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ORIGINAL PAPER

Siblings' interaction in migration decisions: who provides for the elderly left behind?

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Abstract In most poor countries, with high emigration rates, elderly people are dependent on their children for the provision of care and income. This paper is the first to explicitly model and estimate social interaction between siblings' migration decisions in such settings. The interaction consists of two effects with opposite signs; a chain migration effect that can cause traditional caregiving structures to break down and an opposing specialization effect that increases family members' incentives to remain at home and provide care when their siblings migrate. The estimates for Moldova, one of the countries with the highest emigration rates in the world, indicate that siblings' interaction strongly decreases their equilibrium emigration rates. Siblings' interaction is found to increase in line with the incentives that are assumed in the model. Hence, the paper provides evidence of the robustness of families' informal security arrangements to large-scale emigration and has important implications for policies that aim at the population left behind.

Keywords Migration · Social interaction · Peer effects · Elderly care · Remittances · Intra-family allocation · Migration cost

JEL Classifications F22 · J14 · I19 · D10

1 Introduction

All around the world societies are aging. In rich economies, this demographic transition poses challenges to public pension funds, health insurers, and families who

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share the burden of care. In poorer countries, the consequences are 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 ones such as China or the post-Soviet republics. In many of these countries, migration is one of the most effective poverty reduction strategies for families (Clemens 2011). 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 % of GDP in some countries (Worldbank 2011). When their parents grow old, care becomes an important good to provide in addition to income. Earning money abroad and buying formal care for parents domestically is seldom an option because markets for eldercare do not exist or are out of financial reach for the majority of the population (Lloyd-Sherlock 2000; Worldbank 2007). This is often a consequence of an institutional failure to ensure the quality of formal care. The situation is exacerbated where migrant workers have the opportunity to work as caregivers for the elderly in developed countries, which increases the wages that have to be paid for a substantial domestic market to develop in their home country. Another factors decreasing the scope for the emergence of domestic care markets in the short or medium term are norms and values among many countries' populations that cause formal care to be frowned upon.

In this paper, I jointly consider migration, remittances, and care provision to analyze working-age adults' social interaction in migration decisions when formal care markets do not exist. The empirical estimates suggest that social interaction strongly decreases equilibrium migration rates of the children of elderly people in the sample. The paper is based on a model introduced in Antman (2012a) that focused on the strategic interaction of siblings with regard to individual care and time contributions in a migration setting. The social interaction in migration decisions was not modeled in much detail by her. By contrast, my paper is the first to explicitly model as well as estimate peer effects in siblings' migration decisions. The main contribution is to suggest that family-level peer effects in migration decisions consist of two opposing social interaction effects and to provide empirical evidence of their existence, their relative size, and determinants. First, migrant family members can support each other abroad, which makes migration more profitable and thereby increases the likelihood that other siblings will migrate as well. Second, the marginal utility of staying at home and providing care to elderly parents increases when more family members migrate. The social interaction and particularly the relative sizes of both effects are important because they determine whether elderly people will be left behind and whether families will disintegrate. Peer effects amplify or dampen the effect of any individual- or group-level determinants of migration, including policy, and thereby have implications for overall emigration rates.

The model highlights why children in some families provide care to their elderly when migration is highly profitable and why others do not do so even when all are altruistic towards their parents. Furthermore, the model implies that due to family members' incentives, migration might not decrease aggregate care provision in larger families. This as well as important predictions, such as a responsiveness to the frailty of elderly parents, are tested later in the paper. The model's main implications are tested using novel nationally representative survey data from Moldova, one of the countries with the highest emigration rates worldwide. The results suggest that the stabilizing second effect dominates the first one, which can explain why emigration rates are still relatively low compared to the size of wage differentials. The net effect of social interaction on migration rates is found to differ in line with the potential supply and demand of care and income. The empirical results suggest that if elderly people are left behind, this will not only be a consequence of large wage differentials faced by their children but will typically also depend on a lack of scope for family members to specialize in providing care domestically and earning income abroad. The results show that care provision is remarkably robust to migration. In addition, elderly parents benefit from the remittances sent by their migrant children.

In Section 2, I review the most relevant literature. Section 3 introduces the model and derives a number of testable hypotheses regarding the behavior of elderly parents and their children. The data are introduced in Section 4. Section 5 discusses the empirical strategy and results used to analyze siblings' interaction in migration decisions. Section 6 tests additional predictions of the model and assesses the impact of social interaction found earlier on remittance and care provision. Section 7 provides empirical support for core theoretical assumptions of the model. The last section points out policy implications and concludes.

2 Literature

This paper links the literature on care and migration in order to analyze whether social interaction in families increases or decreases migration in the presence of conflicting incentives to migrate for personal gain and to provide for dependent elderly parents. Before introducing the model, I will briefly summarize the relevant literature.

The early care research consists of unitary models that assume a single utility function or common preferences in a family. Following a paper by Altonji et al. (1992) that strongly rejects altruistically linked models of the extended family, 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 and 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 1999). In non-cooperative 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 by adult daughters without considering the role of other siblings because they assume that daughters are the typical caregivers 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. Wolf et al. (1997) empirically model interactions between siblings' care provision decisions by using a set of simultaneous equations. Byrne et al. (2009) develop a sophisticated model in which not only several children, but also spouses of elderly people and their children-in-law can provide care. As many of the standard care models analyze United States 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, this option is often not available. Furthermore, the pension systems are weak and the levels of private savings of the elderly are low. Thus, elderly people are usually far more vulnerable to poverty than their children. Their livelihoods often depend on monetary transfers from their children (e.g., Cameron and Cobb-Clark 2008). Rapoport and Docquier (2006) survey the different motives for remittances sent by migrants, which can also be used for explaining transfers within a country. The subset of potentially applicable motives in the context of transfers to elderly parents comprises altruism or self-rewarding emotions, service exchange, and bequest. Migration and remittance decisions of families can be modeled as non-cooperative, cooperative, and quasi-cooperative behavior the latter two most prominently in the "New Economics of Labor Migration"-literature following (Stark and Bloom 1985).

The provision of care and the transfer of income, which may be substitutes or complements, were first modeled as a trade-off in the literature on strategic bequests and inter-vivos transfers, which do not explicitly allow for migration (e.g., Cox and Rank 1992; Bernheim et al. 1985; MacDonald and Koh 2003). Giles and Mu (2007) were the first to link care and migration decisions empirically in a setting where access to care markets is missing. They find that Chinese adult children are significantly less likely to migrate when their parents are in poor health and provide evidence that this effect is less influential if an adult child has siblings who can serve as potential substitute caregivers. Their paper highlights that many elderly parents are left behind alone because their children self-select into migration even though their parents depend on them when care markets are absent. However, it does not discuss the role of remittances, the amount of care that is actually provided or social interaction in siblings' migration decisions in detail[1].

So far, only (Antman 2012a) integrates migration decisions, remittances, and care provision in a single framework. Arguing that cooperative models, which are helpful for the analysis of intra-household allocation, are not suitable in situations where family members live separately, she uses a non-cooperative game to model family interactions. Antman's model assumes that the utility functions of adult children depend directly on the contribution of goods and time to elderly family members. She derives three very general best response functions that are estimated under the identifying assumption that these affect another sibling's contribution only through

[1]Other work on the left behind often focuses on factors such as the human capital development of children (e.g., Antman 2012b, Biavaschi 2015) or the labor market decisions of working age adults (e.g., Giuletti et al. 2013) and is not primarily concerned with elderly family members.

the contribution itself. Hence, other siblings' characteristics are instrumental variables for these other siblings' contributions. Here, 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 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. Focusing on interdependencies in transfers, (Antman 2012a) does not study peer effects in migration decisions, which are the focus of this paper.

I model and estimate the endogenous, interdependent migration decisions of adult siblings in detail. The model combines many features of the papers discussed above and is most closely related to Antman (2012a). It goes beyond these previous works by showing how positive and negative endogenous effects can increase or decrease migration incentives. This can cause families to cease providing care to their elderly members or to continue doing so in spite of very high opportunity costs. Thus, the model provides a framework to analyze the consequences of migration for the elderly in most developing countries with high emigration rates. Although the model has been used to explain international migration in the present paper, it can also be applied to internal migration decisions.

3 Theory

Assume two generations of individuals in family[2] f elderly parents $e = 1, 2$ 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[3]. The elderly are assumed not to migrate. Both the elderly and their children gain strictly positive utility from their respective individual consumption C_e and C_i. Furthermore, the utility of the elderly U_e, which is defined in Eq. 1, depends on health H_e. The consumption of elderly people is financed from two sources as (2) shows. They receive exogenous income I (e.g., pensions) and can receive non-negative monetary transfers from their children. These monetary transfers R are the sum of the individual amounts $R_i \geq 0$ sent by all of their children. Elderly individuals maximize their utility after observing

[2]For the given context, family-level decisions are far more relevant than household-level decisions. Whereas household-level decision-making has become standard in the economics of migration, evidence at the family level is still lacking. This is often a pragmatic consequence of data availability and is not ideal because endogenous household formation is typically ignored. I use a core definition of the family here whereby each family consists of an elderly person, their spouse (if alive), and their descendants. Focusing on the family is particularly crucial for understanding the effects and determinants of migration in countries where households are small.

[3]I leave out index f until the empirical part of the paper for notational ease. For the time being, 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.

the amounts of care T and income R, they receive by choosing the share c of their budget to be consumed whereas $(1 - c)(I + R)$ is used to buy health care (e.g., medication).

The health production function H_e of the elderly is specified in Eq. 3. It depends on their frailty $\nu \in [0, 1]$, where higher values reflect poorer health, transfers of care T, and money R. The frailty parameter affects health negatively. Its negative influence can be remedied by care T. The effectiveness of care depends positively on the level of frailty ν. If $\nu = 0$, care does not affect health. If $\nu > 0$, the marginal effect of care increases with frailty. Furthermore, health can be improved by health care spending $I + R - C_e$. As people who eat a better diet or who have more favorable living conditions are typically healthier, I allow for an indirect health effect of income via the consumption-level C_e. In line with the situation in many developing countries, there is no market for care in the country of origin[4].

$$\max_{c} U_e = U_e(C_e, H_e) \tag{1}$$

$$C_e = c(I + R) = c(I + \Sigma_i R_i) \tag{2}$$

$$H_e = H_e(\nu, T, (1 - c)(I + R), C_e) \tag{3}$$

Children have a degree of altruism[5] towards their parents. This is modeled by linking the utility function of children to their elderly parent's health and consumption levels with a discount factor $\delta \in [0, 1]$[6]. For $\delta = 0$, the utility function of children is independent of their elderly parent's welfare. Note that the utility U_e of parents is not directly included in the utility function of their children U_i, which allows for differing relative valuations of both goods between generations. Adult children do not care about their siblings but only about their parents and themselves.[7] The utility function of child i that arises thus is

$$\max_{m_i, R_i, T_i} \quad U_i = U_i(C_i, \delta C_e, \delta H_e) \text{ with } \frac{\partial U_i}{\partial C_i} > 0, \; \frac{\partial U_i}{\partial C_e} > 0, \text{ and } \frac{\partial U_i}{\partial H_e} > 0. \tag{4}$$

[4]This assumption can be relaxed easily by assuming that a fraction ς of elderly parents' budgets can be invested into formal care, leaving $C_e = (1 - c - \varsigma)(I + R)$. 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 us to assume away a market for care. Including formal care in the model does not change the general mechanisms used to model the processes that cause elderly parents to be left behind alone. Furthermore, if the market for general health care does not exist the model simplifies as $c \approx 1$. The quality of general health care infrastructure and its possible free provision are deliberately left unspecified as they can most easily be represented through the relative importance of inputs in H_e.

[5]Or preferences with similar consequences within the model; e.g., reciprocity for long-past investment by their parents or impure altruism.

[6]The limits on 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 ($\frac{\partial U_i}{\partial C_i} < \frac{\partial U_i}{\partial C_e}$ with $C_e = C_i$).

[7]The simplifying assumption that the link in altruism runs only one-way from children to the elderly rather than both ways decouples siblings' utility. Including a two-way link would mean that adult children care indirectly (through their parents' utility) about their siblings. This would decrease the public good character of contributions to parents and thereby decrease the size of some effects. However, the main mechanisms of the model would not be affected.

Children make three decisions: migration, remittances, and care contributions. They have the choice to migrate $m_i = \{0, 1\}$, which allows them to earn a higher wage than when staying at home ($W_i^0, m_i = 0$). Let P_i represent the profitability of migration; that is, both earnings abroad as well as monetary and exogenous non-monetary migration cost. In the migration literature, the profitability of migration is often linked to individuals' migration networks (e.g. Winters et al. 2001; Munshi 2003; McKenzie and Rapoport 2007). In these networks, individuals obtain access to information from peers that decreases the cost of migration (e.g., search cost, travel cost, and psychological cost) and increases the likelihood of finding a well-paid job. In the model, I assume that there are two network layers. First, I assume an exogenous network access N that is identical for all family members. However, adult children who migrate provide a considerable second layer of network access to their siblings[8] without benefiting from the same network effect themselves. This gives rise to an endogenous effect that increases the likelihood of migration in a family as every additional migrating child makes migration for their siblings more profitable. Accordingly, the profitability of migration is a function

$$P_i = P_i(M_{\neg i}, N, X_i), \text{ with } \frac{\partial P_i}{\partial M_{\neg i}} > 0, \ \frac{\partial P_i}{\partial N} > 0, \text{ and } \frac{\partial P_i}{\partial X_i} > 0 \tag{5}$$

where $M_{\neg i}$ is the migration decision of i's siblings, N is exogenous family-level network access, and X_i are individual characteristics that improve wages and reduce monetary and psychological migration costs.

If adult children decide to migrate, they are unable to provide care. If they remain at home, they can provide care to the elderly parent in the form of a time contribution T_i that decreases the amount of time they can spend working and thereby has a negative effect on their own budget. When both at home and abroad, children can transfer part of their income R_i to their parents.

$$C_i = m_i(P_i - R_i) + (1 - m_i)(W_i^0(1 - T_i) - R_i) \tag{6}$$

Substituting Eqs. 2, 3, and 6 in 4 then yields

$$\begin{aligned} \max_{m_i, R_i, T_i} U_i = U_i \Big(& m_i P_i + (1 - m_i)(W_i^0(1 - T_i)) - R_i, \\ & \delta c(I + \Sigma_i R_i), \delta H_e [\nu, \Sigma_i T_i, (1 - c)(I + \Sigma_i R_i), c(I + \Sigma_i R_i)]\Big). \end{aligned} \tag{7}$$

3.1 Predictions with and without linked utility

We can now derive predictions for fully self-intereste+ d behavior as well as intergenerationally linked well-being by changing the degree δ to which the well being of the elderly affects that of their children. Setting δ to its lower bound 0, we get the

[8] This thought is also noted by Antman (2012a) in a footnote. She assumes that the migration cost decreases with the number of siblings who migrate.

simplest and most orthodox behavior of agents: adult children are fully self-interested homines oeconomici who maximize their own consumption as U_i simplifies to:

$$\max_{m_i, R_i, T_i} U_i = U_i(C_i) = U_i\left(m_i(P_i) + (1 - m_i)(W_i^0(1 - T_i)) - R_i\right) \tag{8}$$

As $\frac{\partial U_i}{\partial R_i} < 0$ and $\frac{\partial U_i}{\partial T_i} < 0$, 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 wage gain is larger than their traditional migration cost:

$$m_i = \begin{cases} 1 \text{ if } \mathrm{U_i(P_i) > U_i(W_i^0)} \text{ or } \mathrm{P_i > W_i^0} \\ 0 \text{ otherwise} \end{cases} \tag{9}$$

More profitable migration (or classically speaking: lower migration cost and a higher wage differential) increases the likelihood of migration by making it more likely that the inequality in Eq. 9 holds. In this case, the consumption level of the elderly parent is only their exogenous income I, which they divide optimally between consumption and health care spending. Children do not react to the frailty of their parents ($\frac{\partial T_i}{\partial \nu} = 0$) or to their siblings' transfer decisions ($\frac{\partial m_i}{\partial m_{-i}} = 0$, $\frac{\partial m_i}{\partial R_{-i}} = 0$, and $\frac{\partial m_i}{\partial T_{-i}} = 0$). However, their siblings' migration makes going abroad more profitable and thereby more likely for them by improving network access.

If $\delta = (0, 1]$ individuals consider their parents' welfare. Therefore, their parents' consumption C_e and health H_e are family goods. The utility from parental well being has three components. First, pension income I and frailty ν affect the utility of children directly and are exogenous to them. 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 assume that children observe their siblings' decisions and treat these as fixed[9]. 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^* and care provision T_i^* for $m_i = 1$ and $m_i = 0$, respectively.

$$m_i^* = \begin{cases} 1 \text{ if } \mathrm{U_i\left(m_i = 1, R_i = R_i^*\right) > U_i\left(m_i = 0, T_i = T_i^*, R_i = R_i^*\right)} \\ 0 \text{ otherwise} \end{cases} \tag{10}$$

The optimal levels of individual remittances R_i and care contributions T_i can be derived by maximizing utility while holding child i's migration decision constant (see Eq. 11). For $m_i = 1$ and $m_i = 0 R_i^*$ and T_i^* are the respective levels that balance

[9] I assume these decisions to be only infinitesimally spaced in time and repeated until an equilibrium is reached. As multiple equilibria are possible under certain conditions, the empirical estimation will allow for them. 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 would not yield any added advantage for the empirical analysis. In order to evaluate this assumption in the empirical Section 1 will also estimate sequential frameworks in which one child decides before the next and thereby has a first mover advantage.

marginal disutility from giving up individual consumption C_i (first term) in order to provide welfare to the elderly and the marginal utility feeding back from both the increase in the parent's health (second term) and consumption (third term) due to the transfer. Note that there is a unique optimality condition for R, but it will typically yield different optimal levels R_i^* for $m_i^* = 0$ and $m_i^* = 1$.

$$\begin{aligned} \left(\frac{\partial U_i}{\partial R_i}\middle| R = R^*\right) &= \frac{\partial U_i}{\partial C_i}\frac{\partial C_i}{\partial R_i} + \frac{\partial U_i}{\partial H_e}\frac{\partial H_e}{\partial R_i} + \frac{\partial U_i}{\partial C_e}\frac{\partial C_e}{\partial R_i} = 0. \\ \left(\frac{\partial U_i}{\partial T_i}\middle| T_e = T_e^*\right) &= \frac{\partial U_i}{\partial C_i}\frac{\partial C_i}{\partial T_i} + \frac{\partial U_i}{\partial H_e}\frac{\partial H_e}{\partial T_i} = 0. \end{aligned} \tag{11}$$

We can derive several predictions from the partial derivatives of the utility function. As before, higher profitability of migration increases 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 frailty ν now increases the likelihood that a child will provide care because the negative effect of frailty on health increases the marginal utility of care provision. If the marginal health improvement from providing care is higher than from providing money in the absence of a care market, this also decreases the likelihood that the child will migrate[10]. 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). If children are affected by their parents' well being ($\delta > 0$), the model will also replicate the result in Antman (2012a) that siblings' provision of remittances and care have an effect on i's optimal contribution (R_i^*, T_i^*). Because I assume a public good character of elderly health and consumption, the marginal utility from providing the same good will be smaller due to falling marginal utility from R and T when other siblings provide these as well. In contrast to my paper, Antman's paper does not focus on social interaction in siblings' migration decisions and treats migration decisions mostly as predetermined in her empirics. She discusses selection into migration briefly as a robustness check by including an inverse Mills ratio in her transfer regressions.

The degree to which children incorporate parental well being δ influences the optimal remittance and care levels because $\frac{\partial R_i^*}{\partial \delta} > 0$ and $\frac{\partial T_i^*}{\partial \delta} > 0$. Thus, the model also includes the standard arrangement found in developing countries where children provide income and care for their parents even if migration is unprofitable or infeasible. Even in the absence of migration, increasing δ can cause a specialization of adult children into caregivers and income providers; this depends on the domestic wage and hence their opportunity cost. When migration is lucrative, its profitability becomes part of the opportunity cost consideration. Then, ceteris paribus, higher δs can lead the marginal migrant to stay at home and specialize in providing care rather than migrate to increase individual income (specialization effect). On the other hand,

[10] Assuming $\frac{\partial H_e}{\partial T_i} > \frac{\partial H_e}{\partial R_i}$ for high levels of frailty seems realistic as care can benefit frail (but not necessarily sick) elderly people more than spending on, for example, medication. This assumption would make the decrease in migration unambiguous.

for any given δ, a migrating sibling can make migration more profitable for i and, as a result, induce them to migrate as well (network effect).

The core prediction of the model is that there is an endogenous effect that discourages migration due to the increasing marginal utility of staying at home as other siblings migrate. Several additional predictions of the model can be tested as well: First, incentives to specialize in providing care are stronger if elderly people are relatively frailer. Second, specialization of children is more common in more heterogeneous groups of siblings. Third, children provide more care in total to frailer parents. Fourth, the elderly parents' exogenous income and received remittances are substitutes. Fifth, opportunity costs matter in care provision.

4 Data and descriptives

To test the predictions of the model, I use a novel nationally representative migration dataset on children and elderly left behind (CELB) that was collected in Moldova in 2011 to 2012. This country is ideal for the analysis of social effects of migration because widespread poverty, high unemployment, and low migration costs result in very strong incentives to migrate. More than 21 % of the population are international migrants and official remittances alone make up about 23 % of the GDP (Worldbank 2011). Migration is often seasonal, which was fostered by the country's steps towards the regularization of flows during the 2000s (IOM 2013). Each year, many migrants return home and cease migrating, even after long spells abroad, and many Moldovans migrate for the first time. This is aided by their good command of the Russian language and the large overlap between Moldovan (Romanian) and other Romance languages, especially Italian. Furthermore, migration to Russia is mostly legal, and many native Romanian speaking Moldovans are able to claim European Union passports due to family ties in Romania. There is no typical age for the first migration or return, but generally migration rates are highest between the age of 18 years and about 45 years. In order to account for the large share of seasonal migrants, current migration is defined throughout the paper as international migration spells of at least 3 months in 2011. 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 using a specific questionnaire. Furthermore, there is detailed information on all household members. For each elderly person, the whereabouts and demographic information on all of their children were gathered.

In the majority of cases, the elderly people live without a spouse (55 %, see Table 1). Most of these are widows or widowers even though the age threshold used to define elderly people is a rather low 60 years. In this paper, I exclude elderly people without children from the sample (7.0 %). Of the remaining elderly, 23.3 % have one child and 58.1 % have two or three. Those in remaining fifth of our sample have four or more children. The data used for this paper comprise 4057 adult children of 1772 elderly persons in 1479 families. The small number of elderly people per family

Table 1 Characteristics of elderly and their families

Variable	All	No migrants	Some migrants	All migrants
Descriptives at the elderly level				
D(has help)	0.51	0.56	0.50	0.17
Hours of help received	6.62	7.17	6.63	2.80
D(receives remittances)	0.10	0.03	0.22	0.25
Log(remittances)	0.29	0.08	0.62	0.71
Age	69.06	69.32	69.09	67.08
Years of education	8.64	8.53	8.43	10.12
D(Female)	0.60	0.62	0.59	0.55
D(Married)	0.55	0.53	0.57	0.58
Household pensions in 1000 lei	12.2	12.4	12.1	11.2
Elderly person owned house in 1999	0.77	0.76	0.80	0.71
Family owned land in 1999 (in hectares)	0.89	0.80	1.11	0.80
Number of daughters in family	1.27	1.14	1.70	0.75
Number of sons in family	1.26	1.14	1.62	0.92
Number of elderly people in household	0.54	0.00	1.37	1.65
Number of children who migrated in 2011	1.48	1.49	1.47	1.48
Total number of elderly	1,772	1,105	511	156
Descriptives at the child level				
D(is a migrant)	0.21	0.00	0.41	1.00
Age	40.9	41.4	40.7	38.1
Years of education	11.3	11.3	11.2	12.1
Female	0.50	0.50	0.51	0.45
Number of siblings	2.24	1.93	2.88	1.07
Total number of children	4,470	2,515	1,698	257

Estimates based on CELB 2012. All but bottom rows provide means

is a consequence of the high mortality rates of elderly men before the age of 70 years that can be observed in many ex-Soviet republics. For comparison, in 2009, the life expectancy was 65.3 for men and 73.4 for women (MLSPF 2011). The survey covers all children of the elderly who were interviewed but not necessarily both parents of each adult child (e.g., because parents are divorced). To analyze siblings' interaction the sample is restricted to families with at least two adult children.

In a migration context, sample representativeness is always a concern as important groups that are affected may be unobserved. Although young children often emigrate with their middle-aged parents after those become permanent emigrants, elderly parents typically stay in Moldova, even if their adult children leave permanently. Hence, only seven elderly individuals from the original sampling frame could not be interviewed because they had migrated with their family. In 95 cases, elderly people were too frail to be interviewed personally and therefore are not covered in the sample.

Two of these individuals lived alone (accordingly, the household interviews are also missing) whereas 93 lived with their family members. This suggests that the worst affected elderly individuals typically receive care from their families. Elderly people living in residential institutions could not be sampled, but compared to other European countries, the share of the elderly who live in residential institutions is marginal.[11] There are less than 200 places in local public residential care institutions and a few hundred additional places at the national level (MLSPF 2012). Hence, the sample used in this paper excludes some very sick elderly individuals. At the same time, emigration does not lead to the large-scale attrition of elderly people who are sufficiently mobile to migrate with their children.

In our dataset, 79 % of the elderly who need help with basic activities such as dressing, body hygiene, or running errands report that they receive it when required. Thus, care is supplied to the large majority of the elderly in need. However, the remaining 21 % who lack a caregiver are a sizable proportion of the elderly population. When care is provided, it comes mainly from family members (95 %). In the majority of cases (78 %), this person also co-resides with the elderly individual. The main caregiver is typically an adult child (79.9 %) and only 5 % of the elderly rely mostly on a non-relative (typically a friend or neighbor). Only 0.4 % mainly receive help from a social worker. Caregiving by elderly people to their spouse is far rarer than it is in many rich countries, where life expectancy differs less between the spouses. Although about 20 % of the single children of elderly people migrate and are thus unable to provide care, the likelihood of all children migrating is substantially lower in larger families. Table 1 summarizes additional information on the characteristics of the elderly and their children that will be used in the regressions.

Moldova is the poorest country in Europe with an annual GDP per capita at purchasing power parity (PPP) 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[12] 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. By going abroad, average Moldovan workers can expect their income to increase at least threefold. According to public knowledge in Moldova, the expected wages for Moldovan migrants are an equate to 9500 to 16,200 US Dollars PPP per year. Remittances are mainly sent within families, with only about 3 % of remittances in our sample coming from non-relatives. There is a striking absence of monetary transfers from non-migrant children to their parents within the country, which is mostly a consequence of poverty. Only 0.5 % of the elderly reported any transfers from family members within the country, which suggests the role of non-migrant biological children in providing income to their parents, while possible in the model, is

[11] However, there is general coverage regarding health. The country introduced a universal health care system with mandatory health insurance in the mid-2000s so that, apart from the sometimes necessary bribes to health care workers, the treatment of acute disease at the district hospital or by a family doctor is free. This has probably decreased the share of income spent on health but it is not relevant for the main conclusions of this paper.

[12] Using the latest Penn tables' PPP conversion factor.

negligible in the empirical example. Rather than sending the money to their elderly parent directly, in less than 4 % of cases, we observe that migrant children send remittances either directly to other siblings who care for their parents or to a household in which another sibling resides with an elderly parent.

5 Siblings' peer effects in migration decisions

In Section 1, first explain how the social interaction of siblings in migration decisions that is proposed in the model can be estimated and then discuss the main results, their heterogeneity, and their robustness.

The literature on social interaction (Manski 1993; Glaeser et al. 2003) discusses several issues that arise when estimating peer effects in siblings' migration decisions. Manski distinguishes endogenous, exogenous, and correlated effects in his model of social interaction. The endogenous effect is the causal effect of other group members' or network members' outcomes on an individual's outcome. The exogenous (or contextual) effect denotes how an individual's outcome is causally affected by their peers' characteristics. Finally, the correlated effect emerges if members of groups are similar, for example, if group formation is endogenous or if a group is subject to common shocks. Several different approaches were used in the past to identify the effects of interest (Bramoullé et al. 2009).

In this paper, the main interest is in the endogenous effect, which captures how i's siblings' migration decisions affect i's likelihood of migrating. The exogenous effect would be a direct and causal effect of the siblings' characteristics on i's migration decision. In line with earlier work, it is ruled out in the model. However, the correlated effect matters greatly for any attempts to estimate peer effects. The correlated effect is the similarity in behavior of group members, which, in the case of this paper occurs because of the family-level correlation in observable and unobservable characteristics[13]. Even after ruling out, the exogenous effect any correlation of unobserved determinants of migration at the family level $\rho_\epsilon > 0$ that is unaccounted for introduces an upward bias into estimates of the endogenous effect.

A second hurdle to estimating whether and to what extent individual i takes their siblings' migration decisions into account are the two components of the endogenous effect that the model introduced. Assuming linear relationships, the migration of individual i is

$$\begin{aligned} m_{if} &= m(\alpha + \rho_1 M_{\neg if} + \beta \nu_f + \gamma P_{if} + \epsilon_{if}) \\ &= m(\alpha + \rho_1 M_{\neg if} + \beta \nu_f + \gamma(\zeta X_{if} + \kappa N_f + \rho_2 M_{\neg if} + \eta_{if}) + \epsilon_{if}) \qquad (12) \\ &= m(\alpha + (\rho_1 + \gamma\rho_2) M_{\neg if} + \beta \nu_f + \gamma(\zeta X_{if} + \kappa N_f + \eta_{if}) + \epsilon_{if}). \end{aligned}$$

Here, ρ_1 is the potentially negative specialization effect of i's siblings' migration on the marginal utility of i's migration and $\gamma\rho_2$ is the increase in the profitability

[13]In the literature on peer effects, the most common reason is selection into groups. Although the birth of an individual child into family f is exogenous to her siblings, observed and unobserved characteristics correlate at the family level. Hence, although group formation is not endogenous, growing up together has similar implications. This is in contrast to a random assignment to groups (e.g., in Sacerdote, 2001).

Table 2 Being a migrant by the number of siblings who are migrants

Number of siblings ($M_{\neg i}$)	Adult child is migrant		
	No	Yes	Total
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

Estimates based on CELB 2012. Row percentages reported throughout. Mean of "is migrant" is 24.5

of migration because a migrating sibling provides network access. Although we cannot disentangle the size of coefficients of the specialization effect ρ_1 and the network effect $\gamma\rho_2$, their joint effect $\rho_1 + \gamma\rho_2$ can indicate the relative size of both components.

According to the model, there can be a specialization effect. In this case, $\rho_1 < 0$. Theoretical considerations as well as evidence from the migration literature allow us to state that empirically the network effect is non-negative (hence, $\rho_2 \geq 0$). This implies that siblings who migrate and provide additional network access do not decrease the profitability of migration ceteris paribus[14]. Furthermore, it is clear that a higher profitability of migration (e.g., higher incomes abroad) does not decrease the likelihood of migration ($\gamma_1 \geq 0$). These assumptions are supported by descriptives. Table 2 shows the stylized fact that for individuals with more migrant siblings the likelihood of being migrants themselves is considerably higher. Although the likelihood of being a migrant is only 16.6 % for individuals who have no migrant siblings, it is 46 % when three or more siblings are migrants. The population average is about 25 %. Such a pattern in conditional migration probabilities can be generated by the model if there is indeed a network effect ($\gamma\rho_2 \geq 0$), if the correlated effect causes the profitability of migration to cluster at the family level, or if both these mechanisms are present.

If the sum of the specialization effect and network effect $\rho_1 + \gamma\rho_2$ is positive after accounting for correlated effects, this would suggest that enhanced network access dominates any incentive to specialize in providing care. Once it is strong enough, such positive peer effects could cause a breakdown of informal caregiving in family f by inducing chain migration. On the other hand, if the estimated peer effect was negative, this would be evidence in line with a strong specialization effect. Such a finding would suggest that in spite of the potential strength of a network effect, the incentives to specialize would dominate it. After accounting for the correlated effect, $\rho_1 + \gamma_1\rho_2 < 0$ is a sufficient condition for $\rho_1 < 0$ and thus the presence of a specialization effect.

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

5.1 Identification and estimation

Because of the presence of correlated and endogenous effects, standard estimators such as OLS or logit cannot be used. An estimator that is suited to estimating the peer effects in siblings' migration decisions needs to account for correlated effects due to family members' similarity. The fact that siblings from each family form separate groups in which every sibling is connected reduces the number of available estimators and identification strategies further (Bramoullé et al. 2009; Lee 2007; Davezies et al. 2009). In addition, migration decisions are binary choices and should be modeled accordingly, further reducing the menu of suitable estimators from which to choose. The estimator I use was introduced in Krauth (2006) and is designed to cope with binary choices and correlated effects. Adapting the notation from Krauth's paper, the binary migration decision $m_{if} = \{0, 1\}$ of individual i from family f is based on the utility function $u_{if}\left(m_{if}; M_f\right)$. Individual i migrates if

$$u_{if}\left(1; M_f\right) - u_{if}\left(0; M_f\right) = (\rho_1 + \gamma\rho_2)\,\bar{m}_f + \lambda x_{if} + \epsilon_{if} > 0, \qquad (13)$$

and stays otherwise. Here, M_f is the vector of all migration choices in family f, $\bar{m}_f$ is the share of migrants among siblings, x_{if} are the observable exogenous characteristics of individuals (e.g., age, years of education, and gender), and ϵ_{if} is an unobserved exogenous component, which is correlated across siblings from the same family. The endogenous effect can be identified by imposing a restriction on the correlated effect[15]. The baseline assumption regarding the correlated effect will be that the correlation of observable characteristics within each family (ρ_x) is a reasonable approximation of the correlation of unobservables (ρ_ϵ)[16]. As this assumption is strong and easily criticized, I will provide evidence that qualitative results regarding the peer effect do not change for any assumed correlation in unobservables on the interval (0, 1). Hence, for the stylized facts, the only required assumption on the correlated effect is $\rho_\epsilon \geq 0$, which means that in terms of their unobservable characteristics individuals are on average at least as similar to their siblings as to a random individual from another family in the sample. There are a number of additional assumptions required for the estimator. Peer groups must be non-overlapping, which is given in the case of groups of siblings with the same biological parents. Furthermore, as discussed above, contextual effects have to be ruled out. This assumption implies that unobserved characteristics that increase the conformity of behavior would result in estimates that are biased towards zero and thus too conservative, for example, a sibling with particularly good personal contacts who makes migration for siblings more profitable. The rather standard assumption is made that observables and unobservables are uncorrelated and the absence of correlation between sibling i's observables and sibling j's unobservables ($i \neq j$) is required for

[15]In some studies on peer effects randomization assures, it is approximately zero. In such cases, the assumption is often not made explicitly.

[16]For a detailed discussion of this assumption, please refer to Krauth (2006), Krauth (2005b), and Altonji et al. (2005).

Table 3 Estimated peer effects in migration decisions: Baseline results

	(1)	(2)	(3)	(4)	(5)
Estimator	Probit	Probit	s2	s2	s2
Equilibrium selection rule	n/a	n/a	Random	Low	High
Peer correlation (ρ_ϵ)	Assumed 0	Assumed 0	0.594	0.593	0.594
			(0.011)	(0.024)	(0.011)
Endogenous effect ($\rho_1 + \gamma\rho_2$)	Excluded	0.256	−0.506	−0.479	−0.496
		(0.007)	(0.051)	(0.105)	(0.048)
Age	−0.004	−0.003	−0.010	−0.011	−0.010
	(0.001)	(0.001)	(0.033)	(0.084)	(0.033)
Years of education	0.005	0.003	0.014	0.014	0.014
	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
D(Female)	−0.005	−0.005	−0.011	−0.012	−0.011
	(0.012)	(0.013)	(0.003)	(0.003)	(0.003)
Conversion factor for marginal effects	1	1	0.292	0.292	0.292
Sample Size	4,057	4,057	4,057	4,057	4,057

Estimates based on CELB 2012. Peer correlation (correlated effect) assumed to be 0 in probit in columns 1 and 2. Hence, the probit in column 2, which includes the share of siblings who migrate, is inconsistent. Column 1 excludes other siblings' migration decisions. Columns 1 and 2 report marginal effects calculated at the mean of the independent variables. "s2" denotes the routine of the same name in Krauth (2005a). Columns 3–5 assume $\rho_x = \rho_\epsilon$ for different equilibrium selection rules. Covariates are characteristics of individual children. Standard errors in parentheses

an unbiased estimate[17]. As multiple equilibria are possible in peer effect frameworks with correlated effects, a simple equilibrium selection rule is applied[18]. A simulated maximum likelihood (SML) estimator is then used to estimate the parameter vector $\theta_0 = (\lambda, \rho_1 + \gamma\rho_2, \rho_x, \rho_\epsilon, \mu, \sigma)$ consistently.

5.2 Results: Social interactions in siblings' migration decisions

Table 3 provides simple probit estimates (marginal effects reported) in columns 1 and 2 as well as the consistent estimates of the SML procedure in columns 3 to 5. In column 1, the migration status of siblings is excluded. In column 2, it is included but their observable and unobservable characteristics are omitted. The resulting estimate of the peer effect is positive, but a positive bias is expected because the unobserved

[17] In his paper, Krauth provides Monte Carlo evidence of the bias associated with breaking these assumptions. Additional tests using no observables that could have been affected by observing other siblings' unobservables (e.g., education) suggest that the stylized findings presented below are robust to this assumption.

[18] If multiple equilbria exist a random one is chosen with equal probability. As Brian Krauth pointed out via email, this "random" rule should be preferred if the endogenous effect could be positive or negative because "low activity" and "high activity" rules provided with his software are only well defined for positive peer effects. Multiple choices are tested empirically and yield similar results below. The same outcome is suggested by the Monte Carlo study in Krauth (2006).

positive determinants of migration, which are correlated at the family level, are included in the marginal effect of other siblings' average migration decision when using a standard discrete choice estimator. In columns 3 to 5, the estimates account for this correlated effect. The correlation in the three included observable characteristics of siblings (ρ_x) is about 0.6. Accounting for the correlation of unobservables at the family level does not affect the sign of the exogenous variables. Additional years of education are associated with a higher likelihood of migrating and women are less likely to leave. Compared to column 2, we can see that the estimated effect of education, which is highly correlated among siblings and with individual migration decisions, has far lower standard errors after accounting for the correlated effect.

Under the baseline assumption that the unobservable determinants of migration are correlated as strongly as the observables ($\rho_x = \rho_\epsilon$), the structural parameter of the endogenous effect ($\rho_1 + \gamma\rho_2$) is close to -0.5. The marginal effect can be approximated by multiplying the estimated coefficients with $\phi(\Phi^-1(mean(m_i)))$ from a standard normal distribution. These conversion factors are reported at the bottom of the table. The approximate marginal endogenous effect of increasing the share of siblings who migrate from zero to one for a representative individual with average propensity to migrate is a 14.8 percentage point decrease in the likelihood of migration. For the average family with three adult children (rounded), the migration of an additional sibling thus would decrease her other siblings' individual propensities to migrate by 7.4 percentage points. This is a strong effect when compared to the 21 % likelihood of migrating. The estimate varies only slightly with the equilibrium selection rule that is assumed.

5.3 Results: Heterogeneity

Analyzing heterogeneity in the strength of the peer effect can serve as a test of the model's predictions. So far, we have implicitly assumed that the peer effect is homogeneous across families. However, empirically, it may differ depending on the characteristics of siblings or the elderly. The model suggests the specialization effect should differ in terms of (1) the relative effectiveness in providing care, (2) the potential availability of siblings to substitute as caregivers, and (3) the frailty of the elderly. The following tests suggest that all of these predictions hold in the data.

If a particular gender is perceived to be better at caregiving, mixed groups of siblings should exhibit stronger specialization effects, resulting in more negative peer effects as long as network effects remain similar. As one important assumption of the estimator used in this paper is that all siblings from the same family are included in the estimation, we cannot split the male and female siblings up and reestimate effects. However, we can compare estimates for three groups: families with only female adult children, families with only male adult children, and families with a mix of both genders. As the probability of having a mixed-gender combination of adult children for any group of N adult children is approximately[19] $1 - 2/2^N$ while the probabilities

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

Table 4 Heterogeneity in peer effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Heterogeneity	Gender differences				Family size		Frailty
Subsample	All female	All male	Only mixed	Only mixed	1 or 2 siblings	$\geq$ 3 siblings	Elderly $\geq$70 years
Estimator	s2	s2	s2	s2	s2	s2	s2
Equilibrium selection rule	Random	Random	Random	Random	Random	Random	Random
Peer correlation	0.606	0.584	0.657	0.659	0.622	0.545	0.528
	(0.001)	(0.023)	(0.024)	(0.024)	(0.012)	(0.022)	(0.012)
Endogenous effect ($\rho_1 + \gamma\rho_2$)	−0.321	−0.361	−0.718	−0.724	−0.401	−0.452	−1.021
	(0.084)	(0.084)	(0.084)	(0.084)	(0.039)	(0.063)	(0.103)
Age	−0.010	−0.013	−0.005	−0.005	−0.012	−0.010	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Years of education	0.003	0.015	0.011	0.012	0.010	0.010	0.020
	(0.001)	(0.004)	(0.001)	(0.001)	(0.002)	(0.001)	(0.009)
D(Female)				−0.002	−0.005	−0.013	−0.013
				(0.003)	(0.004)	(0.004)	(0.004)
Conversion factor for marginal effects	0.311	0.315	0.293	0.293	0.295	0.286	0.281
Sample Size	566	548	568	568	2,482	1.575	1.867

Estimates based on CELB 2012. Estimates of peer effect based on subsamples of families where all siblings are female (1), all are male (2), and both males and females are present (3, 4), smaller (5) and larger (6) families, and families with older elderly (7). Column (4) included as comparison to Table 3. Mixed subsample drawn randomly from full sample of mixed household to fit the sample size and distribution of the number of siblings of groups in columns 1 and 2. $\rho_x = \rho_\epsilon$ assumed throughout. Estimated using "s2" routine by Krauth (2005a) with "random" equilibrium selection rule. Covariates are characteristics of individual children. Standard errors in parentheses of only males or only females are approximately $1/2^N$, I draw a random subsample with a similar distribution of the number of children and approximately similar size from the sample of mixed-gender siblings. Columns 1 and 2 in Table 4 suggest that there is no substantial difference in the strength of peer effects in groups of siblings that consist of only women or only men. For both all-female and all-male groups, the estimated effect is between −0.30 and −0.35. This is lower than in the baseline results of Table 3. In column 3, the endogenous effect is estimated in families with at least one son and at least one daughter. As expected, the estimated peer effect of −0.72 is considerably more negative than in columns 1 and 2 and in the combined sample in Table 3. Column 4, which includes the female dummy previously omitted in columns 1–3 in order not to artificially increase ρ_x, shows that this finding is not merely a consequence of the lower migration propensity of women. Hence, the more heterogeneous the relative effectiveness in caregiving and earning income abroad, the stronger the specialization effect.

The model predicts that if one sibling migrates the incentive to specialize as a caregiver will be higher for the fewer potential caregivers that are available. Columns 5 and 6 in Table 4 report the results for smaller and larger groups of siblings. The estimates suggest that the endogenous effect exists in both groups of siblings. In the subsample underlying column 5, the migration of one additional adult child increases the share of migrants among siblings by 0.75 in the small families and 0.28 in larger families[20]. Hence, the marginal reduction in a representative adult child's likelihood to migrate if one of her siblings becomes a migrant is 8.9 percentage points in small families and 3.6 percentage points in larger groups of siblings. Thus, the model's prediction that the availability of substitute caregivers does matter seems to be supported by the data.

Furthermore, the model suggests that the incentive to specialize will be larger in absolute terms among siblings with older parents because they are more likely to require care. Therefore, column 7 in Table 4 reports results only including children whose elderly parents are at least 70 years old. The predicted stronger specialization effect is supported by the more negative estimated peer effect compared to the baseline results in Table 3. The marginal effect of increasing the number of migrants among the other siblings by half is approximately -14.3 percentage points for children with older parents, respectively. Hence, the (potentially) more frail the elderly is, the stronger is the evidence of the specialization effect.

Having established several stylized facts regarding siblings' peer effects, Table 5 shows that the negative peer effect does not depend on assuming a particular level of siblings' unobservables. Generally, (Krauth 2005b) discusses that if the correlation of observed variables within a family is higher than the correlation of unobservables the estimated peer effect will be biased downward. If $\rho_x < \rho_\epsilon$, there will be an upward bias. The estimates are negative and very similar in size throughout Table 5. Assuming a low correlation of 0.1 in unobservables, the estimated endogenous effect

[20] $0.487 \cdot 1/1 + 0.513 \cdot 1/2 = 0.75$ and $0.424 \cdot 1/3 + 0.327 \cdot 1/4 + 0.133 \cdot 1/5 + 0.084 \cdot 1/6 + 0.025 \cdot 1/7 + 0.06 \cdot 1/8 = 0.28$, where the denominators are the number of siblings and the numbers with decimal points are the subsample shares of the respective family size.

Table 5 Estimated peer effects in migration decisions: Different identifying assumptions

	Assumed ρ_ϵ										
Assumed ρ_ϵ	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.99
Endogenous effect ($\rho_1 + \gamma\rho_2$)	−0.663†	−0.592	−0.564	−0.508	−0.486	−0.498	−0.494	−0.493	−0.504	−0.523	−0.504
	(0.048)	(0.047)	(0.048)	(0.045)	(0.049)	(0.048)	(0.044)	(0.043)	(0.035)	(0.027)	(0.008)
Age	−0.010	−0.011	−0.011	−0.012	−0.012	−0.011	−0.010	−0.010	−0.008	−0.006	−0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Years of education	0.014	0.015	0.016	0.016	0.016	0.015	0.014	0.013	0.011	0.008	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
D(Female)	−0.012	−0.012	−0.013	−0.013	−0.013	−0.012	−0.012	−0.011	−0.009	−0.007	−0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Sample size	4.057	4.057	4.057	4.057	4.057	4.057	4.057	4.057	4.057	4.057	4.057
Mean endogenous effect‡	−0.654	−0.597	−0.548	−0.508	−0.492	−0.494	−0.494	−0.498	−0.501	−0.518	−0.557

Estimates based on CELB 2012. Peer correlation (ρ_x) fixed at specified levels. Estimated using “s2” routine by Krauth (2005a) with ”random” equililbrium selection rule. Conversion factor for marginal effects as in Table 3, column 3. Coefficients and standard errors in parentheses. Sample comprises 4057 children. † is biased, see Krauth (2006). ‡ Mean taken over results based on 50 sets of random numbers per assumed ρ_ϵ. The endogenous effect is highly significant in each of these separate estimations is -0.592, while for a very high correlation of 0.9 it is -0.504[21]. Note that the coefficients of the exogenous variables are very similar for assumed peer correlations in unobservables of up to $\rho_\epsilon = 0.7$. Hence, the finding that the specialization effect dominates the network effect does not depend on a specific assumed $\rho_\epsilon > 0$.

Overall, the results suggest that there is some form of specialization in siblings' decisions to migrate and stay, which dominates any positive peer effect due to shared network access. Compared to siblings acting in autarky, this overall negative peer effect, which is also robust to including several family- and village-level characteristics, leads to lower equilibrium migration rates. This implies that the marginal effects of any policy measure or shock that affects migration will have a smaller effect on equilibrium migration rates than what would be suggested when omitting the social interaction of siblings.

6 Determinants of aggregate care and remittances

The model suggests that care provision is likely to remain relatively stable in spite of the attractive opportunities offered by migration if children feel responsible for their parents. This is a consequence of the increasing marginal utility from supplying care that lets children specialize as caregivers. The following section assesses whether increased migration at the family level indeed causes relatively small changes in aggregate care while increasing remittances[22] and analyzes whether the correlations between determinants of transfers are in line with the predictions. For policies meant to improve the situation of the elderly not only do peer effects in migration decisions matter, but also the aggregate the amounts and determinants of transfers that they receive are important. A decrease in equilibrium migration rates due to negative peer effects would have limited effects on the elderly if the remaining children supplied little care.

In the model, when children take into account their parents' welfare, the sum of their transfers of care and remittances is a function of their elderly parents' income, their frailty, the determinants of the profitability of migration, and the number of children who could potentially become caregivers. For remittances, the role of frailty depends on additional functional assumptions. Assuming a linear specification, we can estimate the extensive and intensive margins of transfers by Eq. 14. The intensive margin of care can be proxied by the hours of help received and that of remittances by their log. Dummy variables indicating positive transfers cover the extensive margin. Aggregate transfer levels of care T and remittances R are explained by a constant α, the instrumented migration decisions of children migration $M_f = \sum_i m_{if}$, a proxy of frailty η, exogenous income of the elderly I, average characteristics of children $\bar{X}$, and an error term ϵ. The monetary income of the elderly (i.e., pensions and

[21] These results are based on 100 simulations of each specification for exactly one set of random numbers per column. At the bottom of the table I report means over 50 different sets of random numbers.

[22] See Antman (2013) for a short test based on a simulation for the case of Mexico.

remittances) is pooled at the household level by source[23]. Care is mostly rival for spouses and is therefore evaluated separately for each spouse rather than pooled. Frailty ν_{ef} could be measured by standard clinical indicators of mobility (e.g., the instrumental activities of daily living (IADLs) by Lawton and Brody (1969)), but such measures may also be affected by children's transfers (see who use the same data (Böhme et al. 2015)). Therefore, I use age as a proxy for frailty[24]. As estimates of the determinants of aggregate transfer levels have to account for the differing attractiveness of migration (cf. Eq. 10), I use a two-stage instrumental variable approach for estimation.

$$\begin{aligned} T_{ef} &= \alpha^T + \phi^T M_f + \beta^T \nu_{ef} + \iota^T I_f + \theta^T \bar{X}_f + \epsilon^T_{ef} \\ R_f &= \alpha^R + \phi^R M_f + \beta^R max(\nu_f) + \iota^R I_f + \theta^R \bar{X}_f + \epsilon^R_f \end{aligned} \tag{14}$$

The profitability of migration is crucial for inter-family variation in migration outcomes. Exogenous variation comes from network size interacted with economic growth. The use of network-based instruments was pioneered by works such as Munshi (2003), McKenzie and Rapoport (2007), Yang (2008), and Woodruff and Zenteno (2007), who interact networks with different exogenous factors that are beyond the control of potential migrants. While (McKenzie and Rapoport 2007) exploit interactions between networks and local United States labor market conditions, we can exploit the large variation in 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 USA, 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 that the number of adult children per family and these families' investments in education are not affected by the prospect of migrating because the elderly in our data made 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. The village-destination country cell specific network size is then interacted with the average GDP per capita growth in the respective destination country between 2004 and 2010 in order to predict 2011 migration volumes at the family level in these villages[25]. As 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

[23] Thus, I abstract from the budget allocation literature, which deals with the ways budgets are shared and distributed within a decision-making unit. Additional sources of income that are endogenous and lie outside of the scope of the model, such as income from the sale of assets, are ignored. Monetary transfers from children within the country are not considered because they were hardly reported.

[24] 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. However, the proxy is 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 no equivalent exists when using age as a proxy for frailty.

[25] The formula is as follows: $\text{NetworkGrowthInteraction}_i = \sum_{j=1}^{J} \left[\frac{\text{migrants2004}_{i,j}}{\text{population2004}_i} \frac{1}{T} \sum_{t=1}^{T} \left(\frac{\text{GDP}_{j,t+1} - \text{GDP}_{j,t}}{\text{GDP}_{j,t}} \right) \right]$, where $t = 2004, ..., 2010$ are years, $j = 1, ..., J$ are all destination countries, and $i = 1, ..., I$ all sampled localities in Moldova. For more detailed discussion of the specific instrument see Böhme et al. (2015).

strength of the pull effect between villages. The number of sons and daughters and the network size of villages to the four main destinations in the 2004 census are used as controls. The migrant shares are included to control for initial village-level characteristics before the exogenous growth pull (2004-2010) and proximity to borders[26]. Their signs are not important for this paper. To be clear, the two-step procedure does not seek to point-identify the causal effect of an extra migrant on the level of transfers but rather provides the most straightforward way of introducing a selection correction into the transfer decision. Conditional on network size and family characteristics, the exogenous network-growth interaction only has an effect on the transfer size through the migration decision.

As a starting point, Table 6 reports simple logit and OLS estimates. The first row in Table 6 suggests that elderly parents with more migrant children receive more remittances and less care. The amount of care provided to the elderly increases with age at the extensive as well as intensive margin. For example, an 80-year-old parent would receive an estimated 4.8 h of additional care per week. Both additional daughters and additional sons are associated with a significantly higher likelihood of receiving care, but only additional daughters are associated with more hours of care (Table 6, column 2). However, if the additional child is a migrant, the absolute likelihood and levels of care are lower. Children who are on average younger or less educated are more likely to provide care and provide more hours. This is in line with the expected difference in opportunity costs between these groups, as older and more educated children are more likely to have a job and a family that require their attention. Elderly people with a living spouse receive less of any transfer, which is expected because a spouse can provide a substitute for help from children.

Most of these results remain similar after controlling for self-selection into migration by instrumenting the number of migrant children. First stage results are reported in Table 7. The network-growth-interaction IV is highly significant and has the expected positive sign, which reflects the fact that higher growth abroad as well as stronger networks exert a pull-factor for migrants. The estimates suggest that the families with the lowest IV value have 1.98 migrants less than the families with the highest values[27]. Conditional on the other covariates, the total number of children who migrate does not decrease with the age of the elderly parent. The education level of the elderly parent, which is a determinant of their pension income, wealth, and health status, is positively correlated to the number of migrants. Thus, the additional 0.15 migrants per year of education may indicate less need for transfers from children and higher profitability of migration, which would both be expected to result in higher migration of children. In line with findings from other countries, younger biological children, who often do not yet have children of their own, are on average more likely to migrate. The average years of education of children are insignificant but become statistically significant if parental education is left out of the regression (not shown). In addition, individuals from urban areas are more likely to migrate.

[26] Additional destination country shares can be included but they do not affect the results.

[27] The variable ranges from 2.3 to 691.7.

Table 6 OLS estimates of total transfers of care and remittances by adult children

	(1)	(2)	(3)	(4)
Dependent variable	D(receives help)	No. of hours received	D(Receives remittances)	log(remittances)
Estimator	Logit	OLS	Logit	OLS
	Marg. Eff.	Coefficients	Marg. Eff.	Coefficients
Endogenous variable				
Number of	−0.126***	−0.974***	0.069***	0.331***
migrant children	(0.017)	(0.356)	(0.008)	(0.041)
Characteristics of elderly				
Age	0.009***	0.239***	−0.001	−0.006
	(0.003)	(0.070)	(0.002)	(0.006)
Education	−0.004	−0.069	−0.005*	−0.014*
	(0.004)	(0.086)	(0.002)	(0.008)
D(married elderly person)	−0.098***	−1.961***	−0.025*	−0.121**
	(0.029)	(0.632)	(0.015)	(0.054)
Household pensions	−0.002	−0.048	−0.001	−0.002
	(0.002)	(0.038)	(0.001)	(0.003)
Characteristics of children				
Mean age	−0.008***	−0.168***	−0.003**	−0.006
	(0.003)	(0.053)	(0.001)	(0.005)
Mean education	−0.019***	−0.335***	0.000	0.003
	(0.005)	(0.116)	(0.003)	(0.009)

Table 6 (continued)

	(1)	(2)	(3)	(4)
Dependent variable	D(receives help)	No. of hours received	D(Receives remittances)	log(remittances)
Estimator	Logit	OLS	Logit	OLS
	Marg. Eff.	Coefficients	Marg. Eff.	Coefficients
No. of daughters	0.038***	0.775**	−0.018***	−0.064***
	(0.013)	(0.355)	(0.007)	(0.023)
No. of sons	0.054***	−0.135	−0.015*	−0.040
	(0.014)	(0.296)	(0.008)	(0.026)
Other				
D(urban)	0.059*	−0.782	−0.022	−0.125**
	(0.030)	(0.600)	(0.015)	(0.053)
Constant		1.550		1.141***
		(4.040)		(0.316)
Level of aggregation	Elderly	Elderly	Family	Family
Observations	1,749	1,749	1,479	1,479
Pseudo R^2 / R^2 adj.	0.054	0.047	0.122	0.090
Wald χ^2 or F test	118.2	8.4	127.8	8.3

Estimates based on CELB 2012. $*p < 0.1$; $**p < 0.05$; $***p < 0.01$, robust standard errors in parentheses. Dependent variables are restricted to transfers received from biological children. Age proxies frailty ν_{ef} in the model. Education and household pensions proxy income I_f. Mean age and education of children as well as the urban dummy pick up the opportunity cost component of $\bar{X}_f$, while the spouse dummy and the numbers of sons and daughters proxy the supply of potential caregivers

Table 7 IV estimates of total transfers of care and remittances by adult children, 1st stage

Estimator	(1) Baseline 2SLS Coefficients	(2) Baseline 2SLS Coefficients	(3) Bequest motive 2SLS Coefficients	(4) Bequest motive 2SLS Coefficients	(5) Robustness 2SLS Coefficients
Instruments and related controls					
Network-growth interaction (IV)	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Network-growth interaction x number of children (IV)					0.000
					(0.000)
Migrant share to Italy 2004	0.003*	0.002	0.003*	0.002	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Migrant share to Ukraine 2004	−0.013**	−0.010**	−0.013**	−0.010**	−0.013**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Migrant share to Romania 2004	−0.027***	−0.026***	−0.028***	−0.027***	−0.027***
	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Migrant share to Russia 2004	−0.014***	−0.013***	−0.014***	−0.013***	−0.014***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Characteristics of elderly					
Age of elderly person	0.004	0.002	0.004	0.003	0.004
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Education of elderly person	0.015**	0.014*	0.015**	0.014**	0.015**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
D(married elderly person)	−0.015	−0.023	−0.021	−0.031	−0.014
	(0.050)	(0.048)	(0.050)	(0.047)	(0.051)
Household pensions (in 1000 lei)	−0.002	0.000	−0.001	0.001	−0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
D(elderly person owned house in 1999)			−0.030	−0.014	
			(0.042)	(0.041)	
D(elderly person owned land in 1999)			0.021**	0.022**	
			(0.009)	(0.009)	
Characteristics of children					
Mean age of children	−0.008**	−0.008**	−0.009***	−0.009***	−0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mean years of education of children	0.005	0.006	0.003	0.003	0.005
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Number of daughters	0.225***	0.227***	0.226***	0.227***	0.203***
	(0.028)	(0.030)	(0.028)	(0.029)	(0.058)
Number of sons	0.232***	0.236***	0.229***	0.231***	0.210***
	(0.026)	(0.026)	(0.026)	(0.026)	(0.059)

Table 7 (continued)

Estimator	(1) Baseline 2SLS Coefficients	(2) Baseline 2SLS Coefficients	(3) Bequest motive 2SLS Coefficients	(4) Bequest motive 2SLS Coefficients	(5) Robustness 2SLS Coefficients
Other					
D(urban)	0.107**	0.105**	0.125***	0.126***	0.105**
	(0.047)	(0.046)	(0.048)	(0.046)	(0.048)
Constant	−0.284	−0.218	−0.286	−0.234	−0.233
	(0.289)	(0.279)	(0.286)	(0.275)	(0.313)
Level of aggregation	Elderly	Family	Elderly	Family	Elderly
Observations	1,744	1,475	1,740	1,471	1,744
R^2	0.17	0.17	0.17	0.18	0.17
F statistic 1st stage	13.9	15.9	13.1	15.1	13.5

Estimates based on CELB 2012. 2SLS first stage results, robust standard errors that cluster at the village level given in parentheses. *, **, *** denote $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively. Columns 1 and 3 refer to care outcomes in the following tables, columns 2 and 4 to remittances. The IV is defined on page 16

Furthermore, in column 5, 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. This turns out to be rrelevant. The additional covariates in columns 3 and 4 will be discussed below in Section 7.

The second stage results in Table 8 support the model's predictions regarding frailty, the availability of substitute caregivers, and the opportunity costs of children. The migration of an additional child does not significantly affect care provision, suggesting that children make up for the care formerly provided by their siblings. However, remittances increase as more children migrate. This suggests that the children who remain in the home country and specialize as caregivers potentially provide more care than they would have if none of their siblings had migrated. Columns 1 and 2 indicate that care correlates positively with the age of the elderly. This is in line with the model's prediction that frailer elderly people receive more care. The significant negative coefficients for married elderly people in columns 1, 2, and 4 indicate that elderly people with a living spouse require fewer transfers from their children, because elderly spouses can support each other. The correlation of remittances and pension income is insignificant, which may surprise as remittances and other sources of income should be substitutes, but is anomaly is explained by economically active elderly people in the sample; their exclusion (available on request) yields the expected significant negative correlation. In line with the opportunity costs of care predicted by the model, older and more educated children provide less hours of care to their parents, even after correcting for their likelihood of migration. The

Table 8 IV estimates of total transfers of care and remittances by adult children, 2nd stage

	(1)	(2)	(3)	(4)
Dependent variable	D(receives help)	No. of hours received	D(Receives remittances)	log(remittances)
Estimator	2SLS	2SLS	2SLS	2SLS
	Coefficients	Coefficients	Coefficients	Coefficients
Endogenous variable				
Number of children	0.253	−1.314	0.277***	0.745**
who migrate (2011)	(0.186)	(2.838)	(0.104)	(0.323)
Characteristics of elderly				
Age of elderly person	0.008**	0.249***	−0.001	−0.007
	(0.004)	(0.077)	(0.002)	(0.006)
Education of elderly	−0.008	−0.065	−0.007*	−0.017
person	(0.005)	(0.098)	(0.004)	(0.011)
D(married elderly	−0.094***	−1.952***	−0.028	−0.117**
person)	(0.036)	(0.612)	(0.018)	(0.055)
Household pensions	−0.001	−0.051	−0.001	−0.002
	(0.002)	(0.045)	(0.001)	(0.004)
Characteristics of children				
Mean age of children	−0.005	−0.176***	−0.001	−0.003
	(0.004)	(0.062)	(0.002)	(0.005)
Mean years of education	−0.019***	−0.365***	−0.001	0.001
of children	(0.007)	(0.125)	(0.003)	(0.009)
Number of daughters	−0.048	0.893	−0.057**	−0.158*
	(0.046)	(0.753)	(0.027)	(0.083)
Number of sons	−0.038	−0.005	−0.054**	−0.140*
	(0.045)	(0.762)	(0.025)	(0.076)
Instrument-related controls				
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
	(0.005)	(0.068)	(0.002)	(0.007)
Migrant share in Romania 2004	0.008	−0.048	0.003	0.013
	(0.007)	(0.169)	(0.003)	(0.010)
Migrant share in Russia 2004	0.000	−0.026*	0.000	0.001
	(0.001)	(0.013)	(0.000)	(0.001)
Other				
D(urban)	0.007	−0.770	−0.050**	−0.187**
	(0.053)	(0.842)	(0.023)	(0.073)
Constant	0.517***	4.319	0.313***	1.057***
	(0.185)	(4.330)	(0.113)	(0.335)

Table 8 (continued)

	(1)	(2)	(3)	(4)
Dependent variable	D(receives help)	No. of hours received	D(Receives remittances)	log(remittances)
Estimator	2SLS	2SLS	2SLS	2SLS
	Coefficients	Coefficients	Coefficients	Coefficients
Level of aggregation	Elderly	Elderly	Family	Family
Observations	1,744	1,744	1,475	1,475
Kleibergen-Paap test statistic (weak IV)	20.01	20.01	22.01	22.01

Estimates based on CELB 2012. 2SLS first stage results instrumenting the number of migrant children at the family level. Robust standard errors that cluster at the village level given in parentheses. *, **, *** denote $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively. For first stage of columns 1 and 2 see Table 7 column 1, for first stage of columns 3 and 4 please refer to Table 7 column 2. The IV is defined on page 17. Dependent variables are restricted to transfers received from biological children. Age proxies frailty ν_{ef} in the model. Education and household pensions proxy income I_f. Mean age and education of children as well as the urban dummy pick up the opportunity cost component of $\bar{X}_f$, while the spouse dummy and the numbers of sons and daughters proxy the supply of potential caregivers

number of sons and daughters has no significantly different effect on the provision of transfers. If anything, daughters provide a little more care than sons. Thus, the aggregate transfer allocation seems to be in line with the main predictions of the model. Hence, the interaction between siblings not only yields lower migration rates, as discussed in Section 5, but migration also does not seem to decrease the aggregate amounts of care available to the elderly and increases the amount of remittances they receive.

7 Robustness of core assumptions

Three core assumptions underlying the model are so crucial that they should be backed up empirically. First, are decisions taken simultaneously or sequentially? Second, is the design of care and remittances as family goods that are supplied due to other-regarding preferences of children sensible or is there evidence for more selfish motivations? Third, is non-cooperative decision making better suited than a cooperative approach?

An important assumption for the model and the applied estimation technique of peer effects is that the order of siblings in decision making is arbitrary. This would be violated if, for example, older siblings made their migration decisions first. This matters because of potential first-mover advantages and possible inefficiency, such as relatively less effective migrants and caregivers in equilibrium. Whether there is an order in decision making based on observables can readily be tested. For N siblings, we can write N equations of the form $m_{jf} = \alpha_j + \psi_{j1} m_{1f} + \psi_{j2} m_{2f} + ... + \psi_{jN} m_{Nf} + \gamma_j \zeta_j X_{jf} + \eta_f + \epsilon_{jf}$, where for each sibling with position $j = 1, ..., N$ in the birth order of family f, decisions depend on those siblings $k < j$ who were born earlier ($\psi_{jk} := \rho_{11} + \gamma_1\rho_{12} = 0$ for $j \leq k$). As in the peer effects estimation above, each individual is affected by their own age, education, and gender which are included in X_{jf}. Because of the sequential nature, the sources of the correlated effect, observed and unobserved, can be eliminated by imposing a unique fixed effect η_f at the family level[28]. Estimating such systems while assuming that birth order, an interaction of birth order and gender or the relative levels of education provides proxies for the order of decisions yields no stable results across different family sizes (available on request from the author). However, such stability, for example, firstborn children having a systematic influence on the decisions of their younger siblings in the case of birth order, would be expected if the respective observable characteristic underlie a sequential order in decision-making. The absence of a clear order in the Moldovan context is expected. Whereas in traditional, patriarchal societies males might decide about migration before women or older children before their younger siblings, heterogeneous migration opportunities in the case of Moldova are likely to have replaced such a "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 indicate that families from villages with strong networks to Italy more often have female migrants abroad (e.g., providing 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 led to a relatively level playing field by supporting the emancipation of women and providing public education for all children whereas in other countries parents may have had to decide to focus their investment on first-born males (cf. Hanushek 1992; Black et al., 2005; Conley and Glauber,2006). Furthermore, birth order is likely to play a small role because for most adult children in our Moldovan sample 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 in line with the descriptive facts (see also on circularity IOM, 2013) to model the migration decision as simultaneously taken.

Although in this paper, other-regarding preferences are assumed, fully self-interested children might be a better representation of behavior. In the remittance and care literature, two influential explanations for transfers under such circumstances are strategic bequest and service exchange motives. The strategic bequest motive suggests that transfers to elderly parents can be part of a strategic game where current transfers are made in order to ensure a future bequest (Bernheim et al. 1985). However, such a motivation for transfers to elderly parents depends on inheritable possessions. These could, for example, be landholdings, a house, or productive assets. Only 4 % of elderly households in our sample report having savings of at least 500 US dollars. Savings that existed were either wiped out during a high inflation phase after independence that lasted until 2001 or consumed as a consequence

[28]This implicitly assumes that the error is independent of the included individual characteristics after controlling for the family fixed effect, i.e., $cov\left[\epsilon_{jf}, \gamma_j\zeta_j X_{jf}|\eta_f\right] = 0$.

of high unemployment rates and low pensions. Thus, land, a house, or appliances are the only valuable possessions the typical elderly person can bequeath. I, therefore, include two variables for landholdings (in hectares) and ownership of a house or flat by elderly parents as additional covariates in the two-step regressions. I exclude families who own property or landholdings obtained after 1999, the year large-scale emigration in Moldova started, because these could have been financed by remittances. In rural areas, 67 % of the elderly owned some land in 1999[29]. The average rural landholdings of the elderly individuals are only 1.4 hectares. A positive correlation of landholdings and property with care provision and remittances could be expected if a strategic bequest motive was important for transfers. Columns 3 and 4 in Table 7 show the first stage with the additional two regressors. There is no significant correlation between migration and property ownership in 1999, but an extra hectare of land owned by the elderly increases the predicted number of migrants significantly. A likely cause is that rural families who possessed some land in 1999 are better off than their landless neighbors and therefore more capable of financing migration. In economic terms, this effect is tiny because the size of landholdings is very limited. The second stage is reported in Table 9. The results are very similar to those in Table 8 that were discussed above. The estimated effect of property ownership on the care and remittance variables is insignificant throughout columns 1 to 4 in Table 9. However, the estimated 1.5 percentage point higher likelihood and 0.39 additional hours of care per hectare of land suggest that landholdings play some role. The same is not true for remittances. Discussions in Moldova suggest that this finding can be accommodated by treating land as a source of subsistence income, that decreases the relative attractiveness of migration even though it can help finance migration. In this case, the specialization of a sibling as a caregiver may increase in spite of a small positive correlation of land and the number of migrants in the first stage. Considering that migration yields income gains of several hundred percent whereas landholdings are mostly small and the property of the elderly in poor condition, the prospect of inheriting land thus does not seem to be an important motivation for transfers.

Instead of being a consequence of individual optimization, observed migration and transfer decisions could be the result of collective decision-making as is often assumed by the new economics of labor migration. Although there is no straightforward test to discriminate between cooperative and non-cooperative models in the present context, the lack of income pooling between generations of a family as well as typically small family sizes provide a contrast to scenarios in which cooperative modeling is usually used. Still, remittances and care provision extend over the boundaries of households. A clear argument against collective decision-making is that only in a small number of cases do migrants send transfers to their caregiving siblings. Such transfers 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 as an outcome of a bargaining process. Thus, the lack of these kinds of transfers between siblings suggests that non-cooperative frameworks are better

[29] In urban areas, which include semi-urban suburbs, 26 % (0.9 hectares on average) owned some land.

Table 9 IV estimates of total transfers of care and remittances by adult children allowing for bequest motives, 2nd stage

	(1)	(2)	(3)	(4)
Dependent variable	D(receives help)	No. of hours received	D(Receives remittances)	log(remittances)
Estimator	2SLS	2SLS	2SLS	2SLS
	Coefficients	Coefficients	Coefficients	Coefficients
Endogenous variable				
Number of children who migrate (2011)	−0.010	−3.694	0.232	0.624
	(0.147)	(2.970)	(0.144)	(0.417)
Characteristics of elderly				
D(elderly person owned house in 1999)	0.015	−0.415	−0.000	−0.044
	(0.032)	(0.703)	(0.019)	(0.063)
Family owned land in 1999	0.015**	0.394**	−0.000	0.000
	(0.008)	(0.201)	(0.006)	(0.018)
Age of elderly person	0.009***	0.270***	−0.003	−0.011*
	(0.003)	(0.084)	(0.002)	(0.007)
Education of elderly person	−0.001	0.025	−0.006	−0.017
	(0.005)	(0.106)	(0.004)	(0.012)
Married elderly person	−0.095***	−2.113***	−0.015	−0.069
	(0.031)	(0.613)	(0.019)	(0.057)
Household pensions (in 1000 lei)	−0.004	−0.065	−0.001	−0.003
	(0.002)	(0.047)	(0.001)	(0.004)
Characteristics of children				
Mean age of children	−0.007**	−0.204***	−0.001	−0.001
	(0.003)	(0.058)	(0.002)	(0.006)
Mean years of education of children	−0.017***	−0.376***	−0.001	0.002
	(0.006)	(0.136)	(0.003)	(0.009)
Number of daughters	0.011	1.494*	−0.049	−0.136
	(0.036)	(0.763)	(0.035)	(0.100)
Number of sons	0.023	0.333	−0.048	−0.124
	(0.036)	(0.781)	(0.033)	(0.095)
Instrument-related controls				
Migrant share in Italy 2004	−0.002	0.002	−0.001	−0.002
	(0.001)	(0.029)	(0.001)	(0.003)
Migrant share in Ukraine 2004	−0.001	0.074	0.004**	0.009
	(0.005)	(0.078)	(0.002)	(0.007)
Migrant share in Romania 2004	0.003	−0.127	0.003	0.012
	(0.007)	(0.183)	(0.003)	(0.012)
Migrant share in Russia 2004	0.000	−0.026**	0.000	0.000
	(0.001)	(0.013)	(0.000)	(0.001)

Table 9 (continued)

	(1)	(2)	(3)	(4)
Dependent variable	D(receives help)	No. of hours received	D(Receives remittances)	log(remittances)
Estimator	2SLS	2SLS	2SLS	2SLS
	Coefficients	Coefficients	Coefficients	Coefficients
Other				
Urban	0.054	−0.114	−0.050*	−0.192**
	(0.055)	(0.955)	(0.028)	(0.086)
Constant	0.399**	3.327	0.400***	1.312***
	(0.173)	(4.859)	(0.135)	(0.397)
Level of aggregation	Elderly	Elderly	Family	Family
Observations	1,571	1,571	1,326	1,326
Kleibergen-Paap test statistic (weak IV)	12.99	12.99	11.67	11.67

Estimates based on CELB 2012. The instrumented variable is the number of children who were migrants in 2011. 2SLS first stage results, robust standard errors that cluster at the village level given in parentheses. *, **, *** denote $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively. For the first stage of columns 1 and 2 see Table 7 column 3, for the first stage of columns 3 and 4 please refer to 7 column 4. Dependent variables are restricted to transfers received from biological children. Age proxies frailty ν_{ef} in the model. Education and household pensions proxy income I_f. Mean age and education of children as well as the urban dummy pick up the opportunity cost component of $\bar{X}_f$, while the spouse dummy and the numbers of sons and daughters proxy the supply of potential caregivers. Excludes elderly who own property or land that was obtained since 1999

suited to family-level analyses of care and remittances in the migration context when households are small.

Furthermore, there is little evidence supporting service exchange motives, either simultaneous as sometimes discussed in the remittance literature (Rapoport and Docquier 2006) or intertemporal (e.g., Arrondel 2006). Under a service exchange, motive providing or having provided transfers would be necessary to receive remittances and care today or in the future. Both descriptive statistics and a more theory-based approach can be used to assess the extent to which service exchange matters. The likelihood of receiving help from children or grandchildren is not significantly correlated with whether the elderly person ever had primary responsibility for a grandchild.[30] An analytical test for the service exchange motive 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). Instead of relying on the mere observation of simultaneously occurring services and transfers, it evaluates the elasticity between the two indirectly. Service exchange should involve a shadow price

[30] Of those who ever had primary responsibility 56 % receive care themselves. Among those who never had such responsibility, 54 % receive care. Elderly individuals without grandchildren and those who report not to need help are excluded.

for current or past services provided by the elderly that is determined by the elderly individual's outside options, namely their income level without remittances. The reasoning is that under service exchange motives an elderly person would demand a higher shadow price for services if they had higher income. Pension income provides a good proxy for current income. At the same time, it is highly correlated with past income, thereby also allowing a test for intertemporal service exchange within the limits of this correlation. Hence, a positive correlation between pension income and transfers of remittances or care to the elderly would provide support for service exchange. This is not found. As discussed pension income is weakly negatively correlated with remittances, suggesting service exchange is not the motivation for transfers from children.

The models' core assumptions about decision-making and the motivation for transfers thus seem to be more plausible than the alternatives that were discussed in this section. Thus, the model seems to be based on plausible assumptions and provides good predictions of behavior.

8 Summary and implications

In international migration, very large wage differentials can be reaped by migrants. 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. In this case, elderly people are left behind on their own. Any incentives such as wage differentials that cause migration are amplified if the social interaction of siblings causes an increase in all other siblings' likelihood to migrate once an adult child from a family migrates. The attractiveness of migration decreases endogenously, if the marginal utility of staying and providing care to elderly parents increases as other siblings migrate. In this paper, I find that the network effect of siblings' sharing of opportunities abroad is dominated by the opposing endogenous specialization effect due to the incentive to provide physical care for elderly parents. As a result in the majority of families with more than one child at least one of them stays with elderly parents to provide care if required, even though the monetary incentives are strongly in favor of migration for each child individually. Social interaction is found to lead to larger absolute changes in migration rates when the incentives are greater, for example, when elderly parents are in greater need of care. Thus, informal social security networks of families are robust in spite of high opportunity costs, and they shield elderly people from some of the negative social consequences of large scale emigration. Thus, the model adds to the understanding of unobserved migration costs and helps explain why relatively few people become migrants even when low legal barriers to migration and large wage differentials coincide.

Although the negative social interaction stabilizes informal security networks and thereby helps to ensure that elderly people receive care, the model also 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 the moral obligations of children to provide care to their parents is not particularly effective under these circumstances because it can only raise the psychological cost of migration and thereby discourage the marginal migrants from leaving. Other forms of raising obstacles to migration have a similar effect. The theoretical and empirical results in this paper suggest that affecting how transfers from adult children are allocated is a far more promising intervention. Specifically, the logical response to missing markets in care is to foster development of these markets; for example, by establishing conditions under which the quality of private and public formal care are monitored. Migrants face strong incentives to spend parts of their income earned abroad to buy formal care for their parents. This would allow potential migrants to work their way out of poverty while ensuring that care is provided for their needy parents. In 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 countries.

The model assumes a family-based informal provision of care and income to the elderly and the absence of market for care, which is the dominant situation in most developing and emerging countries. The Moldovan case investigated in this study is special because it provides a setting in which the income differentials involving typical migration destinations are very high compared to other large bilateral migration flows and migration costs are low by international standards. This suggests that the incentives to migrate and leave elderly parents behind without care are stacked against the finding of a strong specialization effect. Hence, the findings from this paper can be interpreted as evidence of the robustness of families' informal security arrangements even under extremely strong incentives to migrate.

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