes that utility functions of

adult children depend directly on goods contributions and time contributions to elderly family members. She then derives three very general best response functions. For the empirical analysis the migration decision of individual siblings is assumed to be exogenous, which allows conditioning the optimal contributions of time and goods on migration of an individual and her siblings. This is, however, a very strong assumption. Antman uses siblings' characteristics as instrumental variables for siblings' contributions under the identifying assumption that these affect another sibling's contribution only through the contribution itself. The estimated linear approximations of best response functions provide evidence of strategic complementarity of financial contributions and strategic substitutability of time contributions by other siblings. Furthermore she finds that children substitute between the two kinds of transfers. She links her findings regarding financial transfers to either bequest motives or a competition between siblings for some other return such as love or approval. In the case of care contributions there seems to be no such competition.
In this paper, I extend Antman's approach by modeling and estimating the endogenous, interdependent migration decisions of adult siblings. This allows me to provide evidence of strategic complementarity of siblings' decisions to migrate and stay. I furthermore test whether contributions of adult children correlate with characteristics of the elderly as will be suggested by the model.

3. Theory

While the model takes up many features of the literature discussed above, it goes beyond it by showing how migration incentives can lead families to cease providing care to their elderly. Furthermore, it shows why such situations may be avoided endogenously. The model can thus provide a framework to analyze the consequences of migration for the elderly in most developing countries with high emigration rates. Other theories regarding the motivation behind specific patterns of migration, time allocation and income sharing among family members that have been suggested in the literature will be used to provide alternative predictions to those of this model.

Assume two generations of individuals in family f elderly parents e and their $i = 1, ..., N$ adult children. An elderly person can have multiple biological children, but every adult child i has at most two biological parents[4]. Both children and the elderly gain strictly positive utility from increases to their individual consumption. The consumption of the elderly is financed from two sources as (1) shows. They receive exogenous income I (e.g. pensions) and can receive non-negative monetary transfers from their children in the form of remittances R, which are the sum of all of their individual children's remittances

[4] I leave out index f until the empirical part of the paper for notational ease. Furthermore, notationally there is only one parent-children relationship per family, although this will be relaxed in the empirical part of the paper by allowing elderly spouses to co-reside.

$R_i \geq 0$. The elderly are assumed not to migrate.

$$C_e = I + R = I + \Sigma_i R_i \tag{1}$$

Elderly well-being furthermore depends on their health H, which is a function of two parameters. The first is a parameter of frailty $\nu \in [0, 1]$ where higher values reflect poorer health, and the second is the sum T of children's care provision $T_i \geq 0$. There exists no market for care in the country of origin[5]. The frailty parameter has a negative influence on health, while its negative influence can be remedied by care. If $\nu = 0$ care contribution T_i cannot improve health. In the case of need, the effectiveness of care depends positively on the level of frailty ν. The functional form is thus assumed to satisfy $\left(\frac{dH}{dT}|\nu = 0\right) = 0$, $\left(\frac{dH}{dT}|\nu > 0\right) > 0$.[6]

$$H = H(\nu, T) = H(\nu, \Sigma_i T_i) \tag{2}$$

Children have a degree of altruism or functionally identical properties towards their parents. This is modeled by linking the utility function of children to their elderly parent's well-being with a discount factor $\delta \in [0, 1]$.[7] Hence, for $\delta > 0$ the utility of children is affected by their parents' consumption and health. Adult children do not care about their siblings but only about their parents and themselves[8]. For $\delta = 0$ the utility function of children excludes their elderly parent's welfare. The arising utility function of child i thus is

$$\max_{m_i, R_i, T_i} \; U_i = U_i(C_i, \delta C_e, \delta H) \text{ with } \frac{dU_i}{dC_i} > 0, \; \frac{dU_i}{dC_e} > 0, \text{ and } \frac{dU_i}{dH} > 0. \tag{3}$$

Children make three decisions: Migration, remittances and care contribution. They have the choice to migrate $m_i = \{0, 1\}$, which allows them to earn wage W_i^1 rather than W_i^0 for staying at home ($m_i = 0$). By migrating, chil-

[5]This assumption can be relaxed easily by assuming that a fraction ς of elderly persons' budgets can be invested into formal care. The easiest way to model this would be to let children choose the optimal share ς^*, taking into account the relative price and substitutability of formal and informal care. In the empirical case that will be analyzed in this paper the market is severely underdeveloped (European Commission, 2010). For instance, out of a population in Moldova of more than 3 million, only 430 elderly people were in residential care in 2008 (European Commission, 2009). Thus the model simplifies to $\varsigma^* \approx 0$, allowing to assume away a market for care. Including formal care in the model does not change the general mechanisms used to model the processes causing elderly parents to be left behind.

[6]We do not need to assume $\left(\frac{d^2H}{dTd\nu}|\nu > 0\right) > 0$. For example, for $H \in [0, 1]$, where 1 marks good health, a function capturing these properties would be $H = 1 - \nu^{\frac{1}{T}}$.

[7]The limits on range of δ are optional and rule out two extreme cases: First, $\delta < 0$ reflects a situation in which children receive disutility from parental well-being and second, $\delta > 1$, when a unit of individual consumption provides less utility than a unit of consumption for the elderly individual ($\frac{dU_i}{dC_i} < \frac{dU_i}{dC_e}$ with $C_e = C_i$).

[8]Assuming that the link in altruism is only one-way from children to the elderly rather than both ways decouples siblings' utility.

dren incur a migration cost F_i. Departing from the simplifying assumption of exogeneity of earnings abroad and migration cost that are made in much of the migration literature and owing to the fact that the two variables are partly indistinguishable empirically, let P_i be a functional relationship representing the profitability of migration. In the migration literature, the profitability of migration is often linked to individuals' migration network (e.g. by Winters et al., 2001; Munshi, 2003; McKenzie and Rapoport, 2007). In these networks individuals obtain access to information from peers, which decrease the cost of migration (e.g. search cost, cost of travel, psychological cost) and the likelihood of finding a well-paid job. In line with evidence from other research on migration, I assume network access N to be shared at the family level. However, adult children who migrate provide considerable network access to their siblings[9], but do not benefit from the same network effect for their own migration. This can be called a chain migration effect as every subsequent migrant sibling lowers migration cost and improves earnings prospects for their siblings in case these decide to migrate as well. The profitability of migration is thus a function

$$P_i = P_i(M_{\neg i}, N, X_i), \text{ with } \frac{dP_i}{M_{\neg i}} > 0, \; \frac{dP_i}{N} > 0, \text{ and } \frac{dP_i}{X_i} > 0 \tag{4}$$

where N is exogenous network access, which is shared at the family level, and X_i are individual characteristics that affect wages and migration cost.

If adult children decide to migrate, they can use part of their income to increase the consumption level of their parents by remitting R_i. If they remain home they can provide care to the elderly parent in the form of a time contribution that decreases the amount of time they can spend working and thus has a negative effect on their own consumption[10].

$$m_i(P_i - R_i) + (1 - m_i)(W_i^0(1 - T_i)) = C_i \tag{5}$$

Substituting (1), (2) and (5) in (3) then yields

$$\max_{m_i, R_i, T_i} \; U_i = U_i(m_i(P_i - R_i) + (1 - m_i)(W_i^0(1 - T_i)), \delta(I + \Sigma_i R_i), \delta H(\nu, \Sigma_i T_i)). \tag{6}$$

3.1. Comparative statics with and without linked utility

We can now derive predictions for fully self-interested behavior as well as intergenerationally linked well-being by changing the degree δ to which elderly well-being affects that of their children. Setting δ to its lower bound 0 we get the simplest and most orthodox behavior of agents: adult children are fully self-interested homo oeconomicii who optimize their own consumption as U_i simplifies to:

[9]This thought is also noted by Antman (2012) in a footnote.

[10]The ability to transfer money is assumed away for children who stay in their country of origin. This reflects that local wages are insufficient to provide money considerable amounts of money to parents.

$$\max_{m_i,R_i,T_i} \; U_i^c = U_i^c(C_i) = U_i^c(m_i(P_i - R_i) + (1-m_i)(W_i^0(1-T_i))) \tag{7}$$

As $\frac{dU_i}{dR_i} < 0$ and $\frac{dU_i}{dT_i} < 0$, the optimal levels of care and remittances are $R_i^* = T_i^* = 0$. The migration decision resembles the standard result from the migration literature that individuals migrate when their gain in wages $W_i^1 - W_i^0$ is larger than their migration cost F_i:

$$m_i = \begin{cases} 1 & \text{if} \quad U_i(P_i) = U_i(W_i^1 - F_i) > U_i(W_i^0) \;\; \text{or} \;\; W_i^1 + F_i > W_i^0 \\ 0 & \text{otherwise} \end{cases} \tag{8}$$

Higher profitability of migration (or classically speaking: lower migration cost F_i, and a higher wage differential $W_i^1 - W_i^0$) increase the likelihood of migration by making it more likely that the inequality in (8) holds. In this case the consumption level of the elderly parent is only their exogenous income I. Children do not react to the frailty of their parents ($\frac{dT_i}{d\nu} = 0$) or to siblings' transfer decisions ($\frac{dm_i}{dm_{-i}} = 0$, $\frac{dm_i}{dR_{-i}} = 0$, and $\frac{dm_i}{dT_{-i}} = 0$). Their siblings' migration however increases the profitability of migration through better network access and thus makes migration more likely.

If $\delta = (0, 1]$ individuals consider their parents' welfare. Therefore parents' consumption C_e and health H are family goods. Utility from parental well-being has three channels. First, pension income I and frailty ν affect the utility of children directly and are exogenous to adult children. Second, parental well-being is affected by adult children's individual transfers R_i and, if $\nu > 0$, T_i. Third, utility arises from other siblings' contributions R_{-i} and T_{-i} to both family goods.

To derive equilibrium conditions for $\delta > 0$, let us now assume that children observe their siblings' decisions and treat these as fixed[11]. An adult child will migrate if the utility level of migration is higher than that of non-migration given the optimal levels of individual remittances R_i^* or care provision T_i^*.

$$m_i^* = \begin{cases} 1 & \text{if} \quad U_i(m_i = 1, R_i = R_i^*) > U_i(m_i = 0, T_i = T_i^*) \\ 0 & \text{otherwise} \end{cases} \tag{9}$$

The optimal levels of individual remittances R_i and care contributions T_i can be derived from a maximization holding child i's migration decision constant. For $m_i = 1$ and $m_i = 0$ R_i^* and T_i^* are the respective levels that balance marginal

[11] I assume these decisions to be only infinitesimally spaced in time. It is possible to assume fully simultaneous decision-making without observing other siblings' choices. This would require the introduction of beliefs about siblings' likely decisions. However, this does not yield any added advantage for the empirical analysis. In order to evaluate this assumption in the empirical section I will also estimate recursive frameworks in which one child decides before the next and thus has a first mover advantage.

disutility from giving up individual consumption C_i in order to provide welfare to the elderly and the marginal utility feeding back from the increase in the parent's consumption or health as a consequence of the transfer:

$$\begin{aligned} \left(\frac{dU_i}{dR_i}|R = R^*\right) &= \frac{dU_i}{dC_i}\frac{dC_i}{dR_i} + \frac{dU_i}{dC_e}\frac{dC_e}{dR_i} &= \frac{dU_i}{dC_e} - \frac{dU_i}{dC_i} &= 0. \\ \left(\frac{dU_i}{dT_i}|H = H^*\right) &= \frac{dU_i}{dC_i}\frac{dC_i}{dT_i} + \frac{dU_i}{dH}\frac{dH}{dT_i} &= \frac{dU_i}{dH}\frac{dH}{dT_i} - \frac{dU_i}{dC_i} &= 0. \end{aligned} \tag{10}$$

We can derive several predictions from partial derivatives of the utility function. As before, higher profitability of migration increase the likelihood of migrating. However, it also has a positive influence on the optimal level of remittances R_i^* now. This way, the elderly benefit economically when earnings abroad increase and migration is lucrative enough to be undertaken. Increased parental need ν now increases the likelihood that children stay and provide care because ν's negative effect on health increases the marginal utility of care provision. Accordingly, if the elderly parent requires less care, children will be more likely to migrate which reflects the core finding by Giles and Mu (2007). Furthermore the degree to which children incorporate parental well-being δ influences the optimal remittance and care level because $\frac{dR_i^*}{d\delta} > 0$ and $\frac{dT_i^*}{d\delta} > 0$.

If a child migrates she provides better network access to her siblings which causes an increase in the profitability of migration for these which makes their staying less likely. Because children incorporate parental welfare in their decisions there will however now be counteracting incentives that raise the attractiveness of staying if the elderly parent is frail. Siblings' provision of remittances and care now have an effect on i's optimal contribution (R_i^*, T_i^*) as well as her migration decision m_i by affecting $i's$ marginal utility from sending remittances or providing care. If other siblings contribute a high level of remittances or care the marginal utility from providing the same good will be smaller due to falling marginal utility from R and T. Then individuals' optimal behavior is to specialize in supplying the family good with the higher marginal utility given other siblings' decisions.

Three core features of the model that are important for the migration decisions can be readily tested: First, children provide more care in total to frailer parents. Second, the elderly parent's exogenous income and remittances are substitutes. Third and most crucial for the stability of informal care arrangements and avoiding that elderly parents are left behind there is a second endogenous effect that discourages migration due to increasing marginal utility of providing care. This, at least partly, compensates the chain migration (network) effect. Other implications are summarized in Table 1.

[Table 1 about here]

3.2. Elderly left behind

For policy it is essential to understand why, according to the model, elderly individuals may not receive care although they need it in the absence of functioning care markets. If such markets existed, the implications would be straightforward. A lack of care would then be caused by low altruism of adult children towards their parents in combination with the inability to buy care because of low income relative to the price of care. If the elderly do not have any children their situation will be identical to the case $\delta = 0$. If children supported their parents and markets existed, migration might lead to a break-down of informal caregiving but the elderly would be able to buy formal care. Substituting informal care from family members, which may not be qualitatively identical, could then clearly help attenuate the worst consequences of their children's migration - requiring care and not receiving it. In countries without a market for formal care the elderly can be left behind as a consequence of high wage gains from migration, low migration cost, or domestic poverty. The public good character of care and remittances to parents means the marginal cost is imposed on the supplier alone while the marginal benefits are available to all siblings. Hence, if individuals' incentives to migrate are very favorable, even an elderly person with a large number of children will end up without care in the model. This can yield inefficient outcomes from the family point of view compared to situations with existing care markets.

An equilibrium with elderly left behind is reached when the utility of migrating is higher than that of staying for all children of an elderly person[12]. In addition to a "left-behind" equilibrium a "non-migration" equilibrium as well as intermediate situations with specialization of adult children could potentially exist at the family level, depending on functional assumptions and parameterization. In order to make the model estimable with straightforward techniques, I assume there are no multiple equilibria for a family (Bajari et al., 2010; Brock and Durlauf, 2007), although this condition could be relaxed if more complex estimation technique were used (Paula, 2013). The model shows that family-level specialization regarding migration and staying that looks similar to a coordinated decision can emerge in a non-cooperative framework. However, even when children are altruistic towards their parents, specialization will not necessarily emerge if incentives are too weak, although the loss in well-being for elderly individuals who are left behind without care may be very high. In order to understand the phenomenon of elderly left behind and to investigate whether the model's predictions are met, it is thus crucial to analyze children's interaction. Still, only the interactions of siblings regarding care and remittances have been analyzed in this context so far (Antman, 2012). Hence, after testing whether the predictions regarding *aggregate* transfer levels are in line with the empirical evidence I focus on the intra-family interaction regarding the migration decision, which is this paper's main contribution.

[12]More formal conditions for different equilibria can be found in the appendix.

3.3. Competing explanations

Given the richness of models that seek to explain family decision-making it may not be immediately apparent why a non-cooperative framework based on altruism or a functionally identical link between the generations with simultaneous decisions was chosen. I therefore look for evidence in favor of alternative modeling styles. There are two prominent ways of approaching the phenomenon differently[13].

First, outcomes could be explained by collective decision-making as proposed by the new economics of labor migration. In a collective model, decision-making units can improve overall welfare compared to autonomous individual decision-making outcomes by coordinating the migration and transfer decisions. There are lots of ways to model this. One could design a cooperative model that is comparable to the above and derive predictions that could be contrasted with those derived from the non-cooperative model. The analysis of such a model would however require knowledge of intangible components such as individuals' relative decision-making power and specific utility functions. A unitary model with additive utility for all family members or a simple change to the model by introducing an altruistic link that runs also from elderly back to their children would alternatively suffice to increase the level of cooperation. In all of these cases, the welfare of siblings and elderly would be considered to a larger extent than in the non-cooperative model introduced in this paper. We then could expect an allocation in which elderly persons who desperately need care (high ν) receive care because spill-overs of i's contributions to her siblings' utility would be more or even completely taken into account. Furthermore, the least effective migrant or most effective caregiver (this may or may not be overlapping) would provide care because the relative productivity of each adult child mattered for specialization decisions.

Second, within non-cooperative models self-interested individuals could be motivated to provide family goods by aspects other than altruism which are omitted from the model. When fully self-interested agents are assumed, transfers are typically explained with bequest or exchange motives in the remittance and care literatures. Under the bequest motive, the source of caregiving and remittances is not altruistic behavior but the expectation that these transfers would increase the chances of bequeathing parental possessions in the future. If the bequest motive were relevant, complementarity of siblings' transfers rather than substitutability could be observed and contributions to family goods would increase with an elderly individual's inheritable possessions (Bernheim et al., 1985).

The exchange motive has several facets. In the remittance literature there is an exchange of remittances for services provided to the remitter (e.g. care for grandchildren). In the care literature there is also an intertemporal dimension to exchange (for examples see Arrondel and Masson, 2006). Generations are assumed to have an informal social contract according to which a person receives care as a child and repays this care as an adult to parents when these become

[13] Within both, there may be recursivity in individuals' decisions rather than simultaneity.

frail. A particularly important exchange in the context of migration may be grandparenting while children are abroad as long as the elderly are physically capable to do so. According to the service exchange motive this would increase elderly individuals' own chance of receiving care in the future. In the empirical part of the paper, these explanations will be tested the model's predictions.

4. Data and Descriptives

I use a novel nationally representative migration dataset that was collected in Moldova in 2011-12. The country is ideal for the analysis of social effects of migration because more than 21 percent of the population are international migrants and official remittances alone make up about 23 percent of GDP (Worldbank, 2011). The survey was specifically designed to analyze the effects of migration on children and elderly and thus has specific modules surveying the migration of family members, income sources, care arrangements and other relevant factors. We used stratified random sampling based on the Labor Force Survey of the National Bureau of Statistics at the locality level to gather a nationally representative sample of households with either children, elderly or both. Within households all elderly individuals (defined as aged 60 and above) were interviewed, which provides an advantage over other surveys that only focus on the household head.

In this paper I exclude elderly people without children from the sample (7.0 percent). 20.2 percent of the elderly have one and 53.2 percent have two or three children. The remaining fifth has four or more children. The data used for this paper comprises 3793 adult children of 1744 elderly persons in 1475 families. For each elderly person in the survey, information regarding all children was gathered. However, not all elderly parents of children are included in case parents live separately. The small number of elderly persons per family is a consequence of the high mortality rates of elderly men before the age of 70 that can be observed in many Ex-Soviet republics. After testing the model's prediction regarding aggregate transfers to the elderly, I will also exclude families with just one child which are not meaningful for the analysis of sibling interaction.

In a migration context sample representativeness is always a concern as important affected groups may be unobserved. While young children often emigrate with their middle-aged parents when these become permanent emigrants, elderly will typically stay in Moldova if their adult children leave for good. Hence only seven elderly individuals from the original sampling frame could not be interviewed because they had (clearly) migrated with their family. In 95 cases elderly persons were too frail to be interviewed personally and are thus not covered in the sample. Two of these individuals lived alone (the household interviews are thus also missing) whereas 93 lived with family members. This suggests that the worst affected elderly individuals are typically cared for by their families. Elderly persons who lived in residential institutions could not be sampled. Compared to other European countries the share of the elderly who live in residential institutions is however marginal. There are less than 200 places in local public residential care institutions and a few hundred additional places at the national level (MinLSPF, 2012). Hence, the sample used in this paper misses some very sick elderly individuals. At the same time emigration does not lead to large-scale attrition of elderly persons who are sufficiently mobile to migrate with their children.

Moldova is the poorest country in Europe with an annual GDP per capita at purchasing power parity of just below 3000 US Dollars (Heston et al., 2012). The median old age pension of the elderly in our sample is approximately 1588 US Dollars PPP[14] per year, which is insufficient to satisfy basic needs. Hence many of the elderly rely on subsistence farming and remittances from migrant children to make ends meet. Remittances are mainly a family matter and only about three percent of remittances in our sample come from non-relatives. By going abroad, Moldovan workers can expect their income to multiply[15].
The market in eldercare, especially in long-term care, in Moldova is severely underdeveloped and where there is institutional provision quality is low (Atun et al., 2008; Worldbank, 2007)[16]. In our dataset 81 percent of the elderly who need help with basic activities such as dressing, body hygiene, or running errands, report to receive it. Care is thus supplied to the large majority of the elderly in need. However, the remaining 19 percent who lack a caregiver are a sizable share of the elderly population. When care is provided, it comes mainly from family members (94 percent). In the majority of cases (76.2 percent) this person also co-resides with the elderly individual. The main caregiver is typically an adult child (79.9 percent) whereas for only 5.9 percent of the elderly it is a non-relative (typically a friend or neighbor). Only 0.3 percent mainly receive help from a social worker. Caregiving by elderly people to their spouse is far rarer than in many rich countries, where life expectancy differs less between the spouses. Tables 2 and 3 summarize more information on the variables used in the regressions.

[Table 2 and 3 about here]

5. Estimation strategy

In this section the estimation strategy that is used to test the model's core predictions against alternative explanations is discussed. The empirical analysis focuses aspects that allow falsification of this paper's model because several of its and competing theories' predictions are qualitatively similar. The estimation is organized along the three choice variables of individuals in the model. First,

[14]Using the latest PPP conversion factor from Penn tables.

[15]Common wage rates abroad that are public knowledge in Moldova are an equivalent of 9500 to 16200 US Dollars PPP per year.

[16]There is however, general coverage regarding health. The country introduced a universal health care system with mandatory health insurance in the mid-2000s so that, apart from sometimes necessary bribes to health care workers, the treatment of acute disease at the district hospital or a family doctor is free.

I estimate the allocation of remittances R_f and care T_e to the elderly, which establishes that the model's predictions regarding these are in line with the data. I then provide evidence pointing away from rival explanations that were discussed above. Second, the "specialization" hypothesis regarding the intra-family interdependency of migration decisions m_i is tested.

5.1. Estimating the levels of care and remittances

To recapitulate, according to the model the optimal level of *aggregate* care provision and remittances are nil for fully self-interested children ($\delta = 0$) and implicitly given by (10) for individuals who take into account their parents' welfare. In the model, for given parameters and $\delta > 0$, the absolute level of care provision is a function of elderly persons' income, their frailty and the determinants of the profitability of migration, whereas for remittances the role of frailty depends on functional assumptions. The number of children is relevant for both kinds of transfers as well, because it increases the potential supply of family goods.

The estimation strategy of *aggregate* transfers and migration decisions is straightforward using a two-stage approach in order to estimate the analogue of the optimal transfer choices in (10) and the optimal migration decision in (9). Remittances and care are evaluated as sums received by the elderly from all of their adult children. In the majority (55 percent) of households of the elderly in our sample there is only one surviving elderly person, although the definition of "elderly" is broad by including anyone older than 59. In order to have a joint approach for elderly individuals with and without spouse, I pool each monetary income source of the elderly (i.e. pensions and remittances) separately at the household level[17]. Care is a mostly rival good for spouses and therefore evaluated separately for each spouse rather than pooled. The frailty ν_{ef} could be measured by standard clinical indicators of mobility and dependency such as the (instrumental) activities of daily living (ADL/IADL, Lawton and Brody (1969) for details), which indicate how many daily routine activities from a standardized catalogue a person is able to conduct on her own. Such measures are however empirically partly impossible to disentangle from health status and therefore endogenous, because the model suggests that care provision by children helps frail elderly people improve their health outcomes. I will therefore use the clearly exogenous age of the elderly[18]. Assuming a basic linear specification we can then evaluate the empirical soundness of the model at the extensive and intensive margins of aggregate transfers by estimating two regressions for care and remittances each.

[17] Thus I abstract from the budget allocation literature, which deals with the ways budgets are shared and distributed within a decision-making unit.

[18] Age is highly correlated with and almost linearly related to an IADL mobility indicator (ρ: 0.46). The self-reported need for help increases almost linearly from a base of 36% at age 60 to 100% at age 88 and over. The proxy is however not optimal. In the model a shock that increases the frailty of the elderly would make adult children reconsider their choices. As there are no shocks to age, there exists no equivalent when using age as a proxy for frailty.

$$\begin{aligned} T_{ef} &= \alpha^T + \beta^T \nu_{ef} + \iota^T I_f + \theta^T \bar{X}_f + \phi^T \Sigma_{\forall i} m_{if} + \epsilon_{ef}^T \\ R_f &= \alpha^R + \beta^R max(\nu_f) + \iota^R I_f + \theta^R \bar{X}_f + \phi^R \Sigma_{\forall i} m_{if} + \epsilon_f^R \end{aligned} \quad (11)$$

At the intensive margin T_{ef} can be proxied by hours of help received and R_f by log remittances. At the extensive margin these are dummy variables that indicate positive transfers. I_f proxies exogenous income, X_f are characteristics of children of family f, $\Sigma_{\forall i} m_{if}$ is the number of migrant in family f, and ϵ is the error term. Individual characteristics of adult children are likely to make a difference, for example through skill premia. Generally, education will increase expected wage gains from migration if both countries have similar relative returns to skill in origin and destination country and a large wage differential exists, as is the case of the data I use. Younger individuals furthermore typically face lower psychological cost of migration and may also earn higher wages in low-skilled physically demanding occupations such as construction or harvesting that are typical for Moldovan migrants

For completeness, I will first provide results of one-stage logit and OLS estimates to document what drives descriptive outcomes. It is clear that migration is an endogenous variable in (11). Depending on the true functional form, which is left as general as possible in the model, the variables in (11) are expected to have an influence not only on the chosen transfer level, but also on the likelihood of migration in (9). Hence, in order to interpret the signs of some model parameters on the likelihood of migration and the transfer levels received by the elderly, we must correct for the likelihood of migrating. For example, the distinction between frailty's predicted effect by discouraging migration and its effect on the size of transfers can be understood by looking at the first and second stage separately. This provides an analogue of the two-stage optimization of adult children with respect to migration and transfers that is made in the model. In the second stage I thus include the first stage's predicted migration outcome.

The profitability of migration $P_{if} = P_{if}(X_i, N_f, M_{\neg i})$ is crucial for inter-family variation in migration outcomes and will be approximated by network size and network-growth interactions. This is based on influential work by Munshi (2003), McKenzie and Rapoport (2007), Yang (2008) or Woodruff and Zenteno (2007), who interact networks with different exogenous factors that are beyond the influence of potential migrants. While McKenzie and Rapoport (2007) exploit interactions between networks and US labor market conditions, we can use the large number of destination countries of the migrants in our sample. Moldovan migrants mostly migrate to Russia, Ukraine, Italy and other southern European Union countries but increasingly also to other destinations such as Turkey, the US, or Canada. As large-scale migration only began in Moldova after the Russian financial crisis of 1998, historical data are silent about migration networks. This also means the number of adult children per family and these families investment into education is not affected by the prospect to migrate, as the elderly in our dataset took their fertility choices at least a decade before large-scale migration from Moldova started. The network size is calculated as the number of migrants to a particular country at the village-level in the 2004 census. Then, these network sizes for each village-destination country cell are interacted with the average GDP per capita growth in the particular destination country between 2004 and 2010 in order to predict 2011 migration levels at the family level in these villages. Here migration is defined as international migration spells of at least three months in 2011. As the GDP growth in a destination country is not influenced by the migration decision of an individual from a particular village in Moldova, this provides exogenous variation in the strength of the pull effect between villages. Furthermore, I test for potentially heterogeneous effects of networks on families of different sizes by multiplying the network-growth variable with the number of adult children and including it as an additional instrument[19]. The number of sons and daughters and network size of villages to four main destinations in the 2004 census are used as controls. To be clear, the two step procedure is not seeking to point-identify the causal effect of an extra migrant on the level of transfers. Rather, I seek to provide evidence which variables matter for the migration decision and which matter for the transfer decision. Using the two-step procedure provides the most straightforward way of introducing a selection correction into the transfer decision in this context. From the model it is clear that, conditional on network size and family characteristics, the exogenous network-growth interaction only has an effect on the transfer size through the migration decision.

5.2. Estimating the sibling interaction

The approach to testing the models predictions with respect to the interaction of adult children's migration decisions ("specialization effect") requires detailed explanation. First, its estimation is obstructed by the strong correlation of network access at the family level. Second, the twofold effect of an individual's siblings' migration on her likelihood of migration has to be decomposed. As long as there is any unobserved determinant of migration that is shared at the family level, empirical estimates of other siblings' migration decisions on i's are biased. To see this, let $N_f = N_f^{observed} + \eta_f^{unobserved}$ and N_f be positively correlated with $M_{\neg i}$. Then,

$$\begin{aligned} m_i &= m_i(P_{if}, M_{\neg i}, \epsilon_{if}) \\ &= m_i(P_{if}(X_i, N_f^{observed} + \eta_f^{unobserved}, M_{\neg i}), M_{\neg i}, \epsilon_{if}) \\ &= m_i(P_{if}(X_i, N_f^{observed} + \eta_f^{unobserved}, M_{\neg i}(X_{\neg i}, N_f^{observed} + \eta_f^{unobserved})), \\ &\quad M_{\neg i}(X_{\neg i}, N_f^{observed} + \eta_f^{unobserved}), \epsilon_{if}). \end{aligned} \tag{12}$$

Hence estimates of the effect of other siblings' migration decision would be upwardly biased because $\eta_f^{unobserved}$ would be comprised in $M_{\neg i}$. The same bias

[19]This turns out to be irrelevant. For at least part of the reason, please refer to the section on siblings' interactions in their migration decision further below.

occurs when a family with many migrants is positively selected on unobservable family-level characteristics that lead to a correlation between individuals' migration decisions and the error term. The easiest solution to this problem is using family fixed effects that eliminate any family-level unobserved heterogeneity. This however also eliminates all other sources of variation between families such as frailty or exogenous income of the elderly. Thus, in order to test the models' predictions, I split up the estimations for R, T, and m_i into separate approaches at the appropriate level of variation. For care and remittances I am interested whether the predictions regarding inter-family variation[20] hold, whereas the strategic behavior of siblings regarding their migration decisions has to be evaluated using intra-family variation. Hence, I do not use family fixed effects in the instrumental variable approach aimed at controlling for the aggregate inter-family migration decision, whereas they are used for the analysis of siblings' interaction here.

Assuming linearity in both m_i and P_{if} in (12), we get

$$\begin{aligned} m_{if} &= \alpha + \rho M_{\neg i} + \beta \nu_f + \gamma P_{if} + \epsilon_{if} \\ &= \alpha + \rho_1 M_{\neg i} + \beta \nu_f + \gamma(\zeta X_i + \kappa N_f + \rho_2 M_{\neg i} + \eta_i) + \epsilon_{if} \\ &= \alpha + (\rho_1 + \gamma \rho_2) M_{\neg i} + \beta \nu_f + \gamma(\zeta X_i + \kappa N_f + \eta_i) + \epsilon_{if} \end{aligned} \tag{13}$$

where ρ_1 stands for the potentially negative effect of i's siblings' migration on the marginal utility of i's migration and $\gamma\rho_2$ stands for its network enhancing effect that increases marginal utility. With the linearity assumption, not the whole model but rather a particular variable's aggregate importance for the decision in equilibrium is estimated. Using the family fixed effect η_f (13) reduces to

$$m_i = \alpha + (\rho_1 + \gamma\rho_2) M_{\neg i} + \gamma \zeta X_i + \gamma \eta_i + \eta_f + \epsilon_{if}. \tag{14}$$

This is the social multiplier problem (Glaeser et al., 2003) that goes back to the seminal contribution by Manski (1993). He termed it a reflection problem and introduced the distinction between endogenous, exogenous and correlated effects, which is helpful terminology in this context. In our example, the endogenous effect is a change to the likelihood of migrating because of siblings' migration decisions that is reflected by $\rho_1 + \gamma\rho_2$. The exogenous effect is variation at the family level that makes a family more or less likely to migrate in general. Here this is the family fixed effect η_f. Finally, the correlated effect is the similarity in behavior that might come from similar education levels or ages of siblings that lead to a correlation of individual characteristics X_i. I am interested in the endogenous effect alone here and therefore seek to eliminate hurdles to identification that are posed by the latter two by using sets of equations with family fixed effects.

For the stability of informal care arrangements and the phenomenon of el-

[20]See Antman (2012) for intra-family level analysis of these transfers.

derly left behind, the sign of $\rho_1 + \gamma\rho_2$ is central. If it is positive, this will be evidence of a positive migration interaction among siblings where the effect of enhancing network access trumps the incentive to specialize in providing care. This could cause informal caregiving in family f to break down provided migration is not generally unprofitable. A negative sign of $\rho_1 + \gamma\rho_2$ would suggest that the migration interaction between siblings is negative. The core prediction behind this is a negative coefficient ρ_1. We find its sign by disentangling both components of the reaction to $M_{\neg i}$.
Establishing $\rho_{11} < 0$ is then straightforwardly tested as long as the relative size falls into the right interval. Although $\rho_{11} + \gamma_1\rho_{12}$ is ambiguous, the signs of all three individual parameters are clear from theory. According to the model, ρ_{11} is negative, whereas both ρ_{12} and γ_1 are positive. Theoretical considerations as well as evidence from the migration literature allows us to state that $\rho_{12} \geq 0$, that is, siblings who migrate and provide additional network access and do not decrease the profitability of migration ceteris paribus[21]. Furthermore, it is clear that $\gamma_1 \geq 0$, which rules out that greater profitability of migration decreases the likelihood of leaving through the channel of increasing earnings. Table 8 shows the stylized fact that for individuals with more migrant siblings, the likelihood of being a migrants themselves is considerably higher. While the likelihood of being a migrant is only 16.6 percent for individuals who have no migrant siblings, it is 46 percent when three or more siblings are migrants. The population average is about 25 percent. Such a pattern can be generated by the model if the profitability of migration clusters at the family level and the profitability increases once siblings provide network access to each other ($\rho_{21}\gamma_1 > 0$). Given this lower bound on $\rho_{21}\gamma_1$, $\rho_{11} + \gamma_1\rho_{12} < 0$ is a sufficient condition for $\rho_{11} < 0$. Thus, barring other identification problems a negative parameter estimate for $\rho_{11} + \gamma_1\rho_{12}$ is evidence of a strategic reaction to siblings' migration decisions in support of the specialization hypothesis formulated in the model.

The estimator used has to reflect the non-recursivity of the migration decision. A non-recursive system of two equations in which the individual decision and that of siblings are taken simultaneously helps solve the reflection problem in (14). One simultaneous equation system that corresponds to the considerations above is

$$\begin{aligned} m_i &= \alpha_1 + (\rho_{11} + \gamma_1\rho_{12})M_{\neg i} + \gamma_1\zeta_1 X_i + \gamma_1\eta_f^1 + \gamma_1\eta_i + \epsilon_{if}^1, \\ M_{\neg i} &= \alpha_2 + (\rho_{21} + \gamma_1\rho_{22})m_i + \gamma_2\zeta_2\bar{X}_{\neg i} + \gamma_2\eta_f^2 + \gamma_2\eta_{\neg i} + \epsilon_{if}^2 \end{aligned} \tag{15}$$

where $\bar{X}_{\neg i}$ are other siblings' average characteristics. This system can be estimated semi-parametrically as shown by Bajari et al. (2010). The authors demonstrate that a linear probability model of the discrete choice can be much more easily implemented with correct standard errors by using the 2SLS estima-

[21]This would require that they decrease available information, increase cost of travel, et cetera.

tor with robust standard errors that comes in standard statistical packages such as STATA. The equations are identified by assuming that the characteristics of each individual affect the that individual's profitability of migration directly whereas the aggregate characteristics of siblings affect the profitability of migration only indirectly through family-level or sibling-level network access. This identifying assumption is reflected by the model where siblings' characteristics only affect m_i through $M_{\neg i}$. I run two sets of equations. One uses the share of siblings who are migrants[22] and the other the number of siblings who are migrants. The intuition is that the number of migrants picks up the positive effect on network access $\gamma_1 \rho_{12}$ more strongly than the share, which picks up relatively more of the increase in the utility from staying ρ_{11}. This is a partial remedy to accommodate the likely non-linear effect of $M_{\neg i}$ that could alternatively be bravely assumed away.

[Table 8 about here]

6. Results and discussion

In this section I first discuss the results on aggregate transfers before turning to results regarding the interdependency of migration decisions. For completeness, Table 4 reports simple regression results without exogenizing migration. Clearly, the predictions for $\delta = 0$ of the absence of transfers do not hold. In columns 1 and 2 of Table 4 the incidence and hours of help received from children per week are estimated using a logit model and linear regression respectively. These results suggest that the elderly parents with more migrant children receive more remittances rather than care. Care is considerably higher for the older elderly. An additional child is associated with a 3.5-5 percentage point higher likelihood of receiving care unless this child is a migrant, which is associated with a 7-9 percentage points reduction in this likelihood. Children who are younger on average are more likely to provide care and provide more hours. Furthermore less educated children provide more hours of help. Both correlations are in line with an expected difference in opportunity cost between these groups, as older and more educated children are more likely to have a job and a family that require their attention. These result do however not correct for potential differences in the probability to self-select into migration.

[Tables 4, 5 and 6 about here]

Let us therefore now turn to the results that control for the selection into migration in second stage's transfer decision that are estimated using 2SLS.

[22] The share of migrant siblings used for this alongside the total number of siblings has some unwanted properties. It takes the value of one regardless of the number of siblings in a family if all of these are migrants, although the effects of a similar share of siblings who migrate is likely to differ with the number of migrant siblings in reality (e.g. because of the network access provided by them).

In the first stage regressions in Table 5 aggregate migration decision of adult children do not vary significantly with the age of elderly persons. In line with the expected signs regarding higher profitability of migration for the young and educated, these are on average more likely to migrate. The instrumental variable is highly significant and has the expected positive sign. Columns 1 and 2 have slightly different results because in column 1 all elderly individuals from families with more than one elderly person are taken into account whereas column 2 is estimated at the family level using the age of the older (and thus likely frailer) elderly individual in case of spouses living together. Columns 3 and 4 will be used later. Column 5 shows that the effect of the network-growth interaction variable does not vary (linearly) with the number of adult children in the family.

The second stage results in Table 6, columns 2 and 4 indicate that the amount of care received varies positively with the age of the elderly. The strongly negative effect of age in combination with the insignificance in the the first stage suggests frailty increases care transfers but does not affect the aggregate migration decision considerably. The correlation of remittances and pension income is insignificant, which might surprise at first. Estimating the effect on the subgroup which is economically inactive[23] yields the expected significant negative correlation that underlines the substitutability of monetary income from different sources. The results also suggest that families with predominantly male adult children do not have significantly different likelihoods of migrating nor provide significantly different levels of transfers compared to predominantly female children. Elderly individuals whose spouse is still alive receive less care from their children and fewer remittances, as the elderly can potentially help each other and pool their pension incomes. Also, older children who are more educated provide less care, which is consistent with higher opportunity cost. The core predictions of the model with respect to aggregate transfers thus cannot be rejected. Fully self-interested behavior ($\delta = 0$) could however still hold if bequest motives or service exchange motives played a role.

6.1. Bequest or exchange motives?

For a bequest motive to be relevant there have to be inheritable possessions. These could for example be landholdings, a house, or productive assets. In our dataset only four percent of elderly households report to have savings above 500 USD. This is a consequence of high unemployment rates since the fall of the Soviet Union, low pensions and a high inflation phase after independence that lasted until 2001. Assets, landholdings or a house are thus the only valuable possessions the typical elderly person can bequeath. I thus include the size of landholdings and variables for houses or flats that are owned by elderly parents as additional covariates in the two-step regressions seen above. To make sure there is no spurious effect from possessions that were financed through migration, I exclude houses or landholdings that were obtained since 1999, the

[23] Not shown. The activity choice of the elderly is endogenous and therefore the main specification excludes this additional selection problem.

year large scale emigration in Moldova started. It is unlikely that many elderly people were able to obtain possessions in the meantime through other channels given their poverty. In rural areas 67 percent of the elderly owned some land in 1999[24]. Average rural landholding of the elderly individuals are only 1.4 hectares. I would expect positive effects of landholdings and possessing a house on care provision and higher remittances for elderly individuals with considerable possessions if a bequest motive mattered for transfers. Table 7 provides evidence that elderly parents will receive more hours of help from their children if the family has landholdings but no higher remittances. In the literature (e.g. Antman (2012)) a positive correlation between larger landholdings and higher remittances would however be seen as support for a bequest motive. Furthermore the lack of a negative association between frailty and remittances casts doubt on this. If bequest decisions can be assumed to be taken relatively short before a parent dies, remittances will be expected to be positively correlated age as this is a good forecaster of further life expectancy. One explanation why the bequest motive seems to be irrelevant in this context may be the relative profitability of migration compared to the value of assets of the elderly. Landholdings are typically too small to support a family and have low productivity because there are few productive assets. Also property such as houses that existed before migration are not very valuable when compared to the possible gains from migration[25]. The correlation observed here may thus rather point at the fact that in families where the elderly have landholdings that potentially provide some agricultural income a child can remain with the elderly more easily to provide care. If children are interested in providing both care and remittances to their elderly parents this will not necessarily decrease the aggregate number of migrant children and is thus in line with the estimates in Table 7.

[Table 7 about here]

Let us now turn to service exchange motives. The service exchange can take place over different time dimensions. Typically it is assumed to occur simultaneously. The exchange can also be intertemporal when elderly parents are themselves caregiver for grandchildren and expect care from their biological children or grandchildren in return later *because of* the investment, not as a consequence of some form of altruism. This implies that services are necessary to receive remittances and care today or in the future. Descriptively, many elderly parents are simultaneous providers and recipients of care but transfers from parents to children do not seem not to be a necessary condition for transfers in the reverse direction. In the last four weeks before the interview took place only 43.5 percent of the elderly who report not requiring help themselves, provided any help to their children. This share is 33 percent for elderly individuals who report to need help themselves. In families where at least one child is a migrant and with at least one grandchild only 18 percent of the elderly have ever helped

[24]In urban areas which include semi-urban suburbs 26 percent (0.9 hectares on average).
[25]Assets such as cars are do not yield any significant results either.

their adult children with child care during these biological children's migration spells, which could be expected to be one of the standard services elderly parents could provide to their children while these are abroad. Among the elderly who never had primary responsibility for their grandchildren 54 percent receive help from their own children, whereas it was 56 percent of those elderly persons who did provide help[26]. The difference in means is not statistically significant. Thus providing this service does not seem to increase the likelihood of receiving help for the elderly. An analytical test that has often been used to discriminate between service exchange and altruism, reciprocity or the bequest motive goes back to a paper by Cox (1987). This does not use the simple observation of simultaneous occurring services and transfer flows but evaluates the elasticity between the two indirectly. When service exchange is the motive behind transfers the service an elderly individual provides or has provided in the past for a child has a shadow price that is determined by the elderly individual's outside options, namely their income level without remittances. An elderly person would demand a higher price for services if her own income were higher and an exchange motive relevant. Pension income provides a good proxy for current income as do for example landholdings an elderly person may use to generate income. At the same time both are highly correlated with past income, thus also allowing a test for intertemporal service exchange within the limits of this correlation. Hence, a positive correlation between pension income and remittances or care received by the elderly suggests a service exchange explanation. In his 1987 paper, Cox indeed finds evidence for the existence of service exchange motives behind transfers in the US. As discussed pension income is weakly negatively correlated with remittances, suggesting service exchange is not the motivation for transfers from children. Rapoport and Docquier (2006) note that a service exchange arrangement would be a pareto-improvement over a situation without transfers and services. Under any of the transfer motivations discussed in this paper such pareto-superior outcomes can be reached regardless of any conditionality of transfers on service provision. The exchange may in this context thus occur as a pareto-improving coping-strategy in the face of the social disruption potentially caused by the middle generation's migration. Indeed, when a colleague revisited some of the households who are in the dataset to conduct qualitative interviews, several of the elderly stressed the sense of purpose and joy they received from providing care to their grandchildren. This is rather a sign for other-regarding or "warm-glow" preferences in these families than for exchange motives.

6.2. Interactions of family members

After finding some evidence that the model's predictions regarding the drivers of remittances and care are met, we can turn to the model's other crucial predic-

[26] Elderly individuals without grandchildren and elderly persons who report not to need help are excluded.

tion: strategic interaction within the family regarding the migration decision.

[Table 9 about here]

The results in Table 9 shows the expected patterns of strong negative interaction for the share of migrant siblings and less negative interaction effects for the number of migrant children. Estimated coefficients above one do not necessarily mean all adult children are certain to stay, as the profitability of migration can be very high (family fixed effects are well above one in some families). If we follow the model's explanation, there is thus evidence for increasing marginal utility from providing care once siblings migrate which provides families' informal security networks with a resilience so far overlooked in the literature.

As the true functional form of the peer effect that is linearized for simplification to $\rho_{11} + \gamma_1 \rho_{12}$ in (15) is unknown, it is worth also inspecting the relative sizes of estimated coefficients for different family sizes in Table 9. In column 2 the estimated marginal effect of the share of siblings who migrate on i's decision is larger in absolute value than in column 1 and in column 4 it is larger in absolute value than in column 3. This is expected for two reasons: First, the smallest families for whom we can estimate the interaction (those with just two adult children) are excluded in the even-numbered columns. Thus, naturally for a given share that is composed of a higher number of siblings the estimated effect turns out to be stronger in column 2. The difference between column 3 and 4 can for example occur when the improvement of network access from the a second migrant sibling is smaller than from the first, making the relative effect of $\gamma_1 \rho_{12}$ compared to ρ_{11} less important in larger groups of siblings than in smaller ones in column 3. As these interaction effect exclude the family-level profitability of migration (i.e. the effect of N_f), parameter estimates reported here should not be taken as readily applicable to all sizes of families but rather as robust evidence that there is interdependency of siblings in their migration decision that is in line with the model's predictions.

Another interesting question are gender differences. For this there is a straightforward test. While we cannot readily split up the sample between female and male siblings because of the importance of family fixed effects we can compare estimates for three groups: families with only female adult children, families with only male adult children and families with mixed adult children. As the probability of having a mixed gender-combination of adult children for any group of N adult children is approximately[27] $1 - 2/2^N$ while the probability of only-male or only-female is approximately $1/2^N$, we have to draw a subsample with similar distribution of the number of children and approximately similar size from the sample of mixed-gender siblings. Table 10 shows that the estimated interaction coefficient does not differ significantly between the three

[27]If there were neither small biological departures from 0.5 likelihoods of female births and no fertility choices after observing the gender of the last-born.

types of families. This suggests that women do not react significantly more strongly or weakly than males to the increasing marginal utility of staying behind when siblings migrate. In a country where females are emancipated in public life, sometimes face more attractive migration options than their male counterparts and are migrating in ever increasing numbers, this result does not surprise.

6.3. Recursive decision?

One of the crucial assumptions of the model and the empirical approach used above is its non-recursive nature. Its relative merit can be tested by imposing an order on the decision-making process in families. For this the structure as in equation (15) can be adjusted. We can for example assume that the older siblings make their migration decisions first and thus have a potential first-mover advantage. For N siblings, this yields N equations of the form (16), where for each sibling with position $j = 1, ..., N$ in the birth order of family f, decisions depend on those siblings who where born earlier ($\psi_{jk} = 0$ for $j \leq k$)[28].

$$m_j = \alpha_j + \psi_{j1} m_1 + \psi_{j2} m_2 + ... + \psi_{jn} m_n + \gamma_j \zeta_j X_i + \eta_f + \epsilon_{jf}, \qquad (16)$$

Hence, the effect of each older siblings' migration may depend on each siblings' position in the birth order. Each individual is affected by their own age, education and gender. For all siblings in a family, there is a common network effect η_f as before that now has to be imposed manually by using parameter restrictions. Estimating such systems while assuming that birth order, an interaction of birth order and gender or the relative levels of education provide proxies for the order of decisions yields no stable results across different family sizes (available on request from the author). This can be interpreted as evidence that such order does not exist and is expected because of two reasons. While in traditional, patriarchal societies it may well hold that males decide about migration before women or older before younger siblings, in the case of Moldova heterogeneous opportunities faced by individuals and their families are likely to have replaced such "traditional" order as the main driver of decision-making. First, migration networks have emerged during the past decade in a rather exogenous way to individual families and provide diverse incentives to potential migrants. For example, Luecke et al. (2009) discuss that families from villages with strong networks to Italy more often have female migrants abroad (e.g. pro-

[28]This yields systems as below (here for exactly three siblings.). Note that in (16) the notation was simplified compared to (15), hence introducing ψ as an abbreviation.)

$$m_1 = \alpha_1 + \gamma_1 \zeta_1 X_i + \gamma_1 \eta_f + \gamma_1 \eta_i \ + \epsilon^1_{if}$$
$$m_2 = \alpha_2 + \psi_{21} m_1 + \gamma_2 \zeta_2 X_i + \gamma_2 \eta_f + \gamma_2 \eta_i \ + \epsilon^2_{if}$$
$$m_2 = \alpha_3 + \psi_{31} m_1 + \psi_{32} m_2 + \gamma_3 \zeta_3 X_i + \gamma_3 \eta_f + \gamma_3 \eta_i \ + \epsilon^3_{if}$$

viding informal care to elderly Italians) than families from villages with strong networks to Russia, where the main employer for Moldovan migrants is the construction sector. Second, the Soviet system has lead to a relatively even playing field by supporting emancipation of women and providing public education for all children whereas in other countries parents may have had to decide to focus investment on first-born males (cf. Hanushek, 1992; Black et al., 2005; Conley and Glauber, 2006). Furthermore, assuming lags in decision-making between siblings may be sensible when observing individuals during their successive entry into the labor force. However, for most adult children of the elderly sample used in this paper the end of formal education and the subsequent entry into the Moldovan workforce took place well before large-scale migration started. Hence, rather than assuming a window of opportunity for migration it seems more realistic to model the decision about migration as being ever repeated, while allowing, as done implicitly above, for changing attractiveness of migration to reverse an individual's decision.

6.4. Cooperation?

Table 11 shows that while in about a quarter of families with just one child the elderly parent is left behind, this figure is far lower for families with several children. This pattern can emerge from a non-cooperative framework as provided by the model in this paper or a cooperative model in which children coordinate their decisions. There is no straightforward test to discriminate between cooperative and non-cooperative models in this context in my view. However, some standard results from cooperative game theory cast doubt on *strong cooperation* of family members. In cooperative models, income is typically pooled and its distribution bargained over. In the dataset used here there is hardly any pooling of income between family members beyond the household level and the large majority of the elderly lives alone or with a spouse in Moldova. Still, remittances and care provision extend over the boundaries of households as we have seen. Furthermore, there are only a handful of cases in which siblings send transfers to the caring sibling that could be interpreted as compensation for giving up individual consumption that could be achieved by migration. If families were cooperative beyond the household level in a game-theoretic sense, such transfers between siblings could be expected. The lack of these kinds of transfers between siblings thus suggests that non-cooperative frameworks are better suited for family-level analyses of care and remittances in the migration context when households are small.

[Table 11 about here]

In the non-cooperative model presented in this paper, seeming cooperation is a consequence of inter-generationally linked utility functions. The model deliberately makes no claim to whether the link between utility functions is a consequence of (pure) altruism or some other concept that leads to the same outcomes. For example, children could compensate their parents as a consequence of social norms of values which could be passed down from generation to

generation and thus not be true altruism. In the latter two cases the parameter δ would, rather than carrying a standard altruism parameter interpretation, indicate the strength of ties between generations.
A sensible extension to the model could be heterogeneous δ's that vary between families or even individuals. Low δ's could provide an additional explanation for some families' failure to supply care in spite of their concern for the elderly. The model suggests that if the inter-generational link in a family were weak, children would be less willing to forgo income gains from migration in order to provide care to their parents. A poor relationship to parents would also decrease the transfers of both care and remittances. Indeed, our data shows that the subjective proximity of relationships between the elderly and their children is closely correlated with the amounts of transfers received from them. Causality between transfers and the proximity of relationships however runs in both directions. Therefore I do not see a way of following this up using the data at hand. Developing the theory into this direction is therefore left to future research.

7. Summary and Implications

In international migration very large wage differentials can be reaped by migrants (Clemens, 2011). The model introduced in this paper suggests that such high premia have the potential to cause intra-family caregiving structures for the elderly to break down even when family members are altruistically linked. Adult children however take the migration decision of their siblings into account and potentially decide to remain with their parents to provide care in spite of very profitable migration. This provides resilience to informal social security networks of families that ameliorates the negative social consequences of large scale migration. The mechanism used to model this process is increasing marginal utility of providing care when other siblings migrate and cease to provide care themselves. In the majority of families at least one adult child will therefore stay with the elderly parent to provide care if these are in need, even though the monetary incentives are strongly in favor of migration for each child individually. Thus, the model can explain why, if there is no well-functioning market in eldercare, not everyone will become a migrant although legal barriers to migration are low and wage differentials large. Alternative modeling styles such as self-interest, cooperative behavior or recursive decision-making were discussed and found not to be in line with the novel empirical data exploited for this paper.
While the stabilizing effect on informal security networks provides some promise as migration becomes more common and societies age this paper highlights the economic losses faced by adult children who stay with their parents to provide care as a consequence of missing markets in private care. The often used policy response of raising awareness and referring to moral obligations of adult children to provide care to their parents is not particularly effective under these circumstances because this can only raise the psychological cost of migration

and thereby discourage the marginal migrant from leaving. Other forms of raising obstacles to migration have a similar effect. The theoretical and empirical results in this paper suggest a far more promising intervention lies in affecting how transfers from adult children are allocated. Specifically, the logical response to missing markets in care is to foster development of these markets, for example by establishing conditions in which the quality of private and public formal care is monitored. Migrants would then have strong incentives to spend parts of the incomes earned abroad on formal care for their parents. This would allow potential migrants to work their way out of poverty while ensuring someone takes care of their parents. This way families would have the opportunity to achieve pareto-superior outcomes and the trade-off between migration and care provision would have less severe implications for the elderly. At the same time private care would provide employment in migrants' home countries and spread the economic gains of labor migration more evenly in origin country societies.

8. Bibliography

Altonji, J. G., Hayashi, F., Kotlikoff, L. J., 1992. Is the Extended Family Altruistically Linked? Direct Tests Using Micro Data. American Economic Review 82 (5), 1177–1198.

Antman, F. M., Jan. 2012. Elderly Care and Intrafamily Resource Allocation when Children Migrate. The Journal of Human Resources 47 (2), 331–363.

Arrondel, L., Masson, A., 2006. Altruism, exchange or indirect reciprocity: what do the data on family transfer show? In: Kolm, S.-C., Ythier, J. M. (Eds.), Handbook of the Economics of Giving, Altruism and Reciprocity. Elsevier, Ch. 14, pp. 971–1053.

Atun, R., Richardson, E., Shishkin, S., Kacevicius, G., Ciocanu, M., Sava, V., Erica, E., Svetlana, R., 2008. Moldova: Health system review. Health Systems in Transition 10 (5), 1–138.
URL http://www.euro.who.int/__data/assets/pdf_file/0004/95161/E91756.pdf

Bajari, P., Hong, H., Krainer, J., Nekipelov, D., Oct. 2010. Estimating Static Models of Strategic Interactions. Journal of Business & Economic Statistics 28 (4), 469–482.

Bernheim, B. D., Shleifer, A., Summers, L. H., 1985. The Strategic Bequest Motive. Journal of Political Economy 93 (6), 1045–1076.

Black, S. E., Devereux, P. J., Salvanes, K. G., May 2005. The More the Merrier? The Effect of Family Size and Birth Order on Children's Education. Quarterly Journal of Economics 120 (2), 669–700.

Brock, W. a., Durlauf, S. N., Sep. 2007. Identification of binary choice models with social interactions. Journal of Econometrics 140 (1), 52–75.

Byrne, D., Goeree, M. S., Hiedemann, B., Stern, S., 2009. Formal Home Health Care, Informal Care, and Family Decision Making. International Economic Review 50 (4), 1205–1242.

Cameron, L., Cobb-Clark, D., Nov. 2008. Do coresidency and financial transfers from the children reduce the need for elderly parents to works in developing countries? Journal of Population Economics 21 (4), 1007–1033.

Clemens, M., 2011. Economics and Emigration : Trillion-Dollar Bills on the Sidewalk? Journal of Economic Perspectives 25 (3), 83–106.

Conley, D., Glauber, R., 2006. Parental Educational Investment and Children's Academic Risk: Estimates of the Impact of Sibship Size and Birth Order from Exogenous Variation in Fertility. Journal of Human Resources 41 (4), 722–737.

Cox, D., 1987. Motives for Private Income Transfers. Journal of Political Economy 95 (3), 508–546.

Cox, D., Rank, M. R., 1992. Inter-Vivos Transfers and Intergenerational Exchange. Review of Economics and Statistics 74 (2), 305–314.

European Commission, 2009. Study on Social Protection and Social Inclusion in Moldova. Tech. rep.
URL http://ec.europa.eu/social/BlobServlet?docId=4348&langId=en

European Commission, 2010. Social protection and social inclusion in Belarus , Moldova and Ukraine - Synthesis Report. Tech. Rep. June.
URL http://ec.europa.eu/social/BlobServlet?docId=5759&langId=en

Giles, J., Mu, R., May 2007. Elderly parent health and the migration decisions of adult children: evidence from rural China. Demography 44 (2), 265–88.

Glaeser, E. L., Sacerdote, B. I., Scheinkman, J. A., 2003. The Social Multiplier. Journal of the European Economic Association 1 (2), 345–353.

Hanushek, E. A., 1992. The Trade-off between Child Quantity and Quality. Journal of Political Economy 100 (1), 84–117.

Heston, A., Summers, R., Aten, B., 2012. Penn World Table Version 7.1.
URL https://pwt.sas.upenn.edu/php_site/pwt_index.php

Lawton, M. P., Brody, E. M., 1969. Assessment of older people: self-maintaining and instrumental activities of daily living. The Gerontologist 9 (3), 179–186.

Lloyd-Sherlock, P., Dec. 2000. Old Age and Poverty in Developing Countries: New Policy Challenges. World Development 28 (12), 2157–2168.

Lucas, R. E. B., Stark, O., 1985. Motivations to Remit: Evidence from Botswana. Journal of Political Economy 93 (5), 901–918.

Luecke, M., Omar Mahmoud, T., Steinmayr, A., 2009. Labour Migration and Remittances in Moldova: Is the Boom Over? Tech. Rep. December.
URL http://hdl.handle.net/10419/32525

MacDonald, M., Koh, S.-K., 2003. Consistent Motives for Inter-Family Transfers: Simple Altruism. Journal of Family and Economic Issues 24 (1), 73–97.

Manski, C. F., 1993. Identification of Social Endogenous Effects: The Reflection Problem. Review of Economic Studies 60 (3), 531–542.

McKenzie, D., Rapoport, H., Sep. 2007. Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico. Journal of Development Economics 84 (1), 1–24.

MinLSPF, 2012. Implementation of the UN Convention on the Rights of Persons with Disabilities. Tech. rep., (Ministry of Labor, Social Protection and Family of the Republic of Moldova).
URL www.ohchr.org/Documents/HRBodies/CRPD/Future/CRPD.C.MDA.1_en.doc

Munshi, K., 2003. Networks in the modern economy: mexican migrants in the U.S. labor market. Quarterly Journal of Economics 118 (2), 549–599.

Paula, A. D., 2013. Econometric analysis of games with multiple equilibria. forthcoming in Annual Review of Economics.
URL http://www.cemmap.ac.uk/cemmap/publication/id/6344

Perozek, M. G., 1998. A Reexamination of the Strategic Bequest Motive. Journal of Political Economy 106 (2), 423–445.

Pezzin, L. E., Schone, B. S., 1999. Intergenerational Household Formation, Female Labor Supply and Informal Caregiving A Bargaining Approach. Journal of Human Resources 34 (3), 475–503.

Rapoport, H., Docquier, F., 2006. The Economics of Migrant's Remittances. In: Kolm, S., Ythier, J. M. (Eds.), Handbook of the economics of giving, altruism and reciprocity. No. 1531. Elsevier, Amsterdam, Ch. 17.

Sloan, F. a., Picone, G., Hoerger, T. J., Apr. 1997. The Supply of Children's Time To Disabled Elderly Parents. Economic Inquiry 35 (2), 295–308.

Stark, O., Bloom, D. E., 1985. The New Economics of Labor Migration. American Economic Review Papers & Proceedings 75 (2), 173–178.

Winters, P., de Janvry, A., Sadoulet, E., 2001. Family and Community Networks in Mexico-U.S. Migration. Journal of Human Resources 36 (1), 159–184.

Wolf, D. A., Freedman, V., Soldo, B. J., May 1997. The division of family labor: care for elderly parents. The Journal of Gerontology Series B 52B (1997), 102–109.
URL http://www.ncbi.nlm.nih.gov/pubmed/9215362

Woodruff, C., Zenteno, R., Mar. 2007. Migration networks and microenterprises in Mexico. Journal of Development Economics 82 (2), 509–528.

Worldbank, 2007. From red to gray: the third transition of aging populations in Eastern Europe and the former Soviet Union.
URL http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:21378474~pagePK:146736~piPK:146830~theSitePK:258599,00.html

Worldbank, 2011. Migration and Remittance Factbook 2011.
URL http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21352016~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html

Yang, D., 2008. International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks. Economic Journal 118 (528), 591–630.

9. Appendix

9.1. Equilibria

The shape of functions and parametrization can give rise to different equilibria in a family. For the model to be estimable straightforwardly, I assume only one of these equilibria exists per family (cf. Bajari et al. (2010)):

"Left behind" equilibrium

The elderly are left behind in a stable equilibrium by all their biological children if the least migration-prone child migrates:

$$U_i(m_i = 1, R_i^*|M_{\neg i} = N-1) > U_i(m_i = 0, T_i^*|M_{\neg i} = N-1) \quad \forall\ i = 1,..,N.$$

Note that given that all children are migrants, equilibrium care provision T_e^* is zero. Children's utility when migrating is then

$$U_i(m_i = 1, R_i^*|M_{\neg i} = N-1) = U_i(P_i - R_i^*, \delta(I + \Sigma_{\forall i} R_i^*), \delta H(\nu, 0)),$$

where $R_i^* = \arg\max(U_i|m_i = 1)$. The utility of staying behind for the least migration prone individual is given by

$$U_i(m_i = 0, T_i^*|M_{\neg i} = N-1) = U_i(W_i^0(1 - T_i^*), \delta(I + \Sigma_{\neg i} R_i^*), \delta H(\nu, T_i^*)),$$

where $T_i^* = \arg\max(U_i|m_i = 0)$. Hence, the equilibrium exists for at least one family if for any family for all siblings i,

$$U_i(P_i - R_i^*, \delta(I + \Sigma_{\forall i} R_i^*), \delta H(\nu, 0)) > U_i(W_i^0(1 - T_i^*), \delta(I + \Sigma_{\neg i} R_i^*), \delta H(\nu, T_i^*)).$$

For fully self-interested individuals with $\delta = 0$ and thus $T_i^* = R_i^* = 0$, this holds if $P_i - W_i^0 > 0$. For empirically realistic lower bound wage differentials of monthly $W_i^1 - W_i^0 = 600 - 150$ Euros $= 450$ Euros after having refinanced monetary migration cost, the monthly psychological migration cost would have to be three times the local wage level to avoid that elderly individuals are left behind. For altruistic individuals, a number of assumptions regarding substitutability of utility components, the altruism parameter et cetera would have to be assumed to provide as corresponding back-of-the-envelope calculation.

"Non-migration" equilibrium

Using the same logic as above, an equilibrium without migrants exists for at least one family if for any family for all siblings i=1, ..., N,

$$U_i(P_i - R_i^*, \delta(I + R_i^*), \delta H(\nu, T_{\neg i}^*)) < U_i(W_i^0 - T_i^*, \delta I, \delta H(\nu, T_i^*)).$$

Equilibrium with specialization of siblings

An equilibrium where some siblings migrate and others stay behind ("specialization") exists for at least one family if for any family for at least one of sibling $i = 1, ..., m < N$,

$$U_i(P_i - R_i^*, \delta(I + \Sigma_{i=m+1}^N R_i^*), \delta H(\nu, \Sigma_{i=1}^m T_i^*)) \quad < U_i(W_i^0(1 - T_i^*), \delta(I + \Sigma_{i=m+1}^N R_i^*), \delta H(\nu, \Sigma_{i=1}^m T_i^*))$$

and, at the same time, for at least one other sibling $i = m+1, ..., N$

$$U_i(P_i - R_i^*, \delta(I + \Sigma_{i=m+1}^N R_i^*), \delta H(\nu, \Sigma_{i=1}^m T_i^*)) \quad > U_i(W_i^0(1 - T_i^*), \delta(I + \Sigma_{i=m+1}^N R_i^*), \delta H(\nu, \Sigma_{i=1}^m T_i^*)).$$

10. Tables

Table 1: Model predictions

Variable	Parameter	for $\delta = 0$ $p(m_{if} = 1)$	$T^*_{ief} \| \nu_{ef} > 0$	$R_{if}*$	for $\delta > 0$ $p(m_{if} = 1)$	$T^*_{ief} \| \nu_{ef} > 0$	R^*_{if}
ν_{ef}	β	0	0	0	-	+	?[a]
I_f	ι	0	0	0	-	?[a]	-
P_{if}	γ_1	+	0	0	+	-	+
Specialization effect							
$\Sigma_{\neg i} m_{if}$	ρ_{11}	0	0	0	-	+	-
Chain migration effect							
$\Sigma_{\neg i} m_{if}$	ρ_{21}	+	0	0	+	-	+

[a] Existence and sign of effect depends on utility function and health production function.

Table 2: Characteristics of the elderly

Variable	Obs	Mean	Std. Dev.	Min	Max
has help	1749	.511	.500	0	1
hours of help received	1749	6.623	11.68	0	100
receives remittances	1772	.103	.304	0	1
log(remittances)	1772	.294	.933	0	5.36
age	1772	69.09	7.310	60	99
female	1772	.605	.489	0	1
married	1772	.547	.498	0	1
household pensions in 1000 lei	1772	12.18	7.701	0	61.2
elderly person owned house in 1999	1772	.766	.424	0	1
family owned land in 1999 (in hectares)	1771	.770	1.321	0	15
number of daughters in family	1772	1.267	1.094	0	7
number of sons in family	1772	1.258	1.044	0	8
number of elderly persons in household	1772	1.485	.526	1	4
number of children who migrated in 2011	1772	.541	.827	0	6

Notes: Descriptives at the elderly-level

Table 3: Characteristics of children of the elderly

Variable	Obs	Mean	Std. Dev.	Min	Max
is a migrant	3793	.252	.434	0	1
age	3793	41.587	8.569	21	79
years of education	3793	11.342	2.921	0	25
female	3793	.510	.500	0	1
number of siblings	3793	2.351	1.530	0	8

Notes: Descriptives at the child-level.

Table 4: Results for T_{ef} and R_f received from biological children

		(1)	(2)	(3)	(4)
Model equivalent		$1(T_{ef} > 0)$	T_{ef}	$1(R_f > 0)$	R_f
	Proxy Variable	receives help	hours received	receives remittances	log remittances
		Logit Marg. Eff.	OLS Coefficients	Logit Marg. Eff.	OLS Coefficients
$\Sigma_i m_{if}$	number of migrant children	-0.124*** (0.016)	-1.019*** (0.351)	0.069*** (0.008)	0.323*** (0.041)
ν_{ef}	age (elder)	0.010*** (0.003)	0.257*** (0.068)	0.001 (0.002)	-0.002 (0.005)
I_f	household pensions (elder)	-0.002 (0.002)	-0.057 (0.037)	-0.001 (0.001)	-0.004 (0.003)
$\bar{X}_f$ *(opp. cost)*	mean age (children)	-0.008*** (0.003)	-0.165*** (0.053)	-0.003** (0.001)	-0.006 (0.005)
$\bar{X}_f$ *(opp. cost)*	mean educ (children)	-0.019*** (0.005)	-0.398*** (0.103)	-0.003 (0.002)	-0.009 (0.008)
$\bar{X}_f$ *(substitutes)*	spouse alive (elder)	-0.103*** (0.029)	-1.879*** (0.627)	-0.024 (0.015)	-0.112** (0.054)
$\bar{X}_f$ *(substitutes)*	no. of daughters	0.035*** (0.012)	0.853** (0.349)	-0.015** (0.007)	-0.050** (0.023)
$\bar{X}_f$ *(substitutes)*	no. of sons	0.050*** (0.014)	-0.065 (0.288)	-0.013* (0.008)	-0.029 (0.026)
Constant			1.550 (3.709)		0.831*** (0.272)
Observations		1,749	1,749	1,479	1,479
R^2 (adj.)		0.052	0.045	0.116	0.085
Wald χ^2 or F test		115.4	9.196	122.0	9.718

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, robust standard errors in parentheses. Dependent variables are restricted to transfers received from biological children.

Table 5: First stage results, instrumenting number of migrants among children in 2011

	baseline	baseline	bequest motive	bequest motive	robustness
	elderly-level	family-level	elderly-level	family-level	elderly-level
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Age of elderly person	0.001	-0.001	0.000	-0.002	0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Household pensions (in 1000 lei)	-0.001	0.001	-0.000	0.002	-0.001
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Elderly person owned house in 1999			-0.023	-0.004	
			(0.044)	(0.045)	
Elderly person owned land in 1999			0.030*	0.043**	
			(0.016)	(0.019)	
Mean age of children	-0.009***	-0.009**	-0.009**	-0.008**	-0.009***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Mean years of education of children	0.012*	0.013*	0.011*	0.011	0.012*
	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)
Married elderly person	-0.015	-0.020	-0.022	-0.029	-0.014
	(0.043)	(0.046)	(0.044)	(0.046)	(0.044)
Number of daughters	0.222***	0.224***	0.222***	0.224***	0.201***
	(0.025)	(0.028)	(0.025)	(0.028)	(0.051)
Number of sons	0.232***	0.237***	0.233***	0.237***	0.211***
	(0.025)	(0.027)	(0.025)	(0.027)	(0.052)
Urban	0.126***	0.122***	0.149***	0.157***	0.125***
	(0.043)	(0.046)	(0.045)	(0.048)	(0.043)
Migrant share to Italy 2004	0.003**	0.002*	0.003**	0.003*	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Migrant share to Ukraine 2004	-0.012**	-0.010	-0.012**	-0.009	-0.012**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Migrant share to Romania 2004	-0.027***	-0.026***	-0.026***	-0.026***	-0.027***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
Migrant share to Russia 2004	-0.014***	-0.013***	-0.013***	-0.012***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Network-growth interaction	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Network-growth interaction·					0.000
					(0.000)
Constant	-0.007	0.046	0.013	0.056	0.043
	(0.220)	(0.230)	(0.221)	(0.230)	(0.234)
Observations	1,744	1,475	1,743	1,474	1,744
R^2	0.167	0.170	0.169	0.174	0.168
F stat 1st stage	17.34	15.42	15.02	13.41	16.41

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, robust standard errors in parentheses. Dependent variables are restricted to transfers received from biological children.

Table 6: Second Stage IV estimates for T_{ef} and R_f received from biological children

	(1)	(2)	(3)	(4)
Variable	$1(T_{ef} > 0)$ receives help	T_{ef} hours received	$1(R_f > 0)$ receives remittances	R_f log remittances
Number of children who migrate (2011)	0.268*	-1.190	0.292***	0.787***
	(0.148)	(2.219)	(0.103)	(0.292)
Age of elderly person	0.009***	0.262***	0.000	-0.003
	(0.003)	(0.068)	(0.002)	(0.006)
Household pensions	-0.002	-0.055	-0.001	-0.003
	(0.002)	(0.038)	(0.001)	(0.003)
Mean age of children	-0.004	-0.172***	-0.001	-0.002
	(0.003)	(0.058)	(0.002)	(0.005)
Mean years of education of children	-0.023***	-0.398***	-0.005	-0.009
	(0.006)	(0.109)	(0.003)	(0.010)
Married elderly person	-0.093***	-1.949***	-0.029	-0.121**
	(0.033)	(0.628)	(0.020)	(0.059)
Number of daughters	-0.050	0.881	-0.059**	-0.163**
	(0.037)	(0.636)	(0.025)	(0.073)
Number of sons	-0.041	-0.033	-0.058**	-0.150**
	(0.037)	(0.627)	(0.026)	(0.076)
Urban	-0.005	-0.872	-0.060**	-0.215***
	(0.041)	(0.675)	(0.024)	(0.071)
Migrant share in Italy 2004	-0.003***	-0.015	-0.001	-0.002
	(0.001)	(0.020)	(0.001)	(0.002)
Migrant share in Ukraine 2004	-0.000	0.071	0.004	0.009
	(0.004)	(0.067)	(0.003)	(0.009)
Migrant share in Romania 2004	0.008	-0.045	0.003	0.014
	(0.005)	(0.091)	(0.003)	(0.010)
Migrant share in Russia 2004	0.000	-0.026***	0.000	0.001
	(0.001)	(0.010)	(0.000)	(0.001)
Constant	0.372**	3.081	0.187*	0.718**
	(0.170)	(3.822)	(0.101)	(0.294)
Observations	1,744	1,744	1,475	1,475
K-P rk LM stat (weak I)	22.26	22.26	18.79	18.79

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors used. For first stage of columns 1 and 2 see Table 5 column 1, for first stage of columns 3 and 4 please refer to 5 column 2. Dependent variables are restricted to transfers received from biological children.

Table 7: Second stage IV results for T_{ef} and R_f received from biological children with bequest motive

	(1)	(2)	(3)	(4)
Variable	$1(T_{ef} > 0)$ receives help	T_{ef} hours received	$1(R_f > 0)$ receives remittances	R_f log remittances
Number of children who migrate	0.240	-2.216	0.289***	0.780**
	(0.155)	(2.425)	(0.112)	(0.314)
Age	0.009***	0.258***	0.000	-0.003
	(0.003)	(0.069)	(0.002)	(0.006)
Household pensions (in 1000 lei)	-0.002	-0.051	-0.001	-0.003
	(0.002)	(0.038)	(0.001)	(0.003)
Elderly person owned house in 1999	0.024	-0.228	-0.009	-0.056
	(0.032)	(0.648)	(0.019)	(0.057)
Family owned land in 1999	0.009	0.484**	0.003	0.011
	(0.012)	(0.237)	(0.010)	(0.029)
Mean age of children	-0.005	-0.178***	-0.001	-0.002
	(0.003)	(0.058)	(0.002)	(0.005)
Mean years of education of children	-0.023***	-0.406***	-0.005	-0.008
	(0.006)	(0.110)	(0.003)	(0.009)
Married elderly person	-0.096***	-2.072***	-0.030	-0.125**
	(0.032)	(0.635)	(0.020)	(0.060)
Number of daughters	-0.044	1.111*	-0.058**	-0.161**
	(0.038)	(0.671)	(0.027)	(0.078)
Number of sons	-0.035	0.207	-0.057**	-0.147*
	(0.039)	(0.674)	(0.028)	(0.081)
Urban	0.008	-0.380	-0.058**	-0.210**
	(0.044)	(0.749)	(0.028)	(0.083)
Migrant share in Italy 2004	-0.003***	-0.011	-0.001	-0.002
	(0.001)	(0.021)	(0.001)	(0.002)
Migrant share in Ukraine 2004	-0.000	0.066	0.004	0.009
	(0.004)	(0.066)	(0.003)	(0.009)
Migrant share in Romania 2004	0.008	-0.062	0.003	0.014
	(0.005)	(0.092)	(0.003)	(0.010)
Migrant share in Russia 2004	0.000	-0.026***	0.000	0.001
	(0.001)	(0.010)	(0.000)	(0.001)
Constant	0.362**	3.323	0.191*	0.746**
	(0.167)	(3.851)	(0.101)	(0.293)
Observations	1,743	1,743	1,474	1,474
K-P rk LM stat (weak I)	19.35	19.35	15.90	15.90

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors used. For first stage of columns 1 and 2 see Table 5 column 3, for first stage of columns 3 and 4 please refer to 5 column 4. Dependent variables are restricted to transfers received from biological children.

Table 8: Row percentage of migrants by number of siblings who are migrants

		is migrant		
		No	Yes	Total
$M_{\neg i}$	0	83.5	16.6	100.0
	1	65.2	34.8	100.0
	2	57.9	42.2	100.0
	≥3	54.0	46.0	100.0
	Total	75.7	24.3	100.0

Note: mean of "is migrant" is 24.5.

Table 9: Estimates of interaction for share of migrants among siblings and number of migrant siblings

Dependent variable: migration status of i

Variable	2nd stage	2nd stage	2nd stage	2nd stage
Subgroup	all	>2 siblings	all	>2 siblings
Share of migrant siblings	-2.027***	-2.838***		
	(0.043)	(0.038)		
Number of migrant siblings			-0.907***	-0.983***
			(0.028)	(0.008)
Family fixed effects	yes	yes	yes	yes
p(F or χ^2 test resp.) eq. 1:	0.000	0.000	0.000	0.000
p(F or χ^2 test resp.) eq. 2:	0.000	0.000	0.000	0.000
Sample size	3,544	2,540	3,544	2,540

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors cluster at the village level.Estimated using peer effects method in Bajari et al. (2010). Additional covariates on top: age, years of education, sex of i. Additional covariates in first stage: mean age of siblings, average years of education of siblings and family fixed effects.

Table 10: Estimates of interactions among siblings by gender composition of adult children

Dependent variable: migration status of i

Subsample	mixed gender	only females	only males
	2SLS[a]	2SLS[a]	2SLS[a]
Variable	2nd stage	2nd stage	2nd stage
Share of of migrant siblings	-1.347***	-1.435***	-1.537***
	(0.091)	(0.056)	(0.068)
Family fixed effects	yes	yes	yes
p(F) eq. 1:	0.000	0.000	0.000
p(F) eq. 2:	0.000	0.000	0.000
Sample size	498	484	462

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors cluster at the village level. Estimated using peer effects method in Bajari et al. (2010). First stage not reported. Additional covariates on top: age, years of education. Additional covariates in first stage: mean age of siblings, average years of education of siblings, number of siblings.

Table 11: Number of children who are migrants by the number of all children (row percentages)

	Migration status of children			
	None	at least one	all	total
1	72.5	0.0	27.5	100.0
2	61.5	30.9	7.5	100.0
3-5	50.9	45.5	3.6	100.0
More than 5	36.2	62.9	1.0	100.0
Total	56.8	35.0	8.2	100.0