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Blood and gender bias in informal care within the family

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Abstract

This paper deals with the question of the relative contribution of spouses to the long-term care (LTC) needs of their dependent parents and parents in-law. Starting from a theoretical model and using SHARE data, the paper focuses on the role of gender and blood relationships as well as the effect of differential opportunity costs within the couple. The results tend to confirm the existence of gender and blood biases in the level of informal care provided by each spouse, while their wage does not seem to play a large role. When we consider the relative level of informal care by spouses, the gender and blood biases are confirmed. Furthermore, the wage ratio is negatively related to the informal care ratio. These results imply that informal care and private insurance coverage may depend on the gender composition of children, which may justify differentiated public LTC transfers.

JEL classification D1 · D6 · H21 · H31

Keywords Informal long-term care · Couple decision-making · Altruism

1 Introduction

Long-term care (LTC) is becoming a major concern for policy makers. Following the rapid aging of our societies, LTC needs are expected to grow, but there is a lot of uncertainty as how to finance those needs. In EU countries, LTC public spending has been estimated to be 1.7% of GDP as of 2019 (European Commission (2021)). Similar figures have been reported for the US and other OECD countries (OECD

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(2021)). In OECD countries, on average, 68% of long-term care recipients aged 65 or more received care at home in 2019 and many of them received some care from family members. Then, the figures on LTC spending tend to underestimate the total amount of care provided, as they do not include informal care.

Family solidarity has traditionally been one of the main pillars of LTC provision. While family informal care is by its nature difficult to measure, some attempts have been made in the literature (see Norton (2016) for a review). Recently, Barczyk and Kredler (2019) provided precise estimates, suggesting that informal care is very important. According to their results, the proportion of informal care hours on total hours of care is 22% in Northern European countries (Belgium, Denmark, the Netherlands and Sweden), 81% in Southern countries (Italy and Spain), and 43% in Middle countries (Austria, France and Germany). In the US they estimate a proportion equal to 54%. Reinhard et al. (2019) report that, in the US, the opportunity cost of informal care is higher than the private cost of LTC services. These numbers, together with societal changes (women's labor force participation, proportion of divorced or childless elderly) suggest that the role of the family in the provision of LTC may be reaching a ceiling. At the same time, despite the substantial risk related to LTC, the insurance market remains rather thin, and public institutions find it hard to take the relay.¹

As we detail below, a large share of informal care is provided by children. This paper focuses on the question of how couples share the provision of informal care to their parents and in-laws. More precisely, we study whether the caring behavior depends on the gender of either the caregiving child or the care recipient parent, as well as on the fact that the caregiving is a child or a child-in-law. Given the predominant role of the family in providing informal LTC, it is crucial to grasp its determinants. Understanding who is more likely to provide care and how caregiving decisions are taken within families is crucial to understand the impact of informal care on both the caregivers and the dependent. On the one hand, if the family composition can affect the amount of care received, this may create heterogeneous needs for formal care. This heterogeneity should be considered by market agents and policy makers to design optimal contracts and policies. On the other hand, in addition to forgone income, it is well documented in the literature (see, among others, Pezzin and Steinberg Schone (1999), Di Novi et al. (2005), and Wilson et al. (2007)) that caregiving imposes substantial health costs on caregivers. These costs have only been recently acknowledged by policymakers, as well as the need to correct for potential gender gaps.² Again, understanding how the caregiving burden is allocated within families proves to be a starting point for meaningful public action.

The question of the informal assistance provided by a married couple to dependent parents is an issue that was widely analyzed in the 1980s and 1990s, mainly in the Anglo-Saxon world (see for instance Pinquart and Sorensen, 2011 for a meta-analysis of the results). This theme, somewhat less present in the late 1990s and early 2000s in academic research, reappeared in the early 2010s and it is mainly based on

¹ For a survey on the so-called LTC insurance puzzle, see Cremer et al. (2012).

² For instance, the 2022 European Care Strategy recently announced by the European commission explicitly takes into account the well-being of both care receivers and caregivers. See <https://ec.europa.eu/social/main.jsp?langId=en&catId=89&furtherNews=yes&newsId=10382>

Japanese data (see for instance Hanaoka & Norton, 2008). The question of the distribution of care for dependent parents within a couple, and more specifically the potential gender and blood bias, are to be analyzed through the prism of the opportunity cost. Indeed, there is a clear trade-off between paid work and parent care provided by daughters or sons and daughters-in-law or sons-in-law.

After a review of the existing empirical literature, we introduce the theoretical model of collective choice within couples and we then test it with SHARE data that cover 17 European countries. The hypotheses to be verified out of the theoretical model are the following. Do children tend to assist their parents more than their in-laws? Do children provide more informal care to the parent (or in-law) sharing their gender than to the parent (or in-law) of the opposite gender? Theoretically, the answer to these questions may depend on the severity of dependence and on the gender of and the blood relationship of the caregiver and the care receiver, since these dimensions may affect both the cost and the productivity of informal care. The income of the caring children matter as well, as it relates to the opportunity cost of caring. We explore whether this cost plays a role on the level of care and on the relative levels of care provided by a couple.

As we will discuss in the following section, the existing empirical literature produces contradicting results. The debate on the role of gender and parenthood as well as the opportunity cost factor in the allocation of informal LTC within the couple still appears to be open. In this paper, we produce some additional evidence. The main novelty of this paper is the use of European (SHARE) data to address the question of blood and gender in informal care to dependent elderly. SHARE data were not particularly suitable for this type of the analysis so far, since information on informal care was collected only at the household level. Starting from the 6th wave (run in 2015), however, data on informal care is collected at the level of the individual caregiver. This allows to analyze more closely the behavior of couples and the attitudes towards in-laws.

Our results on informal care decisions by children in couple show that they are affected by gender and blood relationships. Looking at the intensity of caregiving, the number of weeks devoted to informal care is higher if the dependent has the same gender as the potential caregiver, and if the caregiver and the dependent have a blood relationship. Moreover, daughters who helped her own mother are the most intensive caregivers. We cannot confirm a negative correlation between income and informal care. Complementarity of caregiving inside the couple appears to be strong, while there is arguably some substitutability of assistance provided to parents or in-laws. Finally, when relative care inside the couple is considered, the gender and blood bias are confirmed and we observe a statistically significant impact of the relative income on the relative level of informal care of the spouses.

2 Related Literature

Informal care for the dependent elderly is mostly provided by spouses and children. While there are variations in the role of different caregivers, the evidence is consistent across countries. Klimaviciute et al. (2017) focus on Europe and find that that almost 11% of the children of elderly parents in SHARE provide some care to their

parents. Using data from the US National Long-Term Care Survey and Informal Caregiver Survey, Wolff and Kasper (2006) find that, for dependent receiving informal care, primary caregivers were mostly children (41.3%), followed by spouses (38.4%), and other family or friends (20.4%). Finally, Li et al. (2022), perform a study on Canadian dependent elderly and report that men are more likely to be taken care for by their spouse than the other way around (52%), while women are more likely to be taken care by children or children-in-law (60%) than men. Given the importance of intergenerational caring, there exists a multitude of studies focusing on the relationship between parents and their own children. Children-in-law and especially daughters-in-law are a hidden group of caregivers that is sometimes overlooked in empirical studies. There exist however a number of qualitative (Guberman, 1999; Long et al., 2009) and quantitative studies that analyze the issue of care by in-laws. The results concerning the importance of blood relationships is mixed and depends on the gender of the spouse having a blood relationship with the dependent. Overall the results of these studies point to the fact that the strength of the blood relationship may depend on the gender of the caregiver and of the dependent, even if the results are mixed and depend on the context considered in each study.

A number of studies compare caregiving patterns to parents and to in-laws. The general finding is that dependent individuals receive more care (or are likely to receive more care) from their own children than from their children-in-law. For instance, Peters-Davis et al. (1999), using a small US sample, hypothesize that biological children are more likely to provide informal care than children-in-law but show similar intensities of care once the caregiving decision is taken. Finley et al. (1988) find that filial obligation differs depending on whether the dependent is the mother, the father, or an in-law. This can be explained by varying costs, rewards and levels of reciprocity. Using a meta-analysis that integrates the results from 168 empirical studies (mainly from the 1980s and 1990s) on differences between caregiving spouses, adult children, and children-in-law, Pinquart and Sorensen (2011) find that few differences emerge between children and children-in-law, but children-in-law perceive the relationship with the care recipient as less positive and they report fewer uplifts of caregiving.

When it comes to the interaction between blood and gender, the empirical evidence suggests that women and men tend to respond differently to the strength of blood relationships. Ingersoll-Dayton et al. (1996) find that gender explains in part the extent of care provided to parents and parents-in-law. Shuey and Hardy (2003) examine how American couples manage their assistance to aging parents using the Health and Retirement Survey. They find that couples are more responsive to the needs of the wife's parent(s) than to those of the husband's parents. Lee et al. (2003), based on a small sample, show that women contact and assist parents more than in-laws, whereas for men there is no difference. Pillemer and Suitor (2006) highlight that emotional closeness and similarity of gender and attitudes were the main determinants of care. Henz (2009) examines whether and how couples share the provision of informal care towards their parents using four waves of the British General Household Survey. The more care is required, the more likely people care for their parents-in-law. More sons-in-law than daughters-in-law provide care but, once involved, daughters-in-law provide on average more hours of care than sons-in-law. Own full-time employment reduces both men's and women's caring for their

parents-in-law, and men's caring drops further if their wife is not in the labor market. These findings suggest that daughters-in-law often take direct responsibility whereas sons-in-laws' caregiving depends more on their wives' involvement. Using Japanese data, Hanaoka and Norton (2008) find that the effects of children's presence vary substantially with gender and marital status, and do not find evidence that daughters-in-law take on primary caregiving responsibilities, in line with Hashizume (2000) and Long and Harris (2000). Turning to the quality of care, Nishi et al. (2010) show that there may be a survival "penalty" for older Japanese women who are cared for by their daughters-in-law.

In our paper we will also consider the impact of the (relative) education and income of spouses on the allocation of informal care within the couple. The aforementioned study by Hanaoka and Norton (2008) finds results that are consistent with the fact that children with a lower opportunity cost of time are more likely to provide care than children with higher opportunity cost. Carmichael and Charles (2003) find that carers (both men and women) are less likely to be working than otherwise similar non-carers. In the case where they have a paid job, they earn significantly less. Sousa-Posa et al. (2001) show that men's allocation of time was invariant to changes in socio-economic factors while women's allocation was dependent on them, assuming that unobservable traits such as abilities and motivations may play an important role with regard to market participation decision. Using Australian panel data for the period 2001–2007, Leigh (2010) shows that the impact of caregiving on labor market outcomes and life satisfaction takes several years to manifest itself and that the causal effect is quite small. Dautzenberg et al. (2000) demonstrate that employment significantly reduces the chances of becoming a caregiver. However, they also determine that there is no competition between hours of care provided to parents care and employment. Doty et al. (1998) determine that women's employment outside the home does not reduce severely the supply of informal caregivers. However, disabled elders with employed female primary caregivers tend to obtain more hours of care from other sources. The authors explain this result by the fact that the role of primary caregiver tends most often to be assumed by individuals at a stage of life when they are likely to have left the labor force. On the policy side, Colombo et al. (2011) observe that, because intensive caregiving is associated with a reduction of labor force attachment, many OECD countries have implemented policies to support family carers with the view of mitigating these negative impacts.³

This paper aims at filling in a gap in the literature by providing an analysis of recent European data. The SHARE dataset is particularly suitable to study informal care within couples since data are collected for different members of the same household. We thus focus on the caregiving behavior of married couples facing the long-term care needs of elderly parents. We leave aside a number of interesting dimensions. For instance, while we control for the presence of children's siblings in our empirical specifications, we do not explicitly model the strategic interactions between siblings, which have been shown to be empirically relevant (see for instance Checkovich and Stern (2002) and Fontaine et al. (2009)). Similarly, we do

³ Paid care leave in Belgium, respite care in Austria, Denmark or Germany, flexible work schedules in Australia and the United States or counseling/training services in Sweden (Colombo et al., 2011)

empirically not consider descending intra-family caregiving, namely childcare by grandparents, which may also display gender or blood biases. For instance, Brunello and Yamamura (2022) find a gender bias in childcare, with maternal grandmothers being more likely to provide childcare. While this study is complementary to ours, we focus on parents in relatively bad health and we abstract from descending help and transfers.

3 Theoretical Model

In this section, we develop a model of informal care decision. This decision is taken collectively within couples. We consider a couple of middle aged individuals with a dependent parent (parent of one and therefore in-law of the other). They collectively allocate their time between leisure, work, and informal care in order to maximize a weighted sum of their utilities. The weights reflect the respective bargaining power of the spouses. The utility of each spouse internalizes the utility of the dependent parent, which positively depends on informal care provided by each member of the couple. The productivity of informal care depends on the level of care provided by each spouse and on the blood and gender relationship between each caregiver and the dependent.⁴

We adopt the collective approach of household behavior to describe the supply of informal care provided by couples. This approach to household behavior relies on two hypotheses: (i) each individual in the household has specific preferences and (ii) the outcome of the decision process is Pareto efficient.⁵ Each spouse has to allocate one unit of time between labor, leisure l_i , and caring a_i . The utility of spouse i is given by

$$U_i = u(c_i) + v(l_i) + \alpha\beta H(a_1, a_2; \varepsilon_j, \eta_j),$$

where $u(\cdot)$ and $v(\cdot)$ are strictly concave utility functions. We define consumption as $c_i = w_i(1 - a_i - l_i) + R_i$. Besides consumption each spouse obtains utility for contributing a certain amount of time to the welfare of their parent. We use the subscript $i = 1, 2$ for the gender of the caregiver. Without loss of generality 1 stands for the wife and 2 for the husband. They have a wage income of w_i and non-earned income R_i ($i=1, 2$). We denote the degree of altruism toward the dependent parent by β . We also allow for differences in the productivity of informal care who depend on the relationship between the caregiver and the dependent. In a nutshell, this captures the fact that informal care might more productive if the caregiver and the care recipient have the same gender, and if they share a parenthood by blood or adoption. the objective of the empirical part is to test whether such biases prevail. Finally we denote the severity of the dependency by α . The parent's welfare $H(\cdot)$ is represented

⁴ We use the term "blood" for short to mean parenthood by blood but also by adoption.

⁵ See the seminal paper of Chiappori (1988). In the collective model we use, agents are assumed to be egoistic about their own private and public consumption and disregard their spouse's welfare. However, this setting can be extended to allow for altruism, as in Vermeulen (2002). We do not expect our results to be radically affected by this alternative assumption, since in the collective model the family choice already takes into account all individual's preferences, according to their weights.

by a quasiconcave function that is homogeneous of degree lower than 1 in a_1 and a_2 . This function also depends on the parameters ε_j and η_j , which depend on the relationship between the dependent and the caregiver (we provide more detail below). We use the subscript $j = m, f, ml, fl$ for the type of dependent. Taking the viewpoint of the wife, we have the following possibilities:

1. The dependent is the mother of the wife: $j = m$;
2. The dependent is the father of the wife: $j = f$;
3. The dependent is the mother-in-law of the wife : $j = ml$;
4. The dependent is the father-in-law: $j = fl$.

In the collective choice model, the couple maximizes the following Lagrangian with respect to c_1, c_2, a_1, a_2, l_1 , and l_2 :

$$\begin{aligned} \mathcal{L} = & \varphi[u(c_2) + v(l_2) + \alpha\beta H(a_1, a_2; \varepsilon_j, \eta_j)] + \\ & (1 - \varphi)[u(c_1) + v(l_1) + \alpha\beta H(a_1, a_2; \varepsilon_j, \eta_j)] \\ & - \mu[c_1 + c_2 - R_1 - R_2 - w_2(1 - a_2 - l_2) - w_1(1 - a_1 - l_1)], \end{aligned} \quad (1)$$

where φ denotes the bargaining power of the husband and μ is the Lagrange multiplier associated with the budget constraint faced by the couple. The parameter φ may be a function of the wage gap ($w_2 - w_1$) and/or the non-earned income gap ($R_2 - R_1$). The severity of the dependence is captured by the parameter $\alpha > 0$. We adopt the following functional form for H :

$$H(a_1, a_2) = a_1^{\varepsilon_j} a_2^{\eta_j}.$$

The marginal productivity of each spouse's caring time depends on the caring time of the other spouse and on the parameters ε and η . These parameters are specific to the gender of the caregiver, as well as on the gender of the care receiver and on the blood relationship. Thus, in our model, the time devoted by each spouse to caring does not translate into the same value of care of care. We also assume that $\varepsilon_j + \eta_j < 1$.⁶ This implies that $H_{12}(a_1, a_2) > 0$. In words, the two informal care levels are complements: the cross derivative of a_1 and a_2 is positive. The idea here is that informal care is a common enterprise of the couple. Spouses invest their time in activities that are not identical (and thus substitutable) but engage in a division of labor depending on their relative productivities. The overall well-being of the care receiver depends on the presence of both caregivers. For example, one may think of one child grocery shopping for the elderly while the other takes care of the cooking.

The parameters ε_j and η_j capture the productivity of the wife's and the husband's informal care, which depends on the blood and gender relationship. We conjecture a gender effect implying that informal care is more productive when the caregiver and the dependent have the same gender. Wives are more productive in caring of their mother than their father and their mother-in-law than their father-in-law, i.e. $\varepsilon_m > \varepsilon_f$ and $\varepsilon_{ml} > \varepsilon_{fl}$. The opposite is true for husbands, i.e. $\eta_{fl} > \eta_{ml}$ and $\eta_f > \eta_m$. Furthermore, we also hypothesize a blood effect: care is more productive when the caregiver and the dependent are related by blood, i.e. $\eta_m < \varepsilon_m$, $\eta_f < \varepsilon_f$, $\eta_{ml} > \varepsilon_{ml}$, and $\eta_{fl} > \varepsilon_{fl}$.

⁶ We assume decreasing returns to obtain a non degenerate solution.

(remember that the subscript refer to the relationship of the wife to the dependent parent). These inequalities are to be tested in our empirical analysis.

In the appendix A1 we show that

$$\frac{a_1}{a_2} = \frac{\varepsilon_j w_2}{\eta_j w_1}. \quad (2)$$

We can rewrite this equation as:

$$\frac{a_1}{a_2} = E_j W > 0.$$

E_j is the measure of the gender and blood bias, with the inequalities $E_1 > E_2$, $E_3 > E_4$, $E_1 > E_3$, and $E_2 > E_4$ to be tested. In words, we expect the a_1/a_2 to be higher when informal care is provided to a dependent who is a woman and who is the mother of the wife. One has the lowest a_1/a_2 if the dependent is the wife's father-in-law. The ranking of E_2 and E_3 will depend on the relative size of the two biases. The ratio $W = w_2/w_1$ is the relative opportunity cost of the informal care provided by the husband. The severity of the dependence and the non-earned income do not appear in the expression for a_1/a_2 .

We are not just interested in explaining a_1/a_2 but also in analyzing the absolute levels of informal care provided by each spouse. Using the FOCs presented in the appendix A1, we obtain the following expressions:

$$(1 - \eta_j - \varepsilon_j) \ln a_1 = (1 - \eta_j) [\ln \varepsilon_j - \ln w_1] + \eta_j [\ln \eta_j - \ln w_2] + \ln \alpha + \ln \beta - \ln \mu. \quad (3)$$

In the same way, we obtain:

$$(1 - \eta_j - \varepsilon_j) \ln a_2 = \varepsilon_j [\ln \varepsilon_j - \ln w_1] + (1 - \varepsilon_j) [\ln \eta_j - \ln w_2] + \ln \alpha + \ln \beta - \ln \mu. \quad (4)$$

The absolute level of informal care of each spouse increases with the severity of dependence, and decreases with the incomes of both spouses. Furthermore, note that μ represent each spouse marginal utility weighted by the bargaining weight. Then, the absolute level of informal care decreases with the marginal utility of consumption of the spouse. It also decreases with the relative welfare weight of the spouse. Not surprisingly, informal care depends on the parameters ε and η . If the caregiver and the dependent have different genders, then the characteristics of the partner (wage, blood relationship with the dependent, same gender) have a greater impact on the individual level of informal care. This comes from the fact that the two levels of informal care are complements in our model.

The analysis so far has focused on a couple of working children. It is possible to show that the main trade-offs are preserved for retirees, except that informal care (and relative informal care) do not depend on wages, but only on non-earned income and bargaining weights.⁷ We have also assumed that there was just one parent to be taken care of by the couple. In reality there can be up to four dependent parents.⁸ In the appendix A2, we analyze the case where there is more than one dependent parent.

⁷ These results are available upon request.

⁸ This will be explained in detail when dealing with the sample construction

The main trade-offs are preserved, and we find that the level of help to one parent negatively affect the level of help to other parents.

From the model above we obtain a number of hypotheses. The ones that we are particularly interested in, and that we want to test empirically, pertain to the gender and blood relationships. More precisely, we obtain the following hypothesis:

Hypothesis 1 The absolute level of informal care increases in case of parenthood by blood or adoption and if the caregiver and the dependent have the same gender.

Hypothesis 2 The relative level of the wife's informal care increases in the blood relationship of the wife with the dependent, and with the fact that the dependent is a woman.

4 Data and Sample

4.1 Data

Our data comes from SHARE, the Survey of Health, Ageing and Retirement in Europe, a free-access database created in 2002 in order to study the phenomenon of Ageing in Europe. The survey, inspired by HRS and ELSA (the USA and UK counterparts of SHARE), brings together many disciplines (epidemiology, economics, sociology, psychology and demography). The survey is large (from 2004 until today, 530,000 in-depth interviews with 140,000 people aged 50 or older from 28 European countries plus Israel) and longitudinal. Thus, SHARE is the largest pan-European social science panel study providing internationally comparable longitudinal micro data which allow insights in the fields of public health and socioeconomic living conditions of European individuals. Data on intergenerational support (financial and time), physical and mental health, financial assets diversity, housing, social contacts, and activities (work, retirement, leisure) is available. Waves 3 and 7 of SHARE are different and concern retrospective information (work career, house moves, early childhood, etc.). In this paper, we use specifically the 6th wave of the survey, conducted in 2015. We do not use other waves because only the sixth wave distinguishes between informal care given by each spouse of the household.⁹

The question in the 6th wave (run in 2015) is asked differently because it is asked to each person in the household interviewed.¹⁰ This allows us to analyze whether and how married children share the provision of informal care to their parents and in-laws. In the case of married children, we are able to observe whether the caring behavior varies with the gender of either the caregiving child or of the care recipient

⁹ Former waves of SHARE also question people aged 50 and over. Their partner was also interviewed if they agreed, but some questions (care, financial and children issues for instance) were only asked to one of the two.

¹⁰ The question is: "Which family member from outside the household, friend or neighbour have you helped in the last twelve months?" The answer possibilities remain the same as in former waves: 1. *Less than once a month*; 2. *At least once a month*; 3. *At least once a week*; 4. *Almost every day*. Although the question concerns individuals outside the household, we observe cohabitation situations and respondents who declare providing care to their cohabiting dependent (in-law) parent(s).

parent and with the fact that the caregiver is a child or a child-in-law. In addition, the information relative to the frequency of informal care provided by children or children in-law is available in this sixth wave. We decided to present the descriptive ascending informal care data in Section 4 according to this specification. In the econometric analysis (Section 5), we decided to transform these data to take into account the true intensity of help behind these categories in terms of weeks. “No help” translates into 0, “Less than once a month” becomes 1; “At least once a month” becomes 2; “At least once a week” becomes 8 and “Almost every day” becomes 52. This choice will be better explained in Section 5.

4.2 Sample Selection Criteria

One of the goals of this study is to examine whether and how married children share the provision of informal care for their parents and in-laws. For this purpose, we initially construct a sample of responding caregivers, which we will call children in the reminder of the paper (this comprises both children and children in-law). Overall, 68,231 individuals are interviewed during the sixth wave of SHARE.¹¹ The question of whom benefits from care is asked up to three times to each respondent who may mention parents, in-laws, (grand)children, siblings, friends, family, relatives or others. 26.9% of respondents declare providing some informal care to at least one person. Since our research focuses on caregiving relationships across two generations, we select respondents with at least one living parent or parent in-law. We then create a sample of potential care receivers, which include all the living parents and parents in-law of the children. We will denote them generically by parents.

It is important to remark that the question we chose to use concern the provision of care by caregivers, and not the care received by potential care receivers. In other words, the children in our samples are the respondents to the survey. The reason for this choice is that there is much more information about the respondents than about their family members.¹² This implies that the information available about the parents in our sample is reduced. We have information on whether they are alive, on their health (on a scale ranging from poor to excellent) and whether they have a living partner. We also have partial information on their location (relative to the respondent child) and their education level.

In order to have a sample of similar parents receiving help, we decided to restrict our sample to child-parent relationships in which the parents are in fair or poor health. Indeed, as we do not have a precise measure of the parents’ dependency status, we wanted to be able to analyze the distribution of help within a couple to parents with the same health characteristics. Like Flawinne, et al. (2023), we therefore choose to consider only child-parent pairs with parents in fair or poor health and do not consider in our sample parents in good, very good or excellent health. In our sample, we finally have 16,278 child-parent pairs for which the parent is in fair or

¹¹ Only 51 persons refuse or are not able to answer the question in Footnote 7.

¹² Indeed, if we had looked at the downward care-receiving relationship, we would not have had any information on the income of the children. Only education is available for the children of respondents and there is no precise information on the couple relationship of these children and on whether these children help their in-laws.

poor health or died in the last twelve months.¹³ Our observations are child-parent pairs and that is why several individuals appear several times in the sample. Each child respondent in the selected sample has on average slightly more than 1.38 elderly parents to potentially care for. Indeed, in our sample, a parent appears twice and a child can appear four times. In fact, if both parents and both parents-in-law are alive, they will appear in four observation points, each of them with a different relationship (“mother”, “father”, “mother-in-law” and “father-in-law”). Four observation lines will be present for the child’s partner, with the the “mother” now being the “mother-in-law”, the “father” the “father-in-law”, the “mother-in-law” the “mother”, and the “father-in-law” the “father.” We will apply the classical methods of clustering of standard errors in our empirical analysis to take into account these cases.

In Table 1 we present the summary statistics of the main variables by geographical European region and for the whole sample.¹⁴ Looking first at the characteristics of the parents, we find that the majority (72.2%) are women. By construction, we have the same number of mothers and mothers-in-law (fathers/fathers-in-law) in our sample since (the mother of a child is the mother-in-law of that child’s partner, and so on). Only 36.0% still have a partner and parents from Southern Europe in our sample appear to be the healthiest ones. Parents cohabit more often with children in Eastern or Southern countries than in Center or even more than in Northern region where this arrangement is quite rare. We observe expected differences in terms of levels of parents’ education across regions.¹⁵

Turning to the characteristics of the 11,808 potential caregivers, 50.1% of children are women¹⁶ and they are on average 59.3 years old. Depending on the region, the levels of individual income, education and employment status vary a lot. Indeed, children from South and East Europe have a lower level of education then their counterparts in North and Central Europe. We observe a similar gradient with respect to individual income, which corresponds to the sum of wages and different benefits (such as pensions or unemployment benefits).

4.3 Variables and Descriptive Statistics

As mentioned above, the aim of the empirical analysis is to test whether and how married children share the provision of informal care between their parents and in-laws. In these relationships, the main dependent variable is the intensity of the children’s informal care (a_1 and a_2 in the theoretical model). In the empirical

¹³ Since the question on informal care covers the last 12 months, and since it is well known that periods of dependence occur in the last moments of life, we felt it was essential to keep parents or parents-in-law who died in the last 12 months in the sample. They represent 4.8% of the sample (see Table 1).

¹⁴ We dropped Israel from the sample in order to have homogeneous regions.

¹⁵ The ISCED (International Standard Classification of Education) was created by UNESCO in order to facilitate comparisons of educations statistics and indicators across countries. “left Low”right is from ISCED 0 (pre-primary education) to 2 (lower secondary or second state of basic education), while “left High”right ranges from ISCED 5 (post-secondary non-tertiary education) to 6 (second stage of tertiary education). It should be noted that for these two last variables, the amount of missing information is significant.

¹⁶ The figure is not 50% because there are very few homosexual couples and that women live longer than men.

Table 1 Overall descriptive statistics. Full sample and geographical regions sub-samples

Covariates/Regions ^a		North	Center	South	East	All
Parents						
Blood relationship	<i>Mother (%)</i>	33.8	35.2	35.4	39.0	36.1
	<i>Father (%)</i>	16.2	14.8	14.6	11.0	13.9
	<i>Mother-in-law (%)</i>	33.8	35.2	35.4	39.0	36.1
	<i>Father-in-law (%)</i>	16.2	14.8	14.6	11.0	13.9
Gender	<i>(% of women)</i>	67.6	70.4	70.8	78.0	72.2
Partner	<i>Yes (%)</i>	40.8	37.5	40.6	26.9	36.0
Health	<i>Fair (%)</i>	58.2	58.8	71.1	60.5	62.9
	<i>Poor (%)</i>	34.1	34.8	26.2	35.5	32.3
	<i>Dead last year (%)</i>	7.7	6.4	2.7	4.0	4.8
	<i>Cohabiting (%)</i>	0.4	4.5	12.2	12.3	8.5
Distance from Child ^b (missing: <i>N</i> = 794)	<i>Max 25 km (%)</i>	47.0	56.3	66.6	55.3	58.3
	<i>[25, 100 km] (%)</i>	26.5	16.0	9.0	15.9	14.9
	<i>More than 100 km (%)</i>	26.1	23.2	12.2	16.5	18.3
Education ^c (missing: <i>N</i> = 2064)	<i>Low (%)</i>	61.9	60.9	95.3	56.4	68.7
	<i>Medium (%)</i>	23.8	29.9	3.2	37.2	24.2
	<i>High (%)</i>	14.3	9.2	1.5	6.4	7.1
<i>N</i>		1752	5318	4968	4240	16278
Children						
Individual Income	<i>Mean (euros)</i>	56351	52129	18929	12446	32120
Employment Status	<i>Working (%)</i>	66.5	50.5	40.1	49.5	49.2
Education ^d (missing: <i>N</i> = 137)	<i>Low (%)</i>	15.4	20.4	55.6	19.2	29.8
	<i>Medium (%)</i>	39.0	49.0	27.7	60.6	44.8
	<i>High (%)</i>	45.6	30.6	16.7	20.2	25.4
Gender	<i>(% of women)</i>	50.2	50.1	50.0	50.1	50.1
Age	<i>Mean</i>	59.8	59.3	59.7	58.8	59.3
<i>N</i>		1296	3856	3454	3202	11808
Ratio (<i>N</i> Parents/ <i>N</i> Children)		1.35	1.38	1.44	1.32	1.38

^aSample by country: Denmark (DK, 1054) & Sweden (SW, 698) = North; Austria (AT, 650), Belgium (BE, 1174), France (FR, 1126), Germany (DE, 1408), Luxembourg (LU, 370) & Switzerland (CH, 590) = Center; Greece (GR, 1386), Italy (IT, 1720), Portugal (PT, 586) & Spain (ES, 1276) = South; Croatia (CR, 668), Czech Republic (CZ, 962), Estonia (EE, 1364), Poland (PL, 444) & Slovenia (SI, 802) = East

^bInformation about distance missing for 132 parents from North; 346 from Center, 148 from South and 168 from East

^cInformation about education missing for 32 parents from North; 280 from Center; 1270 from South and 482 from East

^dInformation about education missing for 14 children from North, 54 from Center; 30 from South and 39 from East

analysis, we focus on the ascending informal care that covers a year of the respondents' life (last 12 months in the question). This window of time may seem short, but the average duration of long-term care needs is quite limited, usually below two years (see for instance Fuino & Wagner, 2020).

Table 2 summarizes the distribution of informal care propensity in our sample. We have that 56.2% of care receivers are mothers, 17.4% are fathers, 19.7% are mothers-in-law and 6.7% are fathers-in-law. Mothers are always the category receiving the highest level of informal care, and fathers-in-law the lowest. Table 2 also provides the propensity by region, and the ranking is similar regardless of the region considered, except in the South, where fathers receive informal care more frequently than mothers-in-law.

Table 3 provides information on the intensity of caregiving. The table presents the data from the point of view of potential care receivers. In other words, it shows the probability of receiving different levels of informal care from a given child, conditional on being the child's mother, father, mother-in-law or a father-in-law. The first row indicates the percentage of parents receiving no care (81.0%), some care but less than once a month (3.1%), at least once a month (4.4%), at least once a week (7.1%) or almost every day (4.4%). We find a North/South-East gradient: parents are more likely to receive some informal care in the North but mainly at low intensity. Indeed, looking at the intensity of care, the North/South-East gradient is now reversed. Parents receiving help every day from their children are more numerous in the East, South and Center than in the North. We can thus confirm the heterogeneity of the intensity of care across regions already pointed out in the literature (see also Klimaviciute et al., 2017). Looking from the second to the fifth row of this table, we

Table 2 Distribution of informal care propensity across care-receiving parents

Relations/Regions	North	Center	South	East	All
Mother	50.8	55.3	57.1	61.1	56.2
Father	19.5	17.7	19.1	13.8	17.4
Mother-in-law	22.2	19.7	17.1	20.0	19.7
Father-in-law	7.5	7.3	6.7	5.1	6.7

Table 3 Descriptive statistics on informal care by child-parent relationship type and regions

Covariates/ Intensity of care	No care (%)	Less than once a month (%)	At least once a month (%)	At least once a week (%)	Almost every day (%)
All	81.0	3.1	4.4	7.1	4.4
Parent					
<i>Mother</i>	70.4	4.2	6.4	11.4	7.6
<i>Father</i>	76.3	3.5	5.9	9.1	5.2
<i>Mother-in-law</i>	89.6	2.3	2.4	3.7	2.0
<i>Father-in-law</i>	90.9	2.2	2.6	2.9	1.4
Region					
<i>North</i>	68.7	10.0	10.1	9.3	1.9
<i>Center</i>	77.5	3.6	5.4	9.2	4.3
<i>South</i>	88.0	1.0	1.7	4.6	4.7
<i>East</i>	82.4	2.3	3.9	6.4	5.0

Table 4 Descriptive statistics on extensive informal care by child-parent relationship with respect to interest variables

Covariates/Care		Percentage of parents helped	Mother (%) helped)	Father (%) helped)	Mother-in- law (%) helped)	Father-in- law (%) helped)
Parents' characteristics						
Partner alive	<i>Yes</i>	14.4	24.8	19.0	7.4	6.4
	<i>No</i>	21.5	31.1	32.1	11.3	13.9
Health	<i>Fair</i>	15.3	24.9	18.1	8.4	5.9
	<i>Poor</i>	20.5	31.2	27.1	11.4	9.7
	<i>Dead last year</i>	56.2	82.0	70.7	29.7	43.1
Child's characteristics						
Individual Income	<i>1st tercile</i>	16.5	26.2	17.3	8.6	6.2
	<i>2nd tercile</i>	20.0	30.2	25.8	12.1	10.2
	<i>3rd tercile</i>	20.4	32.3	28.1	10.7	10.4
Employment Status	<i>Not working</i>	17.5	27.3	21.0	10.0	8.6
	<i>Working</i>	20.3	31.7	25.5	10.7	9.5
Education	<i>Low</i>	13.8	20.5	18.8	7.7	7.1
	<i>Medium</i>	19.1	30.3	23.3	10.1	8.4
	<i>High</i>	24.7	39.6	29.5	13.9	11.6
Gender	<i>Men</i>	14.1	22.6	20.7	8.1	8.9
	<i>Women</i>	23.8	34.7	25.7	13.4	9.3
Age	<i>20-54</i>	18.7	28.1	22.2	10.9	8.3
	<i>55-64</i>	19.6	30.5	24.1	10.3	9.4
	<i>65+</i>	17.1	28.8	27.7	9.8	9.4

observe that informal care is more directed towards women and blood parents (or adoptive parents), irrespective of the region.

The explanatory variables involved in the relationship to be tested are the blood relationship, the gender bias and the child's wage and the wage of the other spouse. Table 4 summarizes the interactions between these variables.¹⁷

The parameters w_1 or w_2 of our theoretical model correspond to individual incomes (wages or benefits) of women and men respectively. We use terciles in order to present the descriptive results, but in the regression we use the continuous variable. We do not have data on wealth at the individual level (available at the household level) or non-labor income, which may affect the bargaining power of children within their couple. We use education as a proxy. For the level of education of the children, we used the ISCED 1997 classification in order to create 3 categories,

¹⁷ Appendix A3 extends the first column of the Table 4 but present the summary statics at the level of regions in order to highlight potential differences in terms of correlation between interest variables and care propensity (receiving / giving). There are no clear cut results and the numbers are in line with the distribution of help presented in Table 3.

as explained in section 4.2 for parents' education (see Footnote 12). Among parents who have a partner, only 14.4% are helped while 21.5% of single parents receive some informal care. We observe that this difference is higher when male parents are concerned. Not surprisingly, we observe that the propensity to receive informal care increases as the health of the partner deteriorates. This is particularly true in the last months of life of the dependent. Around 56.2% of parents deceased in the previous year have received informal care from their children. Again, these figures are higher for women than for men. Since women live longer and are generally younger than their husbands, men more often receive informal care from their wife. This spouse, once dependent, will be cared for by his/her children or children-in-law. Looking at the characteristics of children, daughters or daughters-in-law have higher propensity to provide informal care than sons or sons-in-law (variable women in the second part of the table), except when the parent is the father-in-law. The age of the children does not seem to have a clear influence on the help provided, in contrast to the employment status for which we have a counter-intuitive result since those who are working seem to help more than those who are no longer in the labor market. The more the child is educated or the higher their income bracket, the higher the propensity to care. Again, this could be counter-intuitive in terms of opportunity cost.

However, Table 5 nuances these surprising outcomes. This table presents the distribution of the intensity of informal care across observable characteristics of parents and children. We observe indeed that the fraction of children who help almost every day (last column) is slightly higher for the lowest level of education. The same holds for the employment status (5.3 vs. 3.5%) and especially to our main variable of interest, the income terciles (from 5.1% of children helping almost every day in the first tercile to 3.3% in the third tercile).¹⁸

As expected, in Table 5, we observe that the intensity of informal care from the child increases with the deterioration of the parent's health and if the parent is alone. Daughters and daughters-in-law provide more intensive care than sons or sons-in-law. Indeed, we observe that 6.3% of women help almost every day (vs. 2.4%) and 9.2% take care of a parent at least once a week (vs. 5.0% of men). Finally, we look at how partner characteristics are correlated with the informal care provided by each child.

These variables relate to our theoretical model, which predict that the bargaining power and the relative opportunity cost of providing informal care within the couple will affect the allocation of informal care across spouses. Table 6 presents the distribution of a child's help as a function of five key covariates. We observe that, if the partner is in the third income tercile, a child provide more informal care than if this partner was in the first tercile. This gives a first indication of a potential division of care/labor based on the opportunity cost of work.

This obviously needs to be confirmed empirically. We also have that, if the partner no longer has a living parent, a child will help more intensively (5.4% vs 3.2%). Finally, we see a certain complementarity of informal care within the couple: the more the partner helps, the more (intensively) a child will help. Obviously, this will have to be controlled by the health of the parent and on other parental characteristics, which will be done in the next section.

¹⁸ These income terciles have been constructed by country.

Table 5 Descriptive statistics on intensive informal care by interest variables

Covariates/ Care		No care (%)	Less than once a month (%)	At least once a month (%)	At least once a week (%)	Almost every day (%)
Parents' characteristics						
Partner alive	<i>Yes</i>	85.6	3.2	3.7	5.1	2.4
	<i>No</i>	78.5	3.1	4.7	8.2	5.5
Health	<i>Fair</i>	84.7	2.8	3.9	5.8	2.8
	<i>Poor</i>	79.5	3.1	4.4	7.7	5.3
	<i>Dead</i>	43.8	7.5	10.3	19.9	18.5
	<i>last year</i>					
Child's characteristics						
Individual Income	<i>1st tercile</i>	83.5	2.0	3.3	6.1	5.1
	<i>2nd tercile</i>	80.0	3.3	4.0	7.5	5.2
	<i>3rd tercile</i>	79.6	4.0	5.4	7.7	3.3
Employment Status	<i>Not working</i>	82.5	2.5	3.5	6.2	5.3
	<i>Working</i>	79.7	3.7	5.2	7.9	3.5
Education	<i>Low</i>	86.2	1.8	2.2	4.9	4.9
	<i>Medium</i>	80.9	2.9	4.4	7.6	4.1
	<i>High</i>	75.3	5.1	6.8	8.7	4.1
Gender	<i>Men</i>	85.9	3.0	3.7	5.0	2.4
	<i>Women</i>	76.2	3.3	5.0	9.2	6.3
Age	<i>20-54</i>	81.3	3.5	4.6	7.2	3.4
	<i>55-64</i>	80.4	3.0	4.5	7.5	4.6
	<i>65+</i>	82.9	3.0	3.5	5.5	5.1

5 Results

The unit of observation in our sample is the parent-child pair. Before studying the informal care decision within couples by looking more specifically at the role of gender and blood biases, we consider the provision of informal care to dependent parents. We use different empirical methods in order to establish the relationships between assistance provided, type of relationship, and potential opportunity cost. We believe that the gender of the parent and child and their blood relationship are likely to be exogenous to the choice of providing informal care. What is more problematic is the potential endogeneity of our controls, such as income. This may affect the interpretation of the related coefficient, as well as introducing a potential “left bad controls”right issue. We have tackled the problem in two ways. First, to make sure that bad controls do not affect our main coefficients of interest (namely the ones on gender and blood relationships), we introduce controls in a sequential way. Second, we try to correct for the endogeneity of income using different econometric

Table 6 Descriptive statistics on intensive informal care with respect to partner's characteristics

Covariates/Care			No care (%)	Less than once a month (%)	At least once a month (%)	At least once a week (%)	Almost every day (%)
Partner's characteristics	Income	<i>1st tercile</i>	85.7	2.6	3.2	5.0	3.5
		<i>2nd tercile</i>	79.9	3.2	4.4	7.7	4.8
		<i>3rd tercile</i>	77.2	3.7	5.6	8.7	4.8
	Working	<i>Yes</i>	80.0	3.7	5.1	7.4	3.8
		<i>No</i>	82.2	2.5	3.5	6.8	5.0
	Education	<i>Low</i>	85.9	1.8	2.4	5.0	4.9
		<i>Medium</i>	81.6	3.1	4.2	7.3	3.8
		<i>High</i>	74.5	4.8	6.8	9.3	4.6
		<i>Missing (N = 182)</i>	79.7	3.3	7.7	4.4	4.9
	Has a parent alive	<i>Yes</i>	82.1	3.2	4.4	7.1	3.2
		<i>No</i>	80.2	3.0	4.3	7.1	5.4
	Helps the Parent also	<i>Yes</i>	65.0	6.0	8.4	13.0	7.6
		<i>No</i>	84.8	2.5	3.4	5.7	3.6

techniques. We opted more precisely for the method of Lewbel (2012), providing a heteroscedasticity-based estimator for linear regression models containing an endogenous regressor (here the income or relative income) when no external instruments or other such information is available. We use an OLS model, and our dependent variable is the intensity (or relative intensity) of informal care. This variable is expressed in terms of weeks. “No help” translates in to a value of 0; “Less than once a month” into one 1; “At least once a month” into 2; “At least once a week” into 8; and “Almost every day” into 52.¹⁹

The issue of inflated zero values in our dependent variable is potentially reduced by the selection of our sample, which only includes children-parents pairs where the parent is in bad health. However, two other empirical methods dealing with zero-inflated dependent variables are also considered as robustness tests. The first one is a Tobit model, where the dependent variable is continuous but is observable on a certain interval. The model thus lies halfway between a linear regression (where the endogenous variable is continuous) and a qualitative model. The second one is a Ordered Logit model, which is suitable for ordinal dependent variables. The initial answers given by the children, from 0 (No care) to 4 (Almost every day) fit this empirical model. In the Tobit model, the dependent variable is measured by weeks of care, while in the Ordered Logit model, it is measured by the 0 to 4 values described above.

We then focus on couples, and more precisely on the relative importance of each spouse in the provision of care to dependent parents. Again, we are interested in how

¹⁹ Unfortunately, except for the waves 1 and 2 of SHARE, there is no information on the number of hours devoted to informal care. In these waves, the question on informal care is asked for the whole household and there are no distinctions between members of the couple.

blood relationships and gender affinity affect the importance of the wife's informal care with respect to the husband's. We arbitrarily decide to put women's informal care in the numerator of relative informal care and men's informal care in the denominator. In this analysis of relative care, we will focus only on couples for whom information on the informal care provided to parents/in-laws is available and therefore we only study situations where at least one child provides assistance to at least one parent. This is why the sample for section on the relative informal care decreases significantly. Descriptive statistics will precede an OLS and 2SLS analysis with the Lewbel method.

5.1 Provision of Informal Care

In the first empirical model, presented in Table 7, the dependent variable is informal care, measured in weeks of help. We present results of OLS regressions adding controls sequentially. We cluster the standard errors by child because we observe repeated observations of each child in the data.²⁰ In column (1), we first consider a baseline specification that includes variables in line with the theoretical model. We analyze the effect of the blood relationship (measured by a dummy equal to 1 if the dependent and the carer have a blood relationship), the gender bias measured by a dummy equal to 1 if the dependent and the caregiver have the same gender) and the child's income. In this first specification, estimated coefficients go in the expected direction: positive and significant for the gender and blood bias and negative for the income. On average, a child provide 3.260 weeks a year of informal care more to their own parents than to their in-laws. In column (2), we add a dummy equal to one if the potential care recipient is a woman and interaction terms between blood and gender bias in the specification. We observe that the income coefficient is no longer significant. We can also see that the fact that the potential care recipient is a woman has a direct negative effect on the provision of informal care. However, women seem to drive the gender bias results: women tend to provide more care to women and more particularly daughters provide more care to their mothers. Overall, gender and blood biases persist but the woman/woman and the daughter/mother relationship are particularly intense.

In the third specification (3) with country fixed effects, we add other controls for the parent. Not surprisingly, we find that the worse the health of the parent, the more care they receive. If the parent still has a partner, the child is less likely to provide informal care. In this case, as it is established in the literature, the main carer is likely to be the partner and that is why we observe this negative and significant relation (−1.490 weeks). We also add characteristics for the child: employment status of the child, categories of education, age, health, whether they help other parents (in the same household as the parent or in another one), and if they have at least one parent-in-law alive. We do not see a correlation of work status and education with informal care. Older children help more, while children in worse health help less. Finally, having at least one parent-in-law alive is correlated to lower provision of informal

²⁰ This is due to the fact that children can provide care to more than one parent in this framework. Clustered standard errors allow for intragroup correlation, relaxing the usual requirement for the observations to be independent. In other words, the observations are independent across groups (clusters) but not necessarily within groups.

Table 7 OLS nested informal care models

	(1)	(2)	(3)	(4)	(5)
Parent's characteristics					
Blood bias	3.260*** (0.174)	2.995*** (0.174)	1.974*** (0.435)	2.403*** (0.409)	2.428*** (0.415)
Gender bias	1.092*** (0.152)	-0.700** (0.152)	-0.846*** (0.289)	-1.202*** (0.290)	-0.693** (0.307)
Helped woman		-0.506* (0.275)	-1.175*** (0.275)	-1.733*** (0.281)	-1.326*** (0.300)
Blood bias * Helped woman		-0.619 (0.499)	0.463 (0.499)	0.661 (0.478)	0.233 (0.481)
Blood bias * Gender bias		-1.405*** (0.543)	-0.705 (0.543)	-0.559 (0.527)	-1.181** (0.531)
Gender bias * Helped woman		1.757*** (0.373)	2.181*** (0.373)	3.072*** (0.391)	2.558*** (0.440)
Blood bias * Gender bias * Helped woman		3.294*** (0.724)	2.181*** (0.724)	1.845*** (0.700)	2.120*** (0.706)
Partner alive			-1.490*** (0.149)	-1.368*** (0.149)	-1.141*** (0.152)
Fair health			Ref.	Ref.	Ref.
Poor health			1.333*** (0.186)	1.214*** (0.186)	1.267*** (0.185)
Dead last year			8.518*** (0.715)	7.560*** (0.715)	1.087 (0.764)
Distance from child					-0.986*** (0.060)
Child's characteristics					
Income	-0.005*** (0.002)	-0.002 (0.002)	-0.003 (0.001)	-0.003* (0.002)	-0.005** (0.002)
Working			-0.183 (0.207)	-0.267 (0.207)	-0.386* (0.215)
Low Education			0.055 (0.278)	0.186 (0.278)	-0.342 (0.312)
Medium Education			0.052 (0.217)	0.216 (0.217)	-0.338 (0.242)
High Education			Ref.	Ref.	Ref.
Age			0.026 (0.016)	0.045** (0.016)	0.052*** (0.018)
Health			-0.325*** (0.087)	-0.275*** (0.087)	-0.218** (0.089)
Helps another parent/in-law in the same HH			6.443*** (0.790)	6.079*** (0.790)	5.982*** (0.787)
Helps another parent/in-law in the other HH			0.548* (0.299)	0.159 (0.299)	0.324 (0.293)

Table 7 continued

	(1)	(2)	(3)	(4)	(5)
At least one in-law alive					
Siblings alive			-0.662*** (0.190)	-0.628*** (0.192)	-0.639*** (0.201)
Child's partner characteristics					
Income				-0.001 (0.002)	-0.002 (0.002)
Working				0.184 (0.199)	0.027 (0.209)
Low Education				-0.060 (0.287)	-0.731** (0.298)
Medium Education				-0.382* (0.228)	-0.760*** (0.244)
High Education				Ref.	Ref.
Age				-0.027 (0.019)	-0.038* (0.020)
Health				-0.041 (0.095)	-0.077 (0.096)
Partner helps the parent				2.942*** (0.312)	3.319*** (0.326)
Controls					
Children HH wealth and country fixed effects	No	No	Yes	Yes	Yes
NUTS fixed effects	No	No	No	No	Yes
N	16278	16278	16086	15922	12807
R ²	0.028	0.036	0.101	0.112	0.130

Clustered standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

care, whereas help to one parent is correlated to help to the other parent in the same household, as expected.

There is a positive correlation between help to parents in different households, but this correlation disappears in specifications (4) and (5), where we introduce the characteristics of the child's partner. When controlling for these characteristics, the size of the sample decreases consequently because we lose some observations due to missing values. In these specifications, we also introduce the geographical distance of the parent from the child or the presence of siblings of the child. They both display a negative and significant relationship with informal care. An interesting variable is the complementarity of care within the couple. If the partner provide informal care to a parent, the child will provide to the same parent between 3 and 5 weeks of extra informal care, with respect to the case where the partner does not help. Finally, in specification (5), we observe the expected negative signs of the coefficients for working status and income variables. In this last specification, we added all the binaries of NUTS in order to control for within-country variation in institutional arrangements and, in particular, in the availability and prices of formal long-term care. Indeed, according to the (public or private) supply of formal care, the absolute need of care could be different. Our measure in terms of weeks (0; 1; 2; 8; 52) was an arbitrary choice. We performed some robustness tests with alternative measures in terms of weeks (0; 0.5; 3; 15; 52) but also in terms of days (0; 6; 18; 60; 360). Our results hold and are statistically significant. They are presented in Appendix A4. It is worth to note that the coefficients concerning the blood and gender biases are stable and do not depend on the inclusion of (potentially endogenous) controls. However, the results so far do not take into account the potential endogeneity of our remaining variable of interest, namely income. This may affect the interpretation of the related coefficient. We thus put in place a more rigorous method to take the remaining endogeneity of income with respect to informal care. We opted more precisely for the method of Lewbel (2012), providing a heteroscedasticity-based estimator for linear regression models containing an endogenous regressor (here the income) when no external instruments or other such information is available²¹. Table 8 presents results for the region sub-sample and whole sample. We observe that the negative and significant relation between income and care vanishes once correcting for endogeneity. The other estimated coefficients keep more or less the same magnitude and significativity levels as in the basic OLS model. The model is identified (Kleibergen-Paap rk LM statistic = 443.646 (0.000)). Since we cluster the standard errors by child, we cannot use the classic Cragg-Donald Wald F statistic in order to measure the strength of our instrument. We have to use Kleibergen-Paap rk Wald F statistic (325.248 for the whole sample). With one endogenous regressor, the F statistic less than 10 is cause for concern (Staiger and Stock (1997)). It is therefore questionable whether the instrument is strong enough for the exercise in the North. Concerning the

²¹ It is almost always preferable to use any available external instruments rather than constructed instruments like those of Lewbel (2012) because of the greater difficulty of confirming that constructed instruments are valid. However, constructed instruments can be useful if no external instruments are available and for testing validity of external instruments (Baum and Lewbel, 2019). See Lewbel (2012) for a detailed presentation of the method or Baum and Lewbel (2019) for a popularized explanation and simulation. Appendix A5 recalls the underlying assumptions of Lewbel (2012) method and indicates to what extent they are fulfilled in our application based on Baum and Lewbel (2019).

Table 8 2SLS informal care models (Lewbel, 2012) with internal instruments and by regions

	(North)	(Center)	(South)	(East)	(All)
Parent's characteristics					
Blood bias	2.224*** (0.704)	1.998*** (0.615)	2.871*** (0.716)	2.259** (0.934)	2.488*** (0.386)
Gender bias	-0.218 (0.400)	-1.027** (0.456)	-0.423 (0.555)	-0.249 (0.788)	-0.669** (0.285)
Heped woman	0.077 (0.519)	-1.356*** (0.488)	-1.174** (0.544)	-1.929*** (0.704)	-1.339*** (0.278)
Blood bias * Helped woman	-0.495 (0.954)	0.716 (0.771)	-0.924 (0.807)	1.322 (1.025)	0.183 (0.452)
Blood bias * Gender bias	-0.851 (0.756)	-0.692 (0.756)	-1.580* (0.930)	-1.474 (1.138)	-1.289*** (0.477)
Gender bias * Helped woman	-0.006 (0.741)	2.670*** (0.747)	2.309** (1.018)	2.886*** (1.011)	2.567*** (0.443)
Blood bias * Gender bias * Helped woman	2.304** (1.128)	2.312** (1.142)	3.852*** (1.248)	0.232 (1.445)	2.272*** (0.668)
Partner alive	-1.020*** (0.321)	-1.034*** (0.249)	-0.830*** (0.294)	-1.916*** (0.307)	-1.172*** (0.148)
Child's characteristics					
Income (instrumented)	0.004 (0.011)	-0.001 (0.002)	-0.017 (0.015)	-0.024 (0.015)	-0.002 (0.002)
Working	-0.541 (0.577)	-0.558 (0.385)	-0.122 (0.365)	0.591 (0.459)	-0.294 (0.211)
Helps another parent/in-law in the same HH	0.004 (0.656)	5.488*** (1.217)	12.495*** (2.224)	3.104** (1.479)	5.963*** (0.839)
Helps another parent/in-law in the other HH	0.130 (0.285)	0.163 (0.417)	1.349 (0.910)	-0.652 (0.686)	0.276 (0.298)
At least one in-law alive	-1.121*** (0.387)	-0.449 (0.351)	-0.278 (0.360)	-0.965** (0.388)	-0.652*** (0.196)
Siblings alive	-0.083 (0.079)	-0.161** (0.067)	-0.114 (0.086)	-0.178 (0.110)	-0.144*** (0.046)
Child's partner characteristics					
Income	0.003 (0.007)	-0.002 (0.002)	0.009 (0.011)	-0.006 (0.015)	-0.001 (0.002)
Working	0.014 (0.520)	-0.065 (0.364)	-0.161 (0.349)	0.402 (0.464)	0.082 (0.206)
Partner helps the parent	0.952* (0.488)	2.646*** (0.511)	4.710*** (0.785)	4.539*** (0.720)	3.405*** (0.325)
<i>Controlled by: for the parent, health and distance from child; for child and child's partner, education, age and health; for HH, wealth, country fixed effects</i>					
Kleibergen-Paap rk LM statistic	165.760 (0.000)	179.147 (0.000)	154.153 (0.000)	127.951 (0.000)	443.646 (0.000)
Kleibergen-Paap rk Wald F statistic	8.575	113.653	41.235	34.554	325.248
Hansen J statistic	26.741 (0.532)	22.977 (0.879)	39.380 (0.087)	31.033 (0.414)	36.254 (0.757)
N	1420	4113	4108	3334	12975
R ²	0.122	0.142	0.157	0.119	0.122

Clustered standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

overidentification test of all instruments (Hansen J Statistic), we do not reject the null and confirm the coherency of the instruments (rather than their *true* validity, see Parente & Santos Silva, 2012).

It is interesting to compare the effects of other variables of interest across regions. We can see that in the North, Center and South, help is particularly important in the case of the daughter who helps her mother (last interaction term in the first part of the table) while this is not the case in the East. The relationship between income and informal care is never significant regardless of region. The sign is negative in the East and the Center but not significant. In the Center, South, and East we see that informal care levels to parents within the same household display complementarity, whereas this is not the case in the North. Conversely, we document a potential substitution between informal care to a parent and to an in-law in the North and East, while the relationship is not significant in the Center or South. Finally, even if the magnitude differs (gradient from North to South/East), informal care levels of spouses to the same parent display complementarity.

5.1.1 Robustness checks

Appendices A6 and A7 present the Tobit and Ordered Logit nested regressions. Qualitatively the results are very consistent across to our main 2SLS specification. Appendix A8 presents results from the Tobit and Ordered Logit regression by regions. To facilitate comparisons and readability, the table presents the coefficients and their significance (without standard errors). Table 9 below shows the differences between the results obtained using our baseline 2SLS specification and the ones from the robustness checks. The table reports the sign of the coefficients for each region and specification. The coefficient highlighted in gray are the ones that have the same sign in each specification. One can see that the results are consistent, particularly when it comes to income, blood and gender biases.

Table 9 Comparison of 2SLS, Tobit and Ordered Logit informal care models

	North			Center			South			East			All		
	2SLS	Tobit	O Logit	2SLS	Tobit	O Logit	2SLS	Tobit	O Logit	2SLS	Tobit	O Logit	2SLS	Tobit	O Logit
Parent's characteristics															
Blood bias	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0
Gender bias	=	=	=	<0	=	=	=	=	=	=	=	=	<0	=	=
Helped woman	=	=	=	<0	=	=	<0	=	=	<0	=	=	<0	<0	=
Blood bias * Helped Woman	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Blood bias * Gender bias	=	=	=	=	=	<0	<0	=	=	=	=	=	<0	<0	<0
Gender bias * Helped woman	=	=	=	>0	>0	=	>0	=	=	>0	>0	>0	>0	>0	>0
Blood bias * Gender bias * Helped woman	>0	=	=	>0	>0	>0	>0	=	=	=	=	=	>0	=	>0
Partner alive	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0	<0
Child's characteristics															
Income (instrumented for 2SLS)	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Working	=	=	=	=	=	=	=	<0	<0	=	=	=	=	=	=
Helps another parent/in-law in the same HH	=	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0
Helps another parent/in-law in the other HH	=	=	=	=	=	>0	=	>0	>0	=	=	=	=	>0	>0
At least one in-law alive	<0	=	=	=	=	=	=	<0	<0	<0	<0	=	<0	<0	=
Siblings alive	=	=	=	<0	<0	<0	=	=	=	=	=	=	<0	<0	<0
Child's partner characteristics															
Income	=	=	=	=	=	=	=	>0	>0	=	=	=	=	=	=
Working	=	=	=	=	=	=	=	=	=	=	=	=	=	>0	>0
Partner helps the parent	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0	>0

5.2 Relative provision of informal care within the couple

We now turn to the collective choice to study how married children share the provision of informal care between their parents and in-laws. We aim to study the relation between the relative level of informal care, blood, gender, and the relative incomes within couples. The first ratio is $a_1/(a_1 + a_2)$ where a_1 is the level (in terms of weeks) of informal care provided by the wife and a_2 the level of informal care provided by the husband to a given parent. The second ratio is $w_1/(w_1 + w_2)$ where w_1 is the income of the wife and w_2 the income of the husband. They are calculated as the sum of labor income and benefits (such as pensions) received annually by each individual. These two ratios therefore represent the intensity of the woman's informal care over the total informal care provided by the couple to a given parent and the intensity of the wife income over the total joint income of the couple. The relative intensity of wife care ($a_1/(a_1 + a_2)$) takes values between 0 (only the husband provides informal care) and 1 (only the wife provides informal care). It takes value 0.5 when spouses care for the parent in the same way. Figure 1 shows the cumulative distribution of this relative intensity.

We focus on couple who have at least one parent being cared for by at least one of the spouses. Therefore, we have 2548 couples in this final sample to study the informal care intensity. We observe that 27.2% of the care recipients receive less informal care from women (either from a daughter or a daughter-in-law) than from men (either a son or a son-in-law). Of these, 11.0% receive exactly the same amount of care from both spouses. The remaining 61.8% are taken care more frequently by women.

Table 10 shows the distribution of different scenarios of informal care provision within the household according to differences of income inside the couple. In the "Wife=Husband" category, we included all couples where the wife has an income in the $\pm 20\%$ range with respect to the income of her husband, implying that there is little difference in the income of the spouses.

In the last column of Table 10 we report the relative intensity of wife care, which always takes a value greater than 0.5, implying that women provide more informal care than men. While women provide more care irrespectively on their relative income within the couple, there is a slight increase in the intensity of the wives' help when their income is lower than the one of their husband ($0.671 > 0.665$), as well as an increase in the proportion of cases where wives help alone ($55.1\% > 54.6\%$). In

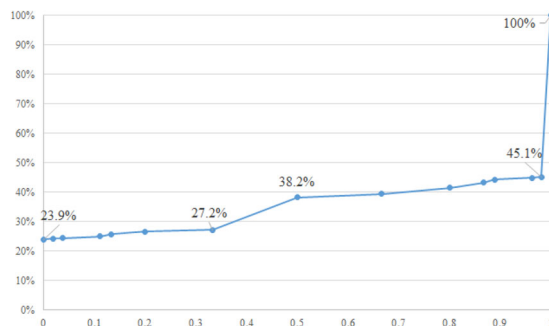


Fig. 1 Cumulative distribution of the relative intensity of wife care inside the couple $a_1/(a_1 + a_2)$

Table 10 Relative informal care depending on income differences and employment situations of children

Covariates/Care		Informal care situations (%)			Informal care intensity (mean; sd) $a1/(a1+a2)$
		Wife helps alone	Husband helps alone	Both help together	
Income difference inside the couple	<i>Wife < Husband</i> (60.5%)	55.1	23.7	21.2	0.671 (0.43)
	<i>Wife = Husband</i> (14.1%)	54.6	24.8	20.6	0.656 (0.43)
	<i>Wife > Husband</i> (25.4%)	54.6	23.6	21.8	0.665 (0.42)
Work situations	<i>Nobody works</i> (29.6%)	59.9	20.8	19.3	0.710 (0.41)
	<i>Only wife works</i> (16.4%)	55.4	22.7	22.9	0.671 (0.42)
	<i>Only husband works</i> (14.4%)	54.6	24.2	21.2	0.660 (0.43)
	<i>Both work</i> (39.6%)	51.1	26.5	22.4	0.636 (0.43)
Total		54.9	23.9	21.2	0.667 (0.43)

Table 10 we also distinguish according to employment status of the children. We consider 4 cases: no spouse works, only the husband works, only the wife works, both work. In 39.6% of couples, both work, while 29.6% of couples are already retired/do not work. We observe that when none of the spouses works, women provide relatively more care than in the other cases. Overall, we observe that children help the parent together in 21.2% of the informal care situations.

We now move to the empirical model analyzing the effect of $w_1/(w_1 + w_2)$ and blood and gender bias on the relative intensity of wife care ($a_1/(a_1 + a_2)$). In Table 11, we implement reduced forms of our model and in the three first specifications (OLS), we do not see any effect of the relative income (in terms of intensity of income of woman in the couple) on the relative intensity of wife care. We observe that the relative intensity of wife care is positively correlated with the dependent elderly to be a woman (so that the gender bias is confirmed) and especially if it is the woman's mother (the blood bias is confirmed by the fact that the intensity of wife care is correlated with helping a parent of the wife). The results concerning the relative income as a main explanatory variable are surprising but are in the same vein as the individual models in section 5.1. One would expect a negative correlation between the relative income and the relative intensity of wife care, but we find no significant correlation.

Again, there is a potential endogeneity issue with our main variable of interest (relative income). We have therefore opted again for the method of Lewbel (2012) to deal with the endogeneity of relative income with respect to relative informal care. However, following Baum and Lewbel (2019) that advocate the importance of finding external instruments if possible, we use the highest level of education reached by the parents of each spouse to instrumentalize relative income. We believe this is a good instrument since the education of parents is likely to be exogenous to relative

Table 11 Relative intensity of wife care inside the couple

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS (external instruments)	(5) 2SLS (external instruments)	(6) 2SLS Lewbel (internal instruments)	(7) 2SLS Lewbel (both instruments)
Helped parent of the wife	0.554*** (0.031)	0.553*** (0.031)	0.551*** (0.031)	0.552*** (0.035)	0.553*** (0.034)	0.551*** (0.031)	0.555*** (0.033)
Helped woman	0.065*** (0.029)	0.064*** (0.029)	0.064*** (0.029)	0.060** (0.035)	0.060** (0.032)	0.058** (0.029)	0.067** (0.030)
Helped parent of the wife * Helped woman	0.015 (0.034)	0.015 (0.034)	0.014 (0.034)	0.021 (0.038)	0.017 (0.038)	0.015 (0.034)	0.011 (0.036)
Relative income (instrumented)		-0.037 (0.027)	-0.027 (0.027)	-0.651*** (0.290)	-0.560 (0.367)	-0.181*** (0.077)	-0.179*** (0.079)
Region	No	No	Yes	No	Yes	Yes	Yes
North			Ref.		Ref.	Ref.	Ref.
Center			0.033*		0.028	0.091	0.099*
			0.020		(0.063)	(0.057)	(0.057)
South			0.073***		0.015	0.019	0.062
			(0.022)		(0.063)	(0.050)	(0.038)
East			0.041**		0.174***	0.172***	0.172***
			(0.0213)		(0.045)	(0.040)	(0.040)
Country fixed effects	No	No	Yes	No	Yes	Yes	Yes
Observations	2548	2548	2548	2273	2273	2548	2273
R ²	0.413	0.414	0.417	0.280	0.327	0.416	0.416
External Instruments				Highest degree of education of parents, Highest degree of education of partner's parents			
Kleibergen-Paap rk LM statistic				20.019 (0.000)	14.188 (0.000)	73.635 (0.000)	77.069 (0.000)
Kleibergen-Paap rk Wald F statistic				10.176	7.315	6.759	8.159
Hansen J statistic				1.067 (0.302)	1.676 (0.195)	11.345 (0.879)	19.829 (0.405)

Clustered standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

informal care, while it is correlated with the relative income of the spouses. We therefore have two external instruments, but these variables are not available for the entire sample (see Table 1 on sample statistics). In the instrumented specifications, presented in Table 11 in columns (4)–(5), we lose 275 observations due to missing values. In columns (4) we present the 2SLS results using the educational attainment of parents as an instrument. The first stage is convincing even if the F statistics makes the instruments appear questionable. However, looking at the overidentification test of all instruments (Hansen J Statistic), we do not reject the null and could confirm the coherency of the instruments. In the instrumented specification, the relative income of the wife is negatively and significantly related to the wife's relative caregiving. Adding country and region fixed effects (column (5)), this effect disappears even if the coefficient remains negative (p-value: 0.127, almost at the 10% threshold).

We then move to the Lewbel method in specification (6). Since we do not use the educational attainment as an instrument, we do not lose observations and our sample goes back to 2548 observations. We find again a negative and significant effect of relative income on relative informal care. In column (7), combining internal (education attainment of parents) and external instruments (no overidentification according to the Hansen J test), the negative effect is confirmed.²² The remarks about the (relatively) low values of the Kleibergen-Papp rk Wald F statistic (because we cluster the S.E.) are the same as before. In all specifications, and irrespectively of inclusions of different controls and instruments, the coefficients for gender and blood bias remain similar, positive and significant. We performed some robustness tests with alternative measures in terms of weeks (0; 0.5; 3; 15; 52) but also in terms of days (0; 6; 18; 60; 360). Our results hold and are statistically significant. They are presented in Appendix A9.

6 Discussion and Conclusion

Our results on informal care decisions by children in couple show that they are affected by gender and blood relationships. Looking at the intensity of caregiving, the number of hours (weeks) devoted to informal care is higher if the caregiver has the same gender as the potential care recipient, and if the caregiver and the care recipient have a blood relationship. Moreover, the result is particularly strong for daughters and mothers. We do not find a significant relationship between income and informal care. Complementarity of caregiving inside the couple seems to be strong, while there is arguably some substitutability of assistance provided to parents and in-laws. Finally, when relative care inside the couple is considered, the gender and

²² According to Baum and Lewbel (2019): “in particular, one could apply the overidentification tests discussed in the previous sections to estimates based on both constructed and external instruments. If validity is rejected, then either the model is misspecified or at least one of these instruments is invalid. If validity is not rejected, it is still possible that the model is wrong or the instruments are invalid, but one would at least have increased confidence that both the external and constructed instruments are valid. More informally, one might simply compare the estimated coefficients based on constructed instruments with those based on external instruments. If they are numerically similar, that increases confidence in the robustness of the model because the two estimators based on very different identifying assumptions are yielding similar results.”

blood bias are confirmed and we observe a statistically significant impact of the relative income on the relative level of informal care of the spouses. These results have two immediate policy implications.

The first one relates directly to the design of social LTC policies. Typically, social agencies do not have good information about the real needs of dependent elderly, since it is difficult to observe the severity of dependence and the intensity of informal care. Our results suggest that the elderly that can only count on children-in-laws or children of a different gender receive less informal care than with children having their gender. While characterizing the optimal policy is clearly out of the scope of this paper, it is clear that a better understanding of the patterns of informal care may inform policy makers on the best way to allocate resources to care receivers and caregivers. While it may not be possible to provide different resources depending on gender of blood relationships, policymakers should take into account the variability of needs, which are likely to translate in different effects (in terms of informal caregiving and caregiver and care receiver welfare) of uniform policies. While difficult to implement politically, policies taking into account the blood and gender relationships may be optimal. An example of these policies are subsidies to the dependent conditional on the presence of children and/or in-laws.²³

A second implication of our results concerns insurance decisions. Based respectively on SHARE and HRS data, Bonsang and Schoenmaeckers (2015) and Klimaviciute et al. (2019) proved that the availability of potential informal caregivers, i.e. the children, decreases the probability of purchasing private voluntary long-term care insurance. Here we go a step further and stress the importance of the “type” of child. When deciding whether to purchase LTC insurance, parents may take into account the gender and blood relationship of potential informal carer. The evidence we describe points to the fact that individuals would be more likely to take out LTC insurance if their living children are children-in-law or children of a different gender than themselves. This behavioral response could be tested empirically in future research. If parents took into account the gender and blood bias in their insurance decisions, this would have an impact also on the residual need for LTC that would have to be covered by LTC policies.

Data availability This paper uses data from SHARE Waves 1, 2, 3, 4, 5, 6, 7 and 8 (DOIs: 10.6103/SHARE.w1.710, 10.6103/SHARE.w2.710, 10.6103/SHARE.w3.710, 10.6103/SHARE.w4.710, 10.6103/SHARE.w5.710, 10.6103/SHARE.w6.710, 10.6103/SHARE.w7.711, 10.6103/SHARE.-w8cabeta.001), see Borsch-Supan et al. (2013) for methodological details.(1) The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N 211909, SHARE-LEAP: GA N 227822, SHARE M4: GA N 261982, DASISH: GA N 283646) and Horizon 2020 (SHARE-DEV3: GA N 676536, SHARE-COHESION: GA N 870628, SERISS: GA N 654221, SSHOC: GA N 823782) and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

²³ In many countries, individuals have no legal obligation to assist their in-laws, but they are legally obliged to assist their parents. For instance, in some US states, nursing homes can recover their bills on the children of their elderly patients.

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Competing interests The authors declare no competing interests.

7 Appendixes

7.1 A1 Solution of the collective choice model

The FOCs of problem (1) are:

$$\frac{\delta\Lambda}{\delta a_2} = -\mu w_2 + \alpha\beta\eta_j \left[a_2^{\eta_j-1} a_1^{\varepsilon_j} \right] = 0$$

$$\frac{\delta\Lambda}{\delta a_1} = -\mu w_1 + \alpha\beta\varepsilon_j \left[a_2^{\eta_j} a_1^{\varepsilon_j-1} \right] = 0$$

$$\frac{\delta\Lambda}{\delta c_1} = -\mu + (1 - \varphi)u'(c_1) = 0; \frac{\delta\Lambda}{\delta c_2} = -\mu + \varphi u'(c_2) = 0$$

$$\frac{\delta\Lambda}{\delta l_1} = -\mu w_1 + (1 - \varphi)v'(l_1) = 0; \frac{\delta\Lambda}{\delta l_2} = -\mu w_2 + \varphi v'(l_2) = 0.$$

The consumption of spouse i is denoted by c_i . This yields the followign values for the levels of informal care.

$$a_1^{1-\eta_j-\varepsilon_j} = \frac{\alpha\beta}{\mu} \left(\frac{\varepsilon_j}{w_1} \right)^{1-\eta_j} \left(\frac{\eta_j}{w_2} \right)^{\eta_j}$$

$$a_2^{1-\eta_j-\varepsilon_j} = \frac{\alpha\beta}{\mu} \left(\frac{\varepsilon_j}{w_1} \right)^{\varepsilon_j} \left(\frac{\eta_j}{w_2} \right)^{1-\varepsilon_j}.$$

Rearranging these expressions we obtain the relative level of informal care (2) as well as the logarithmic expressions for the levels of informal care (3) and (4).

7.2 A2 More than one dependent

We now assume that there can be either one or two dependent parents.

We still use the subscript $i = 1, 2$ for the gender of the caregiver and subscript j for the type of dependent. The problem for the couple when the dependents are j and k is thus to maximize the following Lagrangian with respect to with respect to $c_1, c_2, a_{1j},$

a_{2j} , a_{1k} , a_{2k} , l_1 , and l_2 :

$$\begin{aligned}\Lambda = & \varphi \left[u(c_2) + v(l_2) + \beta \alpha a_{1j}^{\varepsilon_j} a_{2j}^{\eta_j} + \beta \alpha a_{1k}^{\varepsilon_k} a_{2k}^{\eta_k} \right] \\ & + (1 - \varphi) \left[u(c_1) + v(l_2) + \beta \alpha a_{1j}^{\varepsilon_j} a_{2j}^{\eta_j} + \beta \alpha a_{1k}^{\varepsilon_k} a_{2k}^{\eta_k} \right] \\ & - \mu \left[-w_1(1 - l_1 - a_{1j} - a_{1j}) - w_2(1 - l_2 - a_{2k} - a_{2k}) + c_1 + c_2 - R_1 - R_2 \right]\end{aligned}$$

where j and k denote two types of relation wife-dependent. The FOCs are:

$$\begin{aligned}\frac{\delta \Lambda}{\delta c_1} &= u'(c_1)(1 - \varphi) - \mu = 0; \frac{\delta \Lambda}{\delta c_2} = u'(c_2)\varphi - \mu = 0 \\ \frac{\delta \Lambda}{\delta a_{2j}} &= -w_2\mu + \alpha\beta\eta_j \left[a_{2d}^{\eta_j-1} a_{1d}^{\varepsilon_j} \right] = 0 \\ \frac{\delta \Lambda}{\delta a_{1j}} &= -w_1\mu + \alpha\beta\varepsilon_j \left[a_{2d}^{\eta_j} a_{1d}^{\varepsilon_j-1} \right] = 0 \\ \frac{\delta \Lambda}{\delta a_{2k}} &= -w_2\mu + \alpha\beta\eta_k \left[a_{2k}^{\eta_k-1} a_{1k}^{\varepsilon_k} \right] = 0 \\ \frac{\delta \Lambda}{\delta a_{1k}} &= -w_1\mu + \alpha\beta\varepsilon_k \left[a_{2k}^{\eta_k} a_{1k}^{\varepsilon_k-1} \right] = 0 \\ \frac{\delta \Lambda}{\delta l_1} &= -\mu w_1 + (1 - \varphi)v'(l_1) = 0; \frac{\delta \Lambda}{\delta l_2} = -\mu w_2 + \varphi v'(l_2) = 0.\end{aligned}$$

From these FOCs, we have:

$$1 = \frac{a_{2j} \varepsilon_j w_2}{a_{1j} \eta_j w_1} = \frac{a_{2k} \varepsilon_k w_2}{a_{1k} \eta_k w_1}.$$

Using the same notation as above, we find that:

$$\frac{a_{1j}}{a_{2j}} = E_j W; \frac{a_{1k}}{a_{2k}} = E_k W.$$

This formula implies that the relative level of care provided by the wife to one of her parent/parent in law does not depend on whether or not she is caring for other parents/parents in law.

If we consider the absolute level of care supplied by either spouse, it appears clear that it does not depend on the number of dependent parents. We indeed obtain that:

$$a_{1j}^{1-\eta_j-\varepsilon_j} = \frac{\alpha\beta}{\mu} \left(\frac{\varepsilon_j}{w_1} \right)^{1-\eta_j} \left(\frac{\eta_j}{w_2} \right)^{\eta_j}$$

and

$$a_{2j}^{1-\eta_j-\varepsilon_j} = \frac{\alpha\beta}{\mu} \left(\frac{\varepsilon_j}{w_1} \right)^{\varepsilon_j} \left(\frac{\eta_j}{w_2} \right)^{1-\varepsilon_j},$$

which are the same formulas we found with only one dependent. However, the μ , representing the marginal utility of consumption weighted by the bargaining weight, are different. Help to one parent increases the marginal utility of consumption, and thus reduces the level of help provided to another parents. We thus find that there is substitutability between the level of help to different parents.

7.3 A3 Descriptive statistics on extensive informal care by region with respect to interest variables

Covariates/Care		North	Center	South	East
Parents' characteristics					
Partner alive	<i>Yes</i>	21.1	17.6	9.4	19.0
	<i>No</i>	38.3	25.4	13.8	13.6
Health	<i>Fair</i>	28.1	19.1	8.8	14.5
	<i>Poor</i>	31.1	21.8	15.9	18.7
	<i>Dead last year</i>	56.7	56.4	58.2	53.6
Child's characteristics					
Individual Income	<i>1st tercile</i>	24.9	22.3	11.5	14.8
	<i>2nd tercile</i>	34.3	21.5	13.1	17.4
	<i>3rd tercile</i>	32.4	23.2	11.9	19.9
Employment Status	<i>Not working</i>	30.2	22.1	12.3	15.7
	<i>Working</i>	31.8	22.7	11.6	19.2
Education	<i>Low</i>	24.7	16.9	11.4	14.3
	<i>Medium</i>	30.6	22.0	11.7	17.1
	<i>High</i>	34.6	26.5	14.9	21.5
Gender	<i>Men</i>	26.2	17.0	7.4	13.3
	<i>Women</i>	36.5	28.0	16.6	21.9
Age	<i>20-54</i>	28.4	21.6	13.5	16.5
	<i>55-64</i>	34.0	23.2	12.1	18.9
	<i>65+</i>	29.0	21.5	9.6	14.4

7.4 A4 Alternative measures of the intensity of absolute care: robustness tests

	2SLS (Lewbel method)					OLS
	North	Center	South	East	All	All
Alternative measure of weeks of care (0; 0.5; 3; 15; 52)						
Blood bias	2.692***	2.711***	3.025***	2.772***	2.949***	2.900***
Gender bias	-0.060	-0.908*	-0.333	-0.215	-0.587***	-0.605**
Helped woman	0.087	-1.350***	-1.229**	-1.905***	-1.359***	-1.340***
Blood bias * Helped Woman	-0.422	0.444	-0.737	1.200	0.137	0.174
Blood bias * Gender bias	-0.696	-1.167	-1.513	-1.676	-1.448***	-1.368***
Gender bias * Helped woman	-0.125	2.727***	2.308**	2.996***	2.612***	2.595***
Blood bias * Gender bias * Helped woman	2.612**	3.249***	3.889***	0.663	2.721***	2.609***
Income (instrumented in 2SLS)	-0.012	-0.002	-0.016	-0.024	-0.003	-0.005**
Alternative measure in days of care (0; 6; 18; 60; 360)						
Blood bias	16.086***	14.475***	20.050***	16.103**	17.688***	17.277***

Table continued

	2SLS (Lewbel method)					OLS
	North	Center	South	East	All	All
Gender bias	-1.342	-6.953**	-2.883	-1.676	-4.538**	-4.701**
Helped woman	0.473	-9.398***	-8.193**	-13.315***	-9.291***	-9.194***
Blood bias * Helped Woman	-3.441	4.771	-6.290	9.055	1.213	1.551
Blood bias * Gender bias	-5.938	-5.160	-10.913*	-10.402	-9.087***	-8.353**
Gender bias * Helped woman	-0.176	18.456***	16.052**	20.059***	17.780***	17.714***
Blood bias * Gender bias * Helped woman	16.377**	16.781**	26.729***	1.937	16.126***	15.102***
Income (instrumented in 2SLS)	-0.063	-0.010	-0.114	-0.169	-0.014	-0.036**

7.5 A5 Discussion Lewbel (2012)' s assumptions

In our model, observed care could have anchored observed income. In the model $Y_1 = X'\beta + Y_2 + \varepsilon_1$ where $Y_2 = X'\alpha + \varepsilon_2$ (with Y_1 = absolute care to parent and Y_2 = income of the child), ε_1 and ε_2 may be correlated. Lewbel (2012) provides identification and a corresponding simple 2SLS estimator for β and γ in this case, where no element of X can be used as an excluded instrument for Y_2 , the method consists of construction valid instruments (denoted by Z , which includes all elements of X except for the constant term) for Y_2 by exploiting information contained in heteroscedasticity of ε_2 . Baum and Lewbel (2019) argue that three conditions are sufficient for the Lewbel (2012) method to be valid.

The first assumption is that Y_2 is endogenous because it contains an error component μ that appears in the errors of both equations ($\varepsilon_1 = c\mu + V_1$ and $\varepsilon_2 = \mu + V_2$, where c is a constant and μ , V_1 and V_2 are unobserved error terms that are mutually independent conditional on Z). In our model, we can think of μ as the degree of altruism of children (a very altruistic person for whom monetary rewards are not important could *de facto* have a low income because he would have accepted less well paid jobs, for example in the social sector), their preferences in terms of devotion to family (a very altruistic person for whom monetary rewards are not important could *de facto* have a low income), or unobserved ability/productivity of both labor and care.

The second assumption is that the unobserved error μ is homoscedastic, i.e. $Cov(Z, \varepsilon_1 \varepsilon_2) = 0$. As recommended by Baum and Lewbel (2019), we test this assumption by means of the Pagan-Hall test to the Y_1 equation. We reject the null hypothesis of homoscedasticity of the error term ε_1 (White/Koenker test statistic = 1257.129 with Prob > $\chi^2 = 0.000$). However, as emphasized by Baum and Lewbel (2019), the observed heteroscedasticity could come from V_1 and not from μ . In this case, the rejection of homoscedasticity may not be due to assumption 2 being violated but to harmless heteroscedasticity of V_1 (Baum and Lewbel, 2019). Following their argument, we conclude that rejecting the homoscedasticity of ε_1 does not necessarily mean that assumption 2 is violated, and does not prevent us to use Lewbel (2012) method.

Assumption 3 can, hence, be considered to hold. And this third assumption is that ε_2^2 must be correlated with Z , i.e. $Cov(Z, \varepsilon_2^2) \neq 0$. It can be verified by a Breusch-Pagan test for which we reject the null hypothesis of homoscedasticity ($\chi^2 = 21507.03$ with $Prob > \chi^2 = 0.000$).

7.6 A6 Tobit nested informal care models

	(1)	(2)	(3)	(4)	(5)
Parent's characteristics					
Blood bias	21.380*** (0.862)	20.282*** (2.209)	16.569*** (2.212)	20.766*** (2.271)	24.118*** (2.585)
Gender bias	7.252*** (0.690)	-3.849 (2.370)	-2.089 (2.366)	-4.432* (2.467)	0.164 (2.759)
Helped woman		-4.455** (2.113)	-4.315** (2.115)	-8.807*** (2.190)	-4.436* (2.467)
Blood bias * Helped woman		-0.289 (2.532)	3.064 (2.513)	5.544** (2.544)	0.214 (2.827)
Blood bias * Gender bias		-4.358 (2.954)	-2.135 (2.946)	-0.698 (3.027)	-5.833* (3.314)
Gender bias * Helped woman		14.740*** (2.922)	12.397*** (2.835)	18.431*** (3.006)	12.835*** (3.336)
Blood bias * Gender bias * Helped woman		5.782 (3.619)	2.709 (3.460)	-0.599 (3.533)	5.414 (3.843)
Partner alive			-11.926*** (0.911)	-10.718*** (0.891)	-9.244*** (0.970)
Fair health			Ref.	Ref.	Ref.
Poor health			6.374*** (0.779)	5.409*** (0.767)	5.610*** (0.808)
Dead last year			26.483*** (1.414)	21.948*** (1.515)	16.987 (20.745)
Distance from child					-4.927*** (0.280)
Child's characteristics					
Income	0.043*** (0.008)	0.058*** (0.009)	0.009 (0.008)	0.005 (0.008)	-0.001 (0.009)
Working			-0.309 (0.875)	-1.175 (0.882)	-1.528 (0.971)
Low Education			-3.028*** (1.140)	-1.193 (1.202)	-3.652*** (1.299)
Medium Education			-1.282 (0.849)	0.112 (0.871)	-2.494** (0.980)
High Education			Ref.	Ref.	Ref.
Age			0.017 (0.071)	0.054 (0.085)	0.127 (0.099)
Health			-2.375*** (0.368)	-1.902*** (0.381)	-1.651*** (0.418)
Helps another parent/in-law in the same HH			30.250*** (1.803)	27.269*** (1.753)	26.163*** (1.861)
Helps another parent/in-law in the other HH			7.208*** (1.543)	4.143*** (1.515)	4.178*** (1.560)
At least one inlaw alive			-3.280*** (0.806)	-2.532*** (0.828)	-2.317** (0.910)
Siblings alive					-0.726*** (0.264)
Child's partner characteristics					
Income				-0.001 (0.007)	-0.002 (0.007)
Working				2.199** (0.898)	1.758* (0.995)
Low Education				-1.630 (1.155)	-4.839*** (1.257)
Medium Education				-1.998** (0.865)	-3.615*** (0.961)
High Education				Ref.	Ref.
Age				0.038 (0.089)	0.025 (0.100)
Health				-0.457 (0.395)	-0.625 (0.430)
Partner helps the parent				21.158*** (0.961)	22.210*** (1.038)
Controls					
Children HH wealth and country fixed effects	No	No	Yes	Yes	Yes
NUTS fixed effects	No	No	No	No	Yes
N	16278	16278	16086	15922	12807
Pseudo - R ²	0.025	0.028	0.069	0.085	0.106

Clustered standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

7.7 A7 Ordered logit nested informal care models

	(1)		(2)		(3)		(4)		(5)	
Parent's characteristics										
Blood bias	1.259***	(0.046)	1.235***	(0.130)	1.163***	(0.143)	1.524***	(0.155)	1.911***	(0.202)
Gender bias	0.432***	(0.039)	−0.154	(0.148)	−0.032	(0.158)	−0.170	(0.174)	0.177	(0.218)
Helped woman			−0.240*	(0.131)	−0.203	(0.142)	−0.453***	(0.153)	−0.130	(0.196)
Blood bias * Helped woman			−0.027	(0.152)	0.117	(0.164)	0.257	(0.174)	−0.145	(0.220)
Blood bias * Gender bias			−0.267	(0.178)	−0.201	(0.193)	−0.107	(0.208)	−0.501**	(0.255)
Gender bias * Helped woman			0.814***	(0.181)	0.653***	(0.187)	1.041***	(0.207)	0.647**	(0.255)
Blood bias * Gender bias * Helped woman			0.317	(0.216)	0.287	(0.224)	0.055	(0.239)	0.591**	(0.291)
Partner alive					−0.896***	(0.058)	−0.794***	(0.063)	−0.636***	(0.073)
Fair health					Ref.		Ref.		Ref.	
Poor health					0.365***	(0.048)	0.314***	(0.048)	0.365***	(0.056)
Dead last year					1.630***	(0.084)	1.343***	(0.100)	0.702	(3.081)
Distance from child									−0.296***	(0.018)
Child's characteristics										
Income	0.004***	(0.001)	0.004***	(0.001)	0.001	(0.000)	0.001	(0.001)	0.000	(0.001)
Working					0.034	(0.054)	−0.027	(0.056)	−0.048	(0.069)
Low Education					−0.263***	(0.071)	−0.135*	(0.077)	−0.283***	(0.093)
Medium Education					−0.076	(0.053)	0.015	(0.055)	−0.165**	(0.069)
High Education					Ref.		Ref.		Ref.	
Age					0.002	(0.004)	0.002	(0.005)	0.007	(0.007)
Health					−0.154***	(0.023)	−0.128***	(0.024)	−0.119***	(0.029)
Helps another parent/in-law in the same HH					1.891***	(0.105)	1.771***	(0.105)	1.865***	(0.125)
Helps another parent/in-law in the other HH					0.505***	(0.100)	0.338***	(0.103)	0.384***	(0.115)
At least one inlaw alive					−0.152***	(0.049)	−0.119**	(0.052)	−0.096	(0.063)
Siblings alive									−0.052***	(0.018)
Child's partner characteristics										
Income							0.000	(0.000)	0.000	(0.001)
Working							0.150***	(0.057)	0.131*	(0.071)
Low Education							−0.156**	(0.074)	−0.358***	(0.089)
Medium Education							−0.134**	(0.054)	−0.242***	(0.067)
High Education							Ref.		Ref.	
Age							0.004	(0.006)	0.004	(0.007)
Health							−0.024	(0.025)	−0.036	(0.030)
Partner helps the parent							1.411***	(0.060)	1.661***	(0.070)
Controls										
Children HH wealth and country fixed effects	No		No		Yes		Yes		Yes	
NUTS fixed effects	No		No		No		No		Yes	
N	16278		16278		16086		15922		12807	
Pseudo − R ²	0.044		0.050		0.123		0.151		0.180	

Clustered standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

7.8 A8 Tobit and Ordered Logit informal care models by regions

Regions	North		Center		South		East	
	Tobit	Ordered Logit	Tobit	Ordered Logit	Tobit	Ordered Logit	Tobit	Ordered Logit
Parent's characteristics								
Blood bias	12.881***	1.971***	20.541***	1.984***	39.406***	2.038***	24.587***	1.767***
Gender bias	−0.258	0.057	2.231	0.473	3.910	0.137	−2.499	−0.271
Helped woman	0.905	0.114	−2.065	0.081	−4.667	−0.337	−10.427	−0.390
Blood bias * Helped Woman	−3.719	−0.462	−0.377	−0.351	−7.005	−0.168	10.263	0.355

Table continued

Regions	North		Center		South		East	
	Tobit	Ordered Logit	Tobit	Ordered Logit	Tobit	Ordered Logit	Tobit	Ordered Logit
# Weeks/From no care to care almost every day								
Blood bias * Gender bias	-1.894	-0.123	-8.272*	-0.950**	-12.522	-0.590	3.003	0.256
Gender bias * Helped woman	1.625	0.278	7.911	0.270	16.398	0.946	25.285**	1.540**
Blood bias * Gender bias * Helped woman	5.772	0.661	11.435*	1.339***	16.276	0.711	-16.699	-0.894
Partner alive	-4.993***	-0.823***	-8.510***	-0.715***	-10.036***	-0.492***	-12.790***	-0.686***
Child's characteristics								
Income	0.002	0.003	-0.000	0.000	0.035	0.003	-0.083	-0.003
Working	-1.594	-0.107	-1.537	-0.051	-5.706**	-0.280**	1.595	0.091
Helps another parent/in-law in the same HH	5.674***	0.915***	22.263***	1.866***	45.754***	2.376***	32.966***	2.136***
Helps another parent/in-law in the other HH	0.072	0.157	3.485	0.396**	16.450***	0.968***	-2.336	-0.123
At least one in-law alive	-1.095	-0.109	-0.965	0.002	-7.382***	-0.354**	-4.532*	-0.212
Siblings alive	-0.583	-0.092*	-1.030***	-0.076***	0.056	0.012	-0.800	-0.050
Child's partner characteristics								
Income	0.025	0.003	-0.006	-0.000	0.111**	0.006**	-0.034	-0.003
Working	0.446	-0.027	0.629	0.103	2.512	0.171	3.339	0.193
Partner helps the parent	8.334***	1.420***	17.046***	1.436***	37.148***	2.073***	31.173***	2.006***
<i>Controlled by: for the parent, health and distance from child; for child and child's partner, education, age and health; for HH, wealth, country & nuts fixed effects</i>								
N	1260		3854		3869		3056	
Pseudo - R ²	0.088	0.161	0.111	0.191	0.134	0.223	0.109	0.183

Clustered standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

7.9 A9 Alternative measures of the intensity of relative care: robustness tests

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS (external instruments)	(5) 2SLS (external instruments)	(6) 2SLS Lewbel (internal instruments)	(7) 2SLS Lewbel (both instruments)
Alternative measure of weeks of care (0; 0.5; 3; 15; 52)							
Blood bias	0.559***	0.559***	0.557***	0.558***	0.559***	0.556***	0.561***
Helped woman	0.067**	0.067**	0.066**	0.063*	0.063**	0.061**	0.070**
Blood bias * Helped woman	0.012	0.012	0.011	0.018	0.014	0.012	0.008
Relative income (instrumented)		-0.039	-0.028	-0.628**	-0.510	-0.169**	-0.168**
Region	No	No	Yes	No	Yes	Yes	Yes
North			Ref.		Ref.	Ref.	Ref.
Center			0.033*		0.033	0.105*	0.113**
South			0.073***		0.023	0.022	0.065*
East			0.040*		0.177***	0.175***	0.175***
Alternative measure in days of care (0; 6; 18; 60; 360)							
Blood bias	0.555***	0.554***	0.552***	0.553***	0.555***	0.552***	0.557***
Helped woman	0.065**	0.064**	0.064**	0.060*	0.060*	0.059**	0.068**
Blood bias * Helped woman	0.015	0.015	0.014	0.020	0.017	0.014	0.010
Relative income (instrumented)		-0.037	-0.027	-0.641**	-0.537	-0.175**	-0.153*
Region	No	No	Yes	No	Yes	Yes	Yes
North			Ref.		Ref.	Ref.	Ref.
Center			0.033*		0.031	0.096*	0.109*
South			0.074***		0.020	0.020	0.067*
East			0.042**		0.175***	0.174***	0.174***

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