Caregivers in the family: daughters, sons and social norms

Caregivers in the family: daughters, sons and social norms*

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Abstract

We study long-term care (LTC) choices by families with mixed- or same-gender siblings. LTC can be provided either informally by children, or formally at home or in an institution. A social norm implies that daughters suffer a psychological cost when they provide less informal care than the average woman. Daughters have a lower wage than sons so that their opportunity cost of providing LTC is smaller. Families maximize a weighted sum of children's and parent's utilities.

Because of the norm cost and the gender wage gap daughters will be the sole provider of informal LTC in mixed-siblings families. Sons provide LTC only if they have no female sibling.

We show that the *laissez-faire* (LF) and the utilitarian first best (FB) differ for two reasons. First, because informal care imposes a negative externality on daughters via the social norm. Second, because the weights children and parents have in the family bargaining problem differ in general from their weights in social welfare. While these two problems are intertwined it appears that, unless children have a much larger weight than parents, too much informal care will be provided, especially by daughters, and that formal care should be subsidized.

Previous papers suggest that LTC policies should "tolerate", as a side effect, some crowding out of informal care and that the latter should be encouraged. Our results suggest instead that, because of the existing social norm about gender roles in the family, optimal policies should "discourage" informal care through subsidies on formal LTC.

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1 Introduction

1.1 The gender gap in long-term care informal provision

The provision of adequate long-term care (LTC) to the dependent elderly represents a major challenge faced by all developed countries. The stakes are important as dependency represents a significant financial risk. In Europe even low quality nursing homes typically cost more than 2500€ per month and a good quality facility is twice as expensive. In the US good quality facilities can cost up to $10,000 per month. In countries with the lowest provision of public LTC (see Section 7), the share of private spending – mainly out-of-pocket expenditure – on total spending on LTC accounts for more than 30%.

While this problem is already looming right now, it will become even more pressing during the decades to come because of population aging. Elderly people who are affected by cognitive diseases, like Altzheimer's or other forms of dementia, or by motoric problems due to ALS or Parkinson's disease need assistance with their daily activities. The prevalence of these affections starts to rise exponentially from around the age of 80 years. The number of persons aged 80 years and above is growing faster than any other segment of the population (Japan accounts today for the largest share of the population over 80, 27%, followed by Germany and Italy with more than 22%). The number of dependent elderly at the European level (EU 27) is expected to grow from about 21 million people in 2007 to about 44 million in 2060 (EC 2009). In addition, rising incomes increase expectations on the quality of life in old age; the supply of informal care is potentially shrinking; and productivity gains are difficult to achieve in such a labor-intensive sector. All these factors contribute to an increasing trend in LTC spending which is further discussed in Section 7.

An important part of LTC is currently provided informally either by spouses when still alive or, more significantly, by a person's children. Precise estimates of informal care provision are hard to obtain because, by definition, they do not refer to a formal transaction. Still, the extent of informal caregiving is believed to be enormous; see Bonsang and Schoenmaeckers (2015) and Norton (2016, Section 3) for an overview of the relevant empirical studies.

In the past decades, nearly all OECD countries have been encouraging home care which is in line with the preference of elderly people to receive care at home, possibly by relatives. More significantly, this has been a way to contain the huge costs of nursing homes. While for very advanced cases of dementia, institutional care is unavoidable, as long as home care is possible it has been shown to be significantly less costly than institutional care; see for instance Chappell *et al.* (2004). As we discuss in Section 7, many of the implemented policies are directly or indirectly aimed at subsidizing formal and informal home care. They include training and financial support for family caregivers via cash transfers, service-housing arrangements, tax deductions, paid leave

of absence from work.

These policies affect especially the main providers of informal LTC, namely female relatives of impaired old people. The empirical literature is indeed unanimous in finding a gender bias in informal caregiving: women (and daughters in particular) care for elderly relatives and parents more than men (see, among many others, Dentinger and Clarkberg 2002, Schmid *et al.*, 2012).

Bott *et al.* (2017) in a recent article on dementia and informal care in the US argue that "The best long-term care insurance is a conscientious daughter". Indeed, among adult children taking care of their old parents, daughters typically provide more informal care than sons (Arber and Ginn, 1990; Bracke *et al.*, 2008; Haberkern and Szydlik, 2010; Schmid *et al.*, 2012; Tolkacheva *et al.*, 2014). Coward and Dwyer (1990), for instance, consider the *1982 US National Long-Term Care Survey* and the *National Survey of Informal Caregivers* and find that: "within all sibling network categories, daughters were more likely than sons to be providing care to an impaired parent [...]". Jakobsson *et al.* (2016) show that, when the rationing of formal home care is guided by "statistical discrimination", the gender gap in informal care provision is even exacerbated. In particular, the authors document how, in Norway, impaired old people receive less formal care when they have a daughter. This is because, when assigning formal LTC to citizens in need, managers take into account a patient's family situation and the fact that daughters typically provide more informal care. Hence, the gender gap in care provision is even self-reinforcing since daughters will have to compensate the lower amount of formal care received by their parents with a larger provision of informal care.

What are the consequences of this unequal burden? Schmitz and Westphal (2017) study long run consequences of informal care in Germany and show that female caregivers reduce the probability to work full-time by 4 percentage points (at a baseline probability of 35 per cent). The effect is persistent over a period of eight years and seems to be mainly driven by switches to part-time work. High care intensities and longer episodes also increase the long-run probability to leave the labor force. Wages seem to be unaffected contemporaneously but are significantly lower 8 years after the start of a care episode. On the impact of informal care on female labor supply see also Pezzin and Steinberg (1999) and Wilson et al. (2007). Di Novi *et al.* (2005) analyze the impact of the provision of care on the health and quality of life of female informal caregivers using the Survey of Health, Ageing and Retirement in Europe (SHARE). They stress the intense emotional and physical burden on caregivers.[1]

[1] They also report that, since caregiving is stressful, diseases such as cardiovascular problems and depression are more common among informal caregivers, despite the fact that attending people in need may also be, to some extent, a source of happiness.

1.2 Our contribution

We analyze the choices, within the family, which contribute to the emergence of the gender gap in care provision. We then study the polices which can be used to achieve an adequate provision of LTC which balances the interests of the dependent elderly and that of the caregivers of both genders.

Our explanation of the gender gap in care provision is based on two factors. First, sons and daughters have unequal job market situations which determine their opportunity cost of providing care. Second, there is a social norm according to which society expects daughters to be the main caregivers of their parents and which imposes a utility cost on daughters who deviate from this pattern**.** Gender differences in wages are well documented and continue to exist in all OECD countries. By 2014, women full-time workers earned about 79 percent of what men did on an annual basis and about 83 percent on a weekly basis (Blau and Kahn, 2017; see also O'Neill, 2003; Fortin, 2005; Blau and Kahn, 2006). The role of social norms is empirically more difficult to assess; they represent by their very nature a less tangible concept than opportunity costs. Analyzing data from SHARE, Klimaviciute *et al.* (2017) find that, depending on the regions analyzed, informal LTC is mainly driven by a family norm or by moderate altruism. Kotsadam (2011) finds that there is a link between gendered norms and informal care provision by women, and that the strength of this link varies within European countries and is strongest for Germany and Southern European countries. Di Novi *et al.* (2015) document that female informal care is associated with social norms and cultural traits (see also Costa Font, 2010).[2] Our model explains how gender inequalities in the labor marker and social norms on gender roles affect families' LTC arrangements, it shows that they reflect an inefficient equilibrium, and studies potentially welfare improving policies.

We consider long-term care choices by daughters and sons in a society in which families consist either of mixed-gender or same-gender siblings. LTC care can be provided informally at home, or formally at home or in an institution. LTC decisions are made through a cooperative bargaining procedure within each family. Since cooperation guarantees that the outcome is on the family's Pareto frontier, the solution can be characterized by maximizing a weighted sum of parent's and children's utilities.

Providing informal care has two types of costs for siblings. The first is the opportunity cost of lost labor income and is gender-specific because of a gender wage gap. The second one is family-specific and convex; it represents all the other costs of informal LTC, including material and psychological costs. The first cost is mainly relevant for the intensive margin of informal

[2]These outcomes are mirrored by data on hours of informal child-care provision in the couple, confirming women in the role of family caregivers. The relationship between informal child care and norms about gender roles is emphasized in many recent works (see, among others, Barigozzi *et al.* 2018 and references within).

LTC, while the second one is relevant for the extensive margin (the choice between home care and an institution). The social norm inflicts a psychological cost on daughters when they do not provide enough informal LTC at home.[3] The cost of the social norm is increasing in the amount of informal LTC provided by the average daughter in society. The result is that informal care provided by daughters exerts a negative externality on daughters providing less informal care than the average level. Because of the norm cost and the gender wage gap daughters will be the sole provider of informal LTC in mixed siblings families. In families with two sisters, informal care can be provided by one or by both daughters, depending on the size of the family-specific cost. Sons provide LTC only if they have no female sibling.

We also determine the socially optimal solution, that is the allocation that maximizes a utilitarian social welfare function. Following the tradition of public and welfare economics, social welfare is based on individual (as opposed to family) utility. This introduces a "paternalistic" dimension into social preferences in the sense that society weights individuals equally irrespective of their bargaining weights within their respective families.

We show that the *laissez-faire* (LF) and the utilitarian first best (FB) differ for two reasons. First, because informal care imposes a negative externality on daughters via the social norm, the equilibrium will be inefficient. In other words, while the solution is on the Pareto frontier within every family, it is not Pareto efficient for the economy as a whole. This is brought out most clearly in the case where families put the same weight on children than on parents so that private and social weights coincide. In that case, the externality will imply too much informal care so that the levels of both formal home and institutional care will be too small. Consequently, it is possible to make both children and parents better off through a suitably designed LTC policy.

Second, the LF differs from the social optimum because the weights children and parents have in the family bargaining problem differ in general from their weights in social welfare. Thus, even when there is no social norm, so that the LF is on the Pareto-frontier, the solution will not be socially optimal. In that case a Pareto-improvement is not possible, but the utilitarian social welfare function calls for a move *along* the Pareto-frontier to make either the caregivers or the parents better off, depending on the family bargaining weights. In the general case where both social norms and different weights apply, the two effects just described are of course intertwined. However, it is insightful to keep them in mind and to look at special cases where only one of them applies.

To study policy design we first assume away any *ad hoc* restrictions on the set of feasible instruments. In particular, subsidies or taxes can be gender-specific. We show that the FB can

[3] Our results would not change if a social norm for sons would also exist, provided their norm cost is lower or not too much larger than the cost for daughters (see also Footnote 10). Note, however, that such social norm for sons does not seem empirically relevant.

be implemented through a system of subsidies/transfers on formal home and institutional care, financed by a uniform lump-sum tax. When parents and children have identical bargaining weights, so that families maximize the sum of parent's and children's utilities, a Pigouvian subsidy on female informal care is sufficient. Since the externality is associated with daughters' informal care, families with two sons receive no subsidy.

When intra-family weights differ across generations, optimal subsidies/transfers are more complex. Both efficiency and paternalistic (weight-related) effects are now relevant. They reinforce each other when parents have the higher weights, so that all the net subsidies are positive and exceed the Pigouvian levels. Daughters are now subject to a double jeopardy and suffer both from the social norm and from their lower weight in the family. Sons, on the other hand, do not care about the social norm but their informal care is inflated (compared to the utilitarian benchmark) by the higher weight of the parents. To sum up, too much informal care is provided in the LF and this calls for subsidies/transfers on all modes of formal care.

These two outcomes have an important policy implication. Previous papers suggest that LTC policies should "tolerate", as a side effect, some crowding out of informal care.[4] We instead stress the fact that optimal policies on LTC must balance the benefits from lower spending on formal LTC with the costs sustained by (mainly female) informal carers. Specifically, our paper suggests that, when social norms about gender roles exist, optimal policies should indeed "deliberately discourage" informal care through subsidies to formal LTC; see also Section 6 and the Conclusion.

Finally, when children have a higher weight than their parents, efficiency and paternalism go in opposite directions. Then, it may become optimal to discourage one or both types of formal care.

Since gender-specific policies may face political resistance, we also study the optimal gender neutral policies in Subsection 6.2. Interestingly, with nonlinear polices it *may* be possible to implement the FB even under gender neutrality. When this is not possible, gender neutrality leads to second-best policies. We discuss the link between current policies aimed at encouraging

[4] The empirical papers making this point are reviewed by Siciliani (2014). Ettner (1994) finds that US Medicaid home care subsidies increased formal care and reduced informal care. Hoerger *et al.* (1996) exploit variations in Medicaid State policies and find that subsidising home healthcare increases the probability of individuals living independently from their children. Pezzin *et al.* (1996) find that a generous public home care program reduces the probability of informal care. Stabile *at al.* (2006) use a panel approach with fixed effects (at Canadian province level), and show that provinces which increased funding on home care led to a reduction of informal care. Viitanen (2007)'s findings suggest that higher expenditure on formal residential care and home care for the elderly in European countries significantly reduces informal care provided by women who are 45–59 years old both on the extensive margin (the probability of providing any care) and the intensive margin (the amount of care, conditional on providing some care). Findings in Costa Font (2010) suggest that widespread expansion of LTC coverage might need to accommodate existing familistic cultural norms to avoid insurance crowding out.

informal care and implications from our results in Section 7.

2 The model

Consider a population of families. Each family consists of two adult siblings and one old and impaired parent.[5] Children are randomly matched two by two. Given that 50% of children are sons and 50% are daughters, three types of families exist: 1/2 of siblings are mixed, that is they are composed of one son and one daughter (s, d), and 1/4 of siblings are composed of two sons (s, s), or two daughters (d, d) respectively. While parents are economically inactive and only consume care, the children participate in the labor market. The extent to which they do depends on their informal care provision. We normalize all available time to one, and we assume that parents need full-time care.

Two modes of care for the elderly exist: informal LTC provided by adult children and formal market care.[6] Formal care can either be provided at the parent's home, or in a nursing home. We denote informal LTC provision by a_i $(i = s, d)$, while that bought in the private market by a_p. The latter costs p per unit of time. The parent's utility of informal care is given by $u(a_i + a_j)$ $(i, j = s, d)$ and it is given by $\beta u(a_p)$ for formal care with $\beta \in (0, 1]$. We let $u' > 0, u'' < 0$ and $u(0) = 0$. Informal and private LTC are thus imperfect substitutes, with private LTC being (weakly) less welfare enhancing than informal care.[7] When old parents enter the nursing home they receive full-time assistance and $a_p = 1$, with $\beta u(1) > p$.

When adult children provide LTC their labor income decreases proportionally to the time devoted to care. Sons receive an income $w(1-a_s)$ while daughters receive an income $\alpha w(1-a_d)$, where $\alpha \leq 1$ reflects the gender wage gap for female workers as it is observed in nearly all developed countries. This gap can be explained by gender differences in education, experience, job characteristics and by child penalties and, to a decreasing extent, also by discrimination.[8]

[5] This parent is usually the person who took care of his/her spouse before widowhood.

[6] In our model, siblings are part of the same unitarian family. Our approach thus differs from the one adopted by other authors who study strategic interaction between siblings willing (or not willing) to take care of their impaired old parent; see, among others, Konrad *et al.* (2002), Yakita (2018) and references provided in these papers.

[7] There are several papers that suggest that different forms of care are, at least to some extent, substitutable (see, e.g., van Houtven and Norton, 2004; Charles and Sevak, 2005; and Stabile et al., 2006). In our setting, the parameter β can be interpreted as representing the quality of formal care. When $\beta = 1$ formal care provided in the market is as good as informal care provided by children (ideally with tender love).

[8] On the gender wage gap see, for instance, O'Neill (2003); Fortin (2005); Blau and Kahn (2006) and (2017). Most of the conventional definitions are wider than our parameter α, which accounts only for the exogenous part of the gender wage gap. In particular, they also account for gender gaps in labor supplies. And the difference in labor income of sons and daughters is endogenous in our model because it depends on informal care provision. From that perspective our model shows that the gap in informal LTC provision does contribute to the (more

We assume $\alpha w - p \geq 0$ so that the full-time wage of a daughter is high enough to pay for full-time formal care.

A decrease in labor income is not the unique opportunity cost of providing informal LTC. Informal care also comes with material and psychological costs for the care provider which differ across families. They are denoted by

$$C(a_i) = k_i + c(a_i),$$

$i = s, d$, where the variable cost function, which is the same for all, is increasing and convex: $c' \geq 0$ and $c'' \geq 0$. We assume that $k_d \in [0, K]$ and $k_s = k_d + \rho$, where $\rho \geq 0$ is a constant. The fixed cost k_d is family-specific and distributed according to $F(k_d)$ which is the same for all types of families. The fixed cost k_i includes a fixed labor market penalty incurred by any informal caregiver. This penalty represents for instance the cost of moving from a full-time to a part-time employment, that differ according to the children's working condition (see Schmitz and Westphal, 2017). It can also reflect different living situations, or the strength of family ties. The additional male fixed cost ρ captures the possible lack of proximity of a male's job to the family residence. Goldin (2014) and Wiswall and Zafar (2018) show that women look for flexible jobs that are typically characterized by low pay. "Proximity" of the work location to the family residence is one of the major component of the flexibility women search for.

We do not explicitly consider descending and ascending altruism in the family. However, one can think of $C(a_i)$ as the caregivers cost net of a possible benefit arising from their "warm glow" or "joy of giving" altruism. Furthermore, the fact that children are responsible for their parent's LTC can be interpreted as a sort of implicit, albeit forced, ascending altruism.

The empirical literature mentioned in the Introduction indicates that daughters are confronted with some social pressure concerning the provision of informal care. According to Akerlof and Kranton (2000; 2010), individuals may suffer a disutility by deviating from the social categories that are associated with their identity (that is, the individual's sense of self), which causes behavior to conform toward those norms. Applying this idea to our setting, we assume that daughters try to conform to the behavior of their peers and feel guilt if they provide less informal care than the average level provided by women in the society. Formally, denoting $\bar{a}$ the average amount of informal care provided by daughters in the society, we represent the norm for daughters as the disutility $\gamma \max\{0; \bar{a} - a_d\}$ that they suffer when providing less informal LTC than their peer. The parameter $\gamma \in [0, 1]$ reflects the psychological costs from norm deviations.

Note that we concentrate on a persistent norm, with exogenous (unit) cost, γ. In reality norms may evolve over time but this process is likely to involve several generations. The provision of LTC, on the other hand is a problem that societies face now and during the decades to come.

broadly defined) gender wage gap.

The policies that are put in place in a foreseeable future will thus have to accommodate the social norm essentially as it is, before drastic changes can be expected.

Families maximize the weighted sum of utilities, with $\delta \in (0,1)$ being the weight of the siblings' utility and $1-\delta$ being the weight of the parent's utility. The weights are the same in all families and reflect the strength of family ties in the society. We define $\Delta \equiv (1-\delta)/\delta$ as the relative weight of the parent. When $\Delta = 1 \Leftrightarrow \delta = 1/2$ the young and old generation have equal weights. When instead $\Delta > (<)1 \Leftrightarrow \delta < (>)1/2$, the old generation has a higher (lower) weight than the young one and providing informal LTC care represents (does not represent) a strong moral obligation. Unequal weights thus capture situations in which the bargaining power of the two generations differ. To the best of our knowledge no (direct) empirical evidence on the relative size of intergenerational weights exists so that both cases have to be considered. However, some indirect evidence exists. The empirical analysis of Costa Font (2010) exploits cross-country and sub-group variability of a representative database of European Union member states, containing records on LTC coverage and family structure and, shows that family ties enhance informal care-giving duties. In the same vein, Haberkern and Szydlik (2010) find that the extent to which providing informal care to needy family members is considered a moral obligation varies between countries. Using SHARE data, they show that among people aged 65+ in Northern countries, the majority believe that the state should bear the primary responsibility for LTC, while in Mediterranean countries, the majority believes that the family should mainly be responsible. Thus, interpreting δ as the strength of the moral obligation to provide informal LTC, we expect $\delta < 1/2$ in Mediterranean countries and $\delta > 1/2$ in Northern countries.

To sum up, δ reflects the strength of family ties whereas γ captures the importance of gender roles in the society. They represent cultural traits that are homogeneous in our economy.[9] Families differ instead in two other important respects: first, in the gender mix of the siblings and, second, in the material and psychological costs $k_d \in [0, K]$.

3 Families' choices

In this section we study families' choice of the mode of formal LTC and the siblings' allocation of time between work and informal care in case the old parent remains at home.

[9] Interestingly, Haberkern and Szydlik (2010) also report that, in countries where the consensus that care is a family matter is strongest, the share of informal care provided by daughters is also largest, suggesting that δ and γ could be positively correlated.

3.1 Mixed-gender families

First, let us consider a family composed of a son and a daughter. A type-(s,d) which opts for home care solves

$$\max_{a_s,a_d} W_{sd}^{1,2} = \delta\left[w(1-a_s)+\alpha w(1-a_d)-pa_p-C(a_s)-C(a_d)-\gamma\max\{0;\bar{a}-a_d\}\right] + (1-\delta)\left[u(a_s+a_d)+\beta u(a_p)\right], \quad \text{s.t.} \quad a_s+a_d+a_p=1;$$

where $W_{sd}^{1,2}$ indicates that either a corner or an interior solution are possible. Specifically, W^1 refers to the case where only one sibling provides informal care whereas W^2 applies to the case in which both siblings provide care.

Given the time constraint, the amount of home formal care is $a_p = 1-a_s-a_d$ and the corresponding family's expenditure amount to $p(1-a_s-a_d)$.

Together with the decrease in labor income, informal caregivers incur a utility cost $C(a_i)$, $i = s,d$. In addition, the daughter is negatively affected by the social norm whenever she provides less informal care than the average amount provided by daughters in society, $\bar{a}$.

The first order conditions (FOCs) with respect to the son's and the daughter's informal care provision, a_s and a_d, are given by:

$$a_s^*: \quad -\delta[w+c'(a_s^*)-p]+(1-\delta)[u'(a_s^*+a_d^*)-\beta u'(1-a_s^*-a_d^*)]\leq 0, \tag{1}$$

$$a_d^*: \quad -\delta[\alpha w+c'(a_d^*)-p-\gamma I]+(1-\delta)[u'(a_s^*+a_d^*)-\beta u'(1-a_s^*-a_d^*)]\leq 0, \tag{2}$$

where $I\in\{0,1\}$ is an indicator function that takes on the value one when the social norm is binding and zero otherwise. The net marginal cost for each sibling (weighted by the weight of her/his generation) is given by the first term in brackets while the net marginal benefit to the parent (weighted by the weight of her/his generation) is presented by the second term in brackets. Due to the gender wage gap, $\alpha w < w$, and the (possible) cost of the social norm, γI, the marginal cost of informal care provision is strictly lower for the daughter than for the son. In addition, when providing any positive amount of informal care, the son has to pay a larger fixed cost then his sister, $k_s > k_d$.

When both siblings provide informal care, $a_d^{*2} > a_s^{*2} > 0$ holds; while, when only the daughter provides informal care we have $a_d^{*1} > a_s^{*1} = 0$, where the superscript ^{*1} refers to informal care in the corner solution while the superscript ^{*2} denotes informal care in the interior solution.

If $C(a_i)$ is linear or not too convex and/or ρ is high enough, then only the daughter will provide informal LTC and $a_s^{*2}=0$. Whereas, if $C(a_i)$ is convex enough and ρ not too large, it is optimal that both siblings contribute to informal care. A sufficient condition to have a corner solution is the following:

$$\begin{aligned} &k_d+(\alpha w-p-\gamma I)(a_s^{*2}+a_d^{*2})+c\left(a_s^{*2}+a_d^{*2}\right) \\ &<2k_d+\rho+(\alpha w-p-\gamma I)a_d^{*2}+(w-p)a_s^{*2}+c(a_s^{*2})+c(a_d^{*2}) \end{aligned} \tag{3}$$

In words: only the daughter provides informal care if the total cost of providing informal care in the amount $a_d^{*2} + a_s^{*2}$ is strictly lower when it is provided by a single daughter. Note that this condition is sufficient but not necessary because, given the convexity of $c(\cdot)$, $a_d^{*2} + a_s^{*2} > a_d^{*1}$ holds.

Inequality (3) simplifies to:

$$\rho > \tilde{\rho}_{sd} \equiv c(a_d^{*2} + a_s^{*2}) - c(a_s^{*2}) - c(a_d^{*2}) - (1-\alpha)wa_s^{*2} - \gamma I a_s^{*2} - k_d. \qquad \text{(Condition 1)}$$

Condition 1 indicates that, when the additional fixed cost that sons suffer when providing informal care, ρ, is sufficiently high then economies of scale are high and it is efficient that only the daughter provides informal care.

When Condition 1 holds, a_d^{*1} is implicitly given by:

$$a_d^{*1}: \quad \alpha w + c'(a_d^{*1}) - p - \gamma I = \Delta[u'(a_d^{*1}) - \beta u'(1 - a_d^{*1})]. \tag{4}$$

When the old parent has the lower weight in the family ($\Delta < 1$), the net marginal benefit from informal care is reduced and a_d^{*1} decreases accordingly.

Thus, under Condition 1, welfare in the (s,d) family is given by:

$$\begin{aligned} W_{sd}^{*1} = {} & \delta\left[w + \alpha w(1 - a_d^{*1}) - C(a_d^{*1}) - p(1 - a_d^{*1}) - \gamma \max\{0; \bar{a} - a_d^{*1}\}\right] \\ & + (1-\delta)\left[u(a_d^{*1}) + \beta u(1 - a_d^{*1})\right]. \end{aligned}$$

The alternative to home care is a nursing home. In this case $a_p^* = 1$ and the disutility from the social norm suffered by the daughter is $\gamma \max\{0; \bar{a} - 0\} = \gamma\bar{a}$. Welfare of a type-$(s,d)$ family is then:

$$W_{sd}^{*0} = \delta\left[w + \alpha w - p - \gamma\bar{a}\right] + (1-\delta)\beta u(1);$$

where W_{sd}^{*0} indicates that no one provides informal care in the family.

The family opts for the nursing home if it is welfare maximizing, that is if

$$W_{sd}^{*1} \leq W_{sd}^{*0} \quad \Leftrightarrow \quad \widehat{k}_{sd}^{*1} \leq k_d,$$

where the critical fixed cost, $\widehat{k}_{sd}^{*1}$, is defined by:

$$\widehat{k}_{sd}^{*1} \equiv [(p - \alpha w)a_d^{*1} + c(a_d^{*1}) + \gamma \max\{0; \bar{a} - a_d^{*1}\} + \gamma\bar{a}] + \Delta[u(a_d^{*1}) + \beta[u(1 - a_d^{*1}) - u(1)]].$$

For the share $F(\widehat{k}_{sd}^{*1})$ of type-(s,d) families home care is welfare maximizing while for the share $1 - F(\widehat{k}_{sd}^{*1})$ of these families it is optimal that the parent enters a nursing home. The critical cost level and thus the share of families providing informal care is thereby increasing in the norm costs γ, and in the relative weight of the parent, Δ. Hence, when $\Delta < 1$, the two economic forces push in opposite directions: the social norm causes the share of families choosing a nursing home to decrease and a lower weight for the parent causes it to increase.

3.2 Two-daughter families

Now consider a family with two daughters (d, d). When at least one of them provides informal care, their optimization problem is given by:

$$\begin{aligned}\max_{a_{d1},a_{d2}} \; W_{dd}^{1,2} =& \delta[\alpha w(1-a_{d1}) + \alpha w(1-a_{d2}) - pa_p - C(a_{d1}) - C(a_{d2}) \\ & - \gamma\{0; \bar{a} - a_{d1}\} - \gamma\{0; \bar{a} - a_{d2}\}] + (1-\delta)[u(a_{d1} + a_{d2}) + \beta u(a_p)].\end{aligned}$$

Once again, W^1 is used when only one sister provides informal care whereas W^2 applies to the case in which both daughters provide care. Differently from before, both siblings are possibly negatively affected by the social norm. Noting that $a_p = 1 - a_{d1} - a_{d2}$, the FOCs with respect to both a_{d1} and a_{d2} are given by:

$$a_{di}^*: \quad -\delta[\alpha w + c'(a_{di}^*) - p - \gamma I] + (1-\delta)[u'(a_{d1}^* + a_{d2}^*) - \beta u'(1 - a_{d1}^* - a_{d2}^*)] \leq 0, \; i = 1, 2. \quad (5)$$

Two types of solution can arise: either both sisters provide informal care and $a_{d1}^{*2} = a_{d2}^{*2} > 0$ or only one sister provides informal care and $a_{d1}^{*1} > a_{d2}^{*1} = 0$, where as before the superscript ^{*1} refers to optimal care in the corner solution while the superscript ^{*2} indicates informal care in the interior solution. Obviously, the interior solution requires that (5) is satisfied with equality while the corner solution requires that it is satisfied with strict inequality. In addition, because of convexity of $c(a_i)$, $a_{d1}^{*2} + a_{d2}^{*2} > 2a_{d1}^{*1}$ holds.

Suppose only one sister provides informal care, we assume this to be daughter $d1$ so that $a_{d2}^{*1} = 0$ and a_{d1}^{*1} is implicitly determined by:

$$a_{d1}^{*1}: \quad \alpha w + c'(a_{d1}^{*1}) - p - \gamma I = \Delta[u'(a_{d1}^{*1}) - \beta u'(1 - a_{d1}^{*1})]. \quad (6)$$

Note that in this case informal LTC in a two-daughter family coincides with informal care in a mixed family (see expression 4) and we define $a_{d1}^{*1} \equiv a_d^{*1}$. The daughter who is not providing informal care is suffering a disutility from the social norm given by $\gamma\bar{a}$. Welfare in a type-(d, d) family with informal care provision by a single daughter can thus be written as:

$$\begin{aligned}W_{dd}^{*1} =& \delta[\alpha w + \alpha w(1 - a_d^{*1}) - k_d - c(a_d^{*1}) - p(1 - a_d^{*1}) - \gamma \max\{0; \bar{a} - a_d^{*1}\} - \gamma\bar{a}] \\ & + (1-\delta)[u(a_d^{*1}) + \beta u(1 - a_d^{*1})]. \quad (7)\end{aligned}$$

If a type-(d, d) family fully relies on market care, welfare amounts to:

$$W_{dd}^{*0} = \delta[2\alpha w - p - 2\gamma\bar{a}] + (1-\delta)\beta u(1).$$

Now the cost of the social norm is counted twice, because both sisters feel guilt when their parent enters the nursing home. The latter will be the case if it yields a higher welfare, that is if

$$W_{dd}^{*1} \leq W_{dd}^{*0} \quad \Leftrightarrow \quad \widehat{k}_{dd}^{*1} \leq k_d,$$

where:

$$\widehat{k}_{dd}^{*1} \equiv [(p-\alpha w)a_d^{*1} - c(a_d^{*1}) - \gamma \max\{0; \bar{a} - a_d^{*1}\} + \gamma \bar{a}] + \Delta[u(a_d^{*1}) + \beta[u(1-a_d^{*1}) - u(1)]]. \quad (8)$$

Given that, in the corner solution, daughters in same-gender and mixed-gender families provide the same amount of informal care a_d^{*1}, the critical values $\widehat{k}_{dd}^{*1} = \widehat{k}_{sd}^{*1} \equiv \widehat{k}_d^{*1}$ are the same, as well as the share of (d,d) and (s,d) families choosing home care: $F\left(\widehat{k}_{dd}^{*1}\right) = F\left(\widehat{k}_{sd}^{*1}\right) \equiv F\left(\widehat{k}_d^{*1}\right)$.

When $c(\cdot)$ is strictly convex and the fixed cost k_d sufficiently small we have a solution where the daughters split evenly the provision of informal care. FOCs (5) write

$$a_{di}^{*2}: \quad [\alpha w + c'(a_{di}^{*2}) - p - \gamma I] = \Delta[u'(2a_{di}^{*2}) - \beta u'(1-2a_{di}^{*2})], \; i = 1, 2. \quad (9)$$

Welfare of the family in this case is given by

$$\begin{aligned} W_{dd}^{*2} =& \delta[2\alpha w(1-a_{di}^{*2}) - 2k_d - 2c(a_{di}^{*2}) - p(1-2a_{di}^{*2}) - 2\gamma \max\{0; \bar{a} - a_{di}^{*2}\}] \\ &+ (1-\delta)[u(2a_{di}^{*2}) + \beta u(1-2a_{di}^{*2})]. \end{aligned} \quad (10)$$

Only one daughter will provide informal care if:

$$W_{dd}^{*2} \leq W_{dd}^{*1} \quad \Leftrightarrow \quad \widehat{k}_d^{*2} \leq k_d,$$

where:

$$\begin{aligned} \widehat{k}_d^{*2} \equiv& [(p-\alpha w)\left(2a_{di}^{*2} - a_d^{*1}\right) - 2c\left(a_{di}^{*2}\right) + c(a_d^{*1}) - 2\gamma \max\{0; \bar{a} - a_{di}^{*2}\} + \gamma \max\{0; \bar{a} - a_d^{*1}\} + \gamma \bar{a}] \\ &+ \Delta[u(2a_{di}^{*2}) - u(a_d^{*1}) + \beta[u(1-2a_{di}^{*2}) - u(1-a_d^{*1})]]. \end{aligned} \quad (11)$$

Note that $\widehat{k}_d^{*2}$ is increasing with concavity of $c(a_i)$ and becomes zero if the function is linear.

Importantly, $\widehat{k}_d^{*2} < \widehat{k}_d^{*1}$ holds. In words: for low values of the fixed cost $\left(k_d < \widehat{k}_d^{*2}\right)$ both daughters are caregivers, for intermediate values of the fixed cost $\left(\widehat{k}_d^{*2} < k_d < \widehat{k}_d^{*1}\right)$ only one daughter provides care, for high values of the fixed cost $\left(k_d > \widehat{k}_d^{*1}\right)$ informal care is zero.

3.3 Two-son families

Finally, consider a family with two sons (s,s). The social norm is not relevant in this family. When at least one brother provides some informal care the optimization problem writes:

$$\begin{aligned} \max_{a_{s1}, a_{s2}} \; W_{ss}^{1,2} =& \delta[w(1-a_{s1}) + w(1-a_{s2}) - pa_p - C(a_{s1}) - C(a_{s2})] \\ &+ (1-\delta)[u(a_{s1} + a_{s2}) + \beta u(1-a_p)]. \end{aligned}$$

Again, two types of solution can emerge: either both siblings provide informal care and $a_{s1}^{*2} = a_{s2}^{*2} > 0$ or only one brother provides informal care and $a_{s1}^{*1} > a_{s2}^{*1} = 0$.

Proceeding exactly like in subsection 3.1 on can then show that a sufficient condition for the corner solution to prevail is the following:

$$k_d + \rho + 2(w-p)a_s^{*2} + c\left(2a_s^{*2}\right) < 2k_d + 2\rho + 2(w-p)a_s^{*2} + 2c(a_s^{*2}),$$

which generates the condition:[10]

$$\rho > \tilde{\rho}_{ss} \equiv c(2a_s^{*2}) - 2c(a_s^{*2}) - k_d. \qquad \text{(Condition 2)}$$

To keep the number of cases to be considered within tractable limits and to stay in line with the main message of this paper, we assume for the remainder of the paper that

$$\rho > \max\left\{\tilde{\rho}_{sd}, \tilde{\rho}_{ss}\right\} \qquad \text{(Condition 3)}$$

so that we have a corner solution both in mixed-gender families and in two-son families.

Hence, informal LTC in a two-son family $a_{s1}^{*1} \equiv a_s^{*1}$ is chosen such that the net opportunity costs in terms of labor income and material/psychological marginal cost equals the (weighted) net marginal benefit of informal LTC to the parent

$$a_s^{*1}: \quad w + c'(a_s^{*1}) - p = \Delta[u'(a_s^{*1}) - \beta u'(1 - a_s^{*1})]. \qquad (12)$$

Comparing (4) with (12) reveals that $a_s^{*1} < a_d^{*1}$ since both the gender wage gap and the norm cost reduce the opportunity cost of informal LTC provision for daughters. In a type-(s,s) family where home care is provided, welfare can thus be written as:

$$W_{ss}^{*1} = \delta[w + w(1 - a_s^{*1}) - c(a_s^{*1}) - k_d - \rho - p(1 - a_s^{*1})] + (1-\delta)[u(a_s^{*1}) + \beta u(1 - a_s^{*1})].$$

When instead the parent enters the nursing home, welfare is given by:

$$W_{ss}^{*0} = \delta[2w - p] + (1-\delta)\beta u(1)$$

The nursing home is welfare maximizing if

$$W_{ss}^{*1} \leq W_{ss}^{*0} \quad \Leftrightarrow \quad \hat{k}_s^{*1} \leq k_d,$$

where:

$$\hat{k}_s^{*1} \equiv \left[(p-w)a_s^{*1} - c(a_s^{*1}) - \rho\right] + \Delta[u(a_s^{*1}) + \beta[u(1 - a_s^{*1}) - u(1)]]. \qquad (13)$$

For type-(s,s) families the social norm does not affect the critical cost level $\hat{k}_s^{*1}$ and thus the share of families providing informal care $F\left(\hat{k}_s^{*1}\right)$; however, when the parent has the higher weight in the family ($\Delta > 1$) this continues to increase $F\left(\hat{k}_s^{*1}\right)$.

[10] Accounting for a social norm for sons would imply a cost $\gamma_s \max\{0; \bar{a}_s - a_s\}$, where $\bar{a}_s$ is the average care provided by sons in the society. Results would not change qualitatively provided that the cost of deviating from the norm is not more salient for sons (γ_s should not be too high). When a social norm for sons exist, sufficient Condition 2 must be modified and ruling out an interior solution requires a larger ρ. The norm would make splitting more attractive, while a larger ρ goes in the opposite direction.

4 *Laissez-faire* allocation

We are now in the position to characterize the *laissez-faire* allocation. To do so, we first derive the average amount of informal care provided in the population. Then, we show how the social norm affects daughters in our society.

Recall that daughters provide the level of informal care a_d^{*1} in type-(s,d) families and in (d,d)-families with $\widehat{k}_d^{*2} \leq k_d \leq \widehat{k}_d^{*1}$. While they provide the level of informal care a_d^{*2} in (d,d)-families with $0 \leq k_d < \widehat{k}_d^{*2}$. In addition, type-$(s,d)$ families correspond to 1/2 while type-(d,d) families represent 1/4 of families in the population. Finally, the critical cost value, $\widehat{k}_d^{*1}$, is the same in both types of families. The share of women providing a_d^{*1} is given by $F\left(\widehat{k}_d^{*1}\right)/2 + \left(F\left(\widehat{k}_d^{*1}\right) - F\left(\widehat{k}_d^{*2}\right)\right)/4$. The share of women providing a_d^{*2} is $2F\left(\widehat{k}_d^{*2}\right)/4$, because there are two daughters splitting care in 1/4 of the families. The remaining women provide no informal care. Consequently, average informal care provided by women is given by:

$$\begin{aligned}\bar{a}^* &= \left(\frac{1}{2}F\left(\widehat{k}_d^{*1}\right) + \frac{1}{4}\left[F\left(\widehat{k}_d^{*1}\right) - F\left(\widehat{k}_d^{*2}\right)\right]\right)a_d^{*1} + \frac{1}{2}F\left(\widehat{k}_d^{*2}\right)a_d^{*2} \\ &= \left(\frac{3}{4}F\left(\widehat{k}_d^{*1}\right) - \frac{1}{4}F\left(\widehat{k}_d^{*2}\right)\right)a_d^{*1} + \frac{1}{2}F\left(\widehat{k}_d^{*2}\right)a_d^{*2}. \end{aligned} \tag{14}$$

When they share informal care with their sister any of the daughters provides less than when they are the unique caregiver in the family, so that $a_d^{*2} < a_d^{*1}$**.** Thus, expression (14) shows that $a_d^{*2} < \bar{a} < a_d^{*1}$, or that daughters in (s,d)-families and in (d,d) families with $\widehat{k}_d^{*2} \leq k_d \leq \widehat{k}_d^{*1}$ provide more than the average amount of informal care while daughters in (d,d) families with $0 \leq k_d < \widehat{k}_d^{*2}$ provide less than the average amount of care provided by daughters in the society. The latter implies that the norm is never binding for daughters who provide the amount a_d^{*1} of informal care so that $I = 0$ for them. From (4) we have:

$$a_d^{*1}: \quad \alpha w + c'(a_d^{*1}) - p = \Delta[u'(a_d^{*1}) - \beta u'(1 - a_d^{*1})]. \tag{15}$$

The norm is instead binding for all the other daughters in the society and (9) can be rewritten as follows:

$$a_d^{*2}: \quad \alpha w + c'(a_d^{*2}) - p - \gamma = \Delta[u'(2a_d^{*2}) - \beta u'(1 - 2a_d^{*2})] \tag{16}$$

To sum-up, in the *laissez-faire* allocation, the social norm is always binding in families with at least one daughter if the parent enters the nursing home. In addition, in (d,d)-families in which informal care is provided, the norm affects both daughters when they share informal care provision and only the non-caregiver daughter in the case a corner solution applies.

Taking this into account the cost of deviating from the social norm is $\max\{0; \bar{a} - a_d^{*1}\} = 0$ and $\max\{0; \bar{a} - a_d^{*2}\} = \bar{a} - a_d^{*2}$. We can now rewrite the critical cost levels within the three family types, (8), (11) and (13). To facilitate the comparison with the first best, we have gathered the resulting expressions in Appendix A.

Note that $\hat{k}_s^{*1} < \widehat{k}_d^{*1}$ so that the share of families choosing home care is smaller in two-son families than in families with at least one daughter.

The following proposition provides a characterization of the *laissez-faire* allocation.

Proposition 1 (*Laissez-faire* allocation) *(i) In type-(d,d) families, when $0 \leq k_d < \widehat{k}_d^{*2}$, both daughters provide informal care in the same amount a_d^{*2} implicitly defined by (16); when instead $\widehat{k}_d^{*2} \leq k_d \leq \widehat{k}_d^{*1}$, only one sister provides care in the amount a_d^{*1} implicitly defined by (15). In type-(s,d) families, when $0 \leq k_d < \widehat{k}_d^{*1}$, only the daughter provides informal care in the same amount a_d^{*1} defined before.*

(ii) The levels of informal care provided by daughters satisfy: $a_d^{*2} < \bar{a}^* < a_d^{*1}$, where $\bar{a}^*$ is the average level of informal care provided by all daughters in the society as shown in (14).

(iii) In type-(s,s) families, when $0 \leq k_s < \widehat{k}_s^{*1}$, only one brother provides informal care in the amount a_s^{*1} implicitly defined by (12) and such that $a_s^{*1} < a_d^{*1}$.

(iv) For $k_d > \widehat{k}_d^{*1}$ and $k_s > \widehat{k}_s^{*1}$ institutional care is preferred. The critical fixed costs $\widehat{k}_d^{*1}$ and $\widehat{k}_s^{*1}$ are defined by (A1) and (A3) respectively, and are such that $\widehat{k}_s^{*1} < \widehat{k}_d^{*1}$. The critical level such that sisters in (d,d)-families move from splitting care to single-daughter provision, $\widehat{k}_d^{*2} (< \widehat{k}_d^{*1})$, is given by (A2).

(v) All daughters, except the ones providing a_d^{*1}, suffer from the social norm.

The cost of the social norm depends on $\bar{a}^*$ and thus on the choices a_d^{*1} and a_d^{*2}. This implies that the decisions of (d,d) and (s,d) families are interdependent and that informal care a_d^{*1} imposes a negative externality on other daughters both inside and outside the family.

Part of our results could be obtained within a simpler setting with single-child families, either a daughter or a son. With the relevant critical levels suitably redefined, the qualitative results of Proposition 1 (and of Proposition 2 in the following section) would continue to hold in this case. However, the empirical literature has shown that daughters provide more care than sons overall, but more specifically they also provide more care than their male siblings in mixed-gender families. This latter fact and its impact on policy design could not be addressed in a simpler single-child setting. Consequently, studying a model with single-child families would have considerably reduced the practical relevance of our paper.

5 First-best allocation

We now characterize the first-best solution in order to analyze the *laissez-faire* inefficiencies created by the existence of the social norm on the one side, and by the unequal generational weights on the other side. We consider a utilitarian social welfare function given by the sum

of utilities of the three types of families, weighted by their respective shares, and which takes the social norm into account. In other words, welfare corresponds to the sum of utility of *all* individuals. Observe that this is in line with families' objective function when $\Delta = 1$, which corresponds precisely to the case where the parent receives the same weight as each of the children.[11] When $\Delta \neq 1$, social and family weights differ, which introduces a "paternalistic" dimension. We return to the specification of the social welfare function in Section 8.

In line with Proposition 1, we concentrate on solutions where only the daughter provides care in (s,d)-families and where only one of the sons provides care in (s,s)-families. In other words, we assume that the counterpart to Condition 3 holds in the first-best solution. For (d,d)-families, on the other hand, we consider both splitting and single-daughter provision. To be more precise we consider the *possibility* of an interval of small k_d's, $0 \leq k_d < \widehat{k}^1_{dd}$, in which daughters split care. This does not rule out the possibility of a first-best solution with $\widehat{k}^1_{dd} = 0$. However, this will only arise when c is linear; assuming $c'' > 0$ ensures that the interval is not empty.

Recall that an allocation specifies the amount of informal LTC provided by sons and daughters, the family-specific fixed cost of providing informal LTC characterizing the siblings who are indifferent between providing and not providing informal LTC in the three types of families, and the fixed-cost characterizing sisters moving from one to two caregivers in two-sister families. Again, the superscript ^{1} indicates a corner solution whereas the superscript ^{2} denotes and interior solution. We have to determine a^1_{dd}, a^2_{dd}, a^1_{sd}, a^1_{ss}, $\widehat{k}^1_{dd}$, $\widehat{k}^2_{dd}$, $\widehat{k}^1_{sd}$, and $\widehat{k}^1_{ss}$ that maximize the following social welfare function:

$$\begin{aligned}\max_{a^1_{ss},\widehat{k}^1_{ss},a^1_{sd},\widehat{k}^1_{sd},a^1_{dd},a^2_{dd},\widehat{k}^1_{dd},\widehat{k}^2_{dd}} SW = &\frac{1}{2}\left\{\int_0^{\widehat{k}^1_{sd}} W^1_{sd} f(k)\mathrm{d}c + \left[1 - F(\widehat{k}^1_{sd})\right] W^0_{sd}\right\} \\ &+ \frac{1}{4}\left\{\int_0^{\widehat{k}^2_{dd}} W^2_{dd} f(k)\mathrm{d}k + \int_{\widehat{k}^2_{dd}}^{\widehat{k}^1_{dd}} W^1_{dd} f(k)\mathrm{d}k + \left[1 - F(\widehat{k}^1_{dd})\right] W^0_{dd}\right\} \\ &+ \frac{1}{4}\left\{\int_0^{\widehat{k}^1_{ss}} W^1_{ss} f(k)\mathrm{d}k + \left[1 - F(\widehat{k}^1_{ss})\right] W^0_{ss}\right\},\end{aligned} \tag{17}$$

where W^1_{sd}, W^1_{dd} and W^1_{ss} represent families' welfare when only one sibling is providing informal care while W^2_{dd} indicates welfare when two daughters share informal care. The expressions for these welfare levels follow directly from those provided in Section 3 by setting $\Delta = 1$ given that the young and old generation are weighted equally by the social planner. The resulting

[11] In the original specification with δ, each family maximizes (with obvious notation) $\delta U_P + (1-\delta)(U_{C1} + U_{C2})$. With $\delta = 1/2$ (or $\Delta = 1$) this yields

$$\frac{1}{2}\left(U_P + U_{C1} + U_{C2}\right),$$

which corresponds to the maximization of the sum of utilities. We obtain the same social welfare function (17) if each individual is given a weight of 1/3. All this is just a matter of normalization.

expression are gathered in Appendix B.

The optimal levels of informal LTC are derived in the online Appendix E. As in the *laissez-faire*, given the gender wage gap and the son's additional fixed cost ρ, in type-(s,d) families it is optimal that the daughter takes the role of the caregiver. In type-(s,d) families and in (d,d)-families with $\widehat{k}_d^{FB2} \leq k_d \leq \widehat{k}_d^{FB1}$, daughters provide the same level of informal care $a_{sd}^{FB1} = a_{dd}^{FB1} \equiv a_d^{FB1}$. While both sisters provide the level of informal care $a_d^{FB2} (< a_d^{FB1})$ in (d,d)-families with $0 \leq k_d < \widehat{k}_d^{FB2}$. Moreover, the critical cost value for entering a nursing home is the same in (s,d) and (d,d)-families: $\widehat{k}_{sd}^{FB1} = \widehat{k}_{dd}^{FB1} \equiv \widehat{k}_d^{FB1}$. Thus, similarly to the *laissez-faire*, the average informal care provided by women in first best is given by:

$$\bar{a}^{FB} = \left(\frac{3}{4}F(\widehat{k}_d^{FB1}) - \frac{1}{4}F(\widehat{k}_d^{FB2})\right) a_d^{FB1} + \frac{1}{2}F(\widehat{k}_d^{FB2}) a_d^{FB2}. \tag{18}$$

In addition, the social norm is binding for daughters providing informal care at a level $a_d \leq a_d^{FB2}$, i.e. for the daughters not providing care and for the sisters splitting care.

The amount of informal care provided by daughters in the corner solution solves:

$$a_d^{FB1}: \quad \alpha w + c'(a_d^{FB1}) - p + \varphi = u'(a_d^{FB1}) - \beta u'(1 - a_d^{FB1}). \tag{19}$$

In (d,d)-families where daughters split care we have:

$$a_d^{FB2}: \quad \alpha w + c'(a_d^{FB2}) - p - \gamma + \varphi = u'(2a_d^{FB2}) - \beta u'(1 - 2a_d^{FB2}). \tag{20}$$

Informal care provided by sons in type-(s,s) families instead solves:

$$a_s^{FB1}: \quad w + c'(a_s^{FB1}) - p = u'(a_s^{FB1}) - \beta u'(1 - a_s^{FB1}). \tag{21}$$

The right hand side (RHS) in (19), (20) and (21) reflects the net marginal benefit of informal care provision to the parent. The left hand side (LHS) in (21) contains the marginal cost of care for the caregiver brother. The left hand side in (19) and (20) indicates the sum of the private *and the social marginal cost* of informal care for the daughters. In particular, the social marginal cost of informal care is captured by the term φ and is defined by:

$$\begin{aligned} \varphi &\equiv \gamma \left(\frac{1}{2}\left[1 - F(\widehat{k}_{sd}^1)\right] + 2\frac{1}{4}\left[1 - F(\widehat{k}_{dd}^1)\right] + \frac{1}{4}\left[F(\widehat{k}_{dd}^1) - F(\widehat{k}_{dd}^2)\right] + 2\frac{1}{4}F(\widehat{k}_{dd}^2) \right) \\ &= \gamma \left(1 + \frac{1}{4}F(\widehat{k}_d^2) - \frac{3}{4}F(\widehat{k}_d^1)\right). \end{aligned} \tag{22}$$

The above term collects all marginal effects of informal care provided by daughters on the average amount of informal care $\bar{a}^{FB}$ and its expression reflects the total negative externality imposed by single-caregiver daughters on all women who provide care at a level $a_d \leq a_d^{FB2}$. Looking at (22), the first two terms in brackets reflect the costs suffered by all daughters in type-(s,d) and (d,d) families whose parents enter the nursing home, the third term represents

the cost suffered by the non-caregiver daughter in (d,d) families and the last term indicates the cost suffered by the two caregivers in (d,d) families where the interior solution applies.[12]

As derived in online Appendix E, the critical values for the fixed costs $\hat{k}_i^{FB}$ are the following:

$$\widehat{k}_d^{FB1} \equiv (p-\alpha w)a_d^{FB1} - c(a_d^{FB1}) + \gamma \bar{a}^{FB} + u(a_d^{FB1}) + \beta[u(1-a_d^{FB1}) - u(1)] - \varphi a_d^{FB1}, \quad (23)$$

$$\begin{aligned}\widehat{k}_d^{FB2} = {} & [(\alpha w - p)(a_d^{FB1} - 2a_d^{FB2}) + [c(a_d^{FB2}) - 2c(a_d^{FB1})] + \gamma(2a_d^{FB2} - \overline{a}^{FB}))] \quad (24)\\ & + [u(2a_d^{FB2}) + \beta u(1-2a_d^{FB2})] - [u(a_d^{FB1}) + \beta u(1-a_d^{FB1})] - \varphi(2a_d^{FB2} - a_d^{FB1})\end{aligned}$$

$$\widehat{k}_s^{FB1} \equiv (p-w)a_s^{FB1} - c(a_d^{FB1}) - \rho + u(a_s^{FB1}) + \beta[u(1-a_s^{FB1}) - u(1)]. \quad (25)$$

They reflect costs and benefits of the alternative relevant decisions. For example, $\widehat{k}_d^{FB1}$ indicates the difference between private benefits and private and social cost of home and institutional care for (s,d) and (d,d)-families. Note that, with respect to the corresponding values in the laissez faire, both $\widehat{k}_d^{FB1}$ and $\widehat{k}_d^{FB2}$ are corrected to take the negative externality generated by informal care into account. We observe that $\widehat{k}_d^{FB1}$ is "corrected to a larger extent" than $\widehat{k}_d^{FB2}$ because the first critical value internalizes the cost of the negative externality suffered by daughters not providing care whereas the second one internalizes the lower cost suffered by daughters who share the burden of informal care.

The results of this section are summarized in the following proposition.

Proposition 2 (First-best allocation) *(i) In type-(d,d) families, when $0 \leq k_d < \widehat{k}_d^{FB2}$, both daughters provide informal care in the same amount a_d^{FB2} implicitly defined by (20); when instead $\widehat{k}_d^{FB2} \leq k_d \leq \widehat{k}_d^{FB1}$, only one sister provides care in the amount a_d^{FB1} implicitly defined by (19). In type-(s,d) families, when $0 \leq k_d < \widehat{k}_d^{FB1}$ only the daughter provides informal care in the same amount a_d^{FB1} defined before.*

(ii) The optimal levels of informal care provided by daughters satisfy $a_d^{FB2} < \bar{a}^{FB} < a_d^{FB1}$, where $\bar{a}^{FB}$ is the average level of informal care defined by (18). Levels of care a_d^{FB2} and a_d^{FB1} take into account the marginal social cost of informal care, φ, defined in (22), or the negative externality imposed by single-daughter caregivers on all the other daughters.

(iii) In type-(s,s) families, when $0 \leq k_s < \widehat{k}_s^{FB1}$, only one brother provides informal care in the amount a_s^{FB1} implicitly determined by (21) and such that $a_s^{FB1} < a_d^{FB1}$.

(iv) For $k_d > \widehat{k}_d^{FB1}$ and $k_s > \widehat{k}_s^{FB1}$ institutional care is efficient. The critical fixed costs $\widehat{k}_d^{FB1}$ and $\widehat{k}_s^{FB1}$ are defined by (23) and (25) respectively, and are such that $\widehat{k}_s^{FB1} < \widehat{k}_d^{FB1}$. The critical level such that sisters in (d,d)-families move from splitting care to single-daughter provision, $\widehat{k}_d^{FB2}\left(< \widehat{k}_d^{FB1}\right)$, is given by (24).

[12] The second and the last term in (22) are counted twice because there are two sisters in type-(d,d) families.

In first best the negative externality is optimally internalized. Hence the cost of the social norm is lower than in the LF.

6 Policy design

The results presented in the previous sections have shown that the LF and the utilitarian FB differ for two reasons. First, through the social norm, informal care by daughters imposes a negative externality on other women. Because of this externality the equilibrium will be inefficient. *Ceteris paribus* it will imply too much informal care so that the levels of both female formal home and institutional care will be too small. Observe that this inefficiency implies that the equilibrium is not on the Pareto frontier. Consequently, it is possible to make both children and parents better off through a suitably designed LTC policy.

Second, the LF differs from the social optimum because the weights children and parents have in the family bargaining problem differ in general (unless $\Delta = 1$) from their weights in social welfare. Thus, even when there is no social norm, so that the LF is on the Pareto-frontier, the solution will not be socially optimal. In that case a Pareto-improvement is not possible but the utilitarian social welfare function calls for a move *along* the Pareto-frontier to make either the caregivers or the parents better off, depending on the family bargaining weights. In the general case where both social norms and different weights apply, the two effects just described are of course intertwined. However, it is insightful to keep them in mind and to look at special cases where only one of them applies.

6.1 Gender-specific linear policies

We now turn to the design of **linear** long term care policies. Specifically, we examine how the FB allocation can be implemented through such policies. The following proposition is established in online Appendix F.

Proposition 3 *The utilitarian first-best solution can be implemented by a system of linear (positive or negative) subsidies on formal home care,* σ_s^1, σ_d^1 *and* σ_d^2, *and by (positive or negative) cash transfers* θ_s^1, θ_d^1 *and* θ_d^2, *financed by a uniform lump-sum tax. All policies are specific to the gender and the number of informal caregivers in the family. The implementing subsidies for formal home care are given by*

$$\sigma_s^1 = (\Delta - 1)[w + c'(a_s^{FB1}) - p] \tag{26}$$

$$\sigma_d^1 = (\Delta - 1)[\alpha w + c'(a_d^{FB1}) - p] + \Delta\varphi \tag{27}$$

$$\sigma_d^2 = (\Delta - 1)[\alpha w + c'(a_d^{FB2}) - p - \gamma] + \Delta\varphi; \tag{28}$$

the implementing cash transfers are

$$\theta_s^1 = \sigma_s^1(1-a_s^{FB1}) + (\Delta-1)[u(a_s^{FB1}) + \beta[u(1-a_s^{FB1}) - u(1)]] \tag{29}$$

$$\theta_d^1 = \sigma_d^1(1-a_d^{FB1}) + \varphi a_d^{FB1} + (\Delta-1)[u(a_d^{FB1}) + \beta[u(1-a_d^{FB1}) - u(1)]] \tag{30}$$

$$\begin{aligned}\theta_d^2 = \ & \sigma_d^1(1-a_d^{FB1}) - \sigma_d^2(1-2a_d^{FB2}) - \varphi(2a_d^{FB2} - a_d^{FB1}) \\ & + (1-\Delta)[u(2a_d^{FB2}) - u(a_d^{FB1}) + \beta[u(1-2a_d^{FB2}) - u(1-a_d^{FB1})]].\end{aligned} \tag{31}$$

where σ_s^1 and θ_s^1 apply when both siblings are male; σ_d^1 and θ_d^1 apply to families with a unique female caregiver; σ_d^2 and θ_d^2 apply to families with two female caregivers.

The expressions for these subsidies reflect the two effects mentioned before. Furthermore, the signs of the subsidies tell us which of the two effects is stronger and in which direction the LF has to be corrected to achieve the optimal solution. More precisely, using expressions (12), (15) and (16) for the LF, and (19), (20) and (21) for the FB, it follows that

$$\begin{aligned}\sigma_s^1 \gtreqless 0 \quad &\Leftrightarrow \quad a_s^{*1} \gtreqless a_s^{FB1}, \\ \sigma_d^1 \gtreqless 0 \quad &\Leftrightarrow \quad a_d^{*1} \gtreqless a_d^{FB1}, \\ \sigma_d^2 \gtreqless 0 \quad &\Leftrightarrow \quad a_d^{*2} \gtreqless a_d^{FB2}.\end{aligned}$$

In words, the subsidy on formal home care in any given family is positive if the level of informal care provided in the LF is too large and it is negative in the opposite case. This is quite in line with intuition: when the LF implies too much informal care we can reduce it by subsidizing the closest substitute, namely formal home care. A major difference between the subsidy to formal home care for sons and daughters arises because informal care by sons does not contribute to the negative externality and thus σ_s^1 does not depend on the marginal social cost of female informal care, φ (see 26). As a consequence, $\Delta = 1$ implies $\sigma_s^1 = 0$. In words, the amount of male informal care is efficient when intergenerational weights in the family are equal.

For the cash transfers the interpretation of the sign is more complicated. First, to get a meaningful expression to interpret we have to consider the *net* cash transfers, rather than just the value of θ_s^1, θ_d^1 and θ_d^2. This is given by $\theta_s^1 - (1-a_s^{FB1})\sigma_s^1$ for two-son families and by either $\theta_d^1 - (1-a_d^{FB1})\sigma_d^1$ or $\theta_d^2 - \sigma_d^1(1-a_d^{FB1}) + \sigma_d^2(1-2a_d^{FB2})$ for families with at least one daughter. The expressions $\theta_s^1 - (1-a_s^{FB1})\sigma_s^1$ and $\theta_d^1 - (1-a_d^{FB1})\sigma_d^1$ effectively measure the net transfer a family receives when switching from formal home to institutional care and it is of course this level which is relevant for the choice between the two modes of care. Similarly, the expression $\theta_d^2 - \sigma_d^1(1-a_d^{FB1}) + \sigma_d^2(1-2a_d^{FB2})$ represents the (positive or negative) transfer that a (d,d)-family receives when switching from informal care provision by a single daughter to provision by two daughters.

To understand the trade-offs which are involved, it is interesting to consider the two special cases: equal weights and no norm cost. When family and social weights coincide, so that $\Delta = 1$ we have

$$\sigma_d^1 = \sigma_d^2 = \theta_d^1 = \varphi \tag{32}$$

$$\sigma_s^1 = \theta_s^1 = \theta_d^2 = 0. \tag{33}$$

In that case the solution is considerably simplified. Recall that the level of institutional care is constant and equal to 1. Hence, while we have referred to θ_d^1 as a cash transfer it can also be seen as a proportional subsidy on institutional care. To explain (32) and (33) the second interpretation of θ_d^1 is the most telling. With equal weights, the straight Pigouvian rule applies to all types of formal care whether provided at home or in an institution. In other words formal care is subsidized at a rate which reflects the marginal norm cost (marginal social damage) of the informal care it replaces. Observe that this cost is gender specific. In all families where informal care is provided by one or two daughters (that is in all families except for (s, s)) it is equal to φ. But when both siblings are sons, it is equal to zero, because the informal care provided by sons does not affect the norm cost. Interestingly, with $\Delta = 1$, we also have $\theta_d^2 = 0$. Consequently once the Pigouvian subsidy is applied to formal care, sisters' decision to split care or not is efficient. No (additional) correction of the critical cost $\hat{k}_d^{*2}$ motivated by norm costs is needed.

In the other extreme case, when there is no social norm we have $\gamma = \varphi = 0$. Expressions from (26) to (31) then imply that the subsidies on formal home care σ_s^1, σ_d^1 and σ_d^2 as well as the net transfers, $\theta_s^1 - (1 - a_s^{FB1})\sigma_s^1$, $\theta_d^1 - (1 - a_d^{FB1})\sigma_d^1$ and $\theta_d^2 - \sigma_d^1(1 - a_d^{FB1}) + \sigma_d^2(1 - 2a_d^{FB2})$ have the same sign as $(\Delta - 1)$.[13] All policies are now solely determined by "paternalistic" considerations. When parents have the larger bargaining weight in the family ($\Delta > 1$), too much informal care is provided and both modes of formal care, home and institutional, have to be subsidized. The transfer that a (d, d) family receives when switching from informal care provision by a single daughter to provision by two daughters, $\theta_d^2 - \sigma_d^1(1 - a_d^{FB1}) + \sigma_d^2(1 - 2a_d^{FB2})$, requires some additional explanation. When $\Delta > 1$ the range of fixed costs for which daughters split is too large. To understand this recall that, when two daughters provide care, the total informal care provided to parents is larger than when a there is a single provider. Consequently when parents have a larger weight, the policy provides an incentive for fewer daughters to split care (with a negative net transfer of $\theta_d^2 - \sigma_d^1(1 - a_d^{FB1}) + \sigma_d^2(1 - 2a_d^{FB2}) < 0$), so that the total informal care received by parents decrease. The opposite result obtains when children have the larger weight. No policy intervention is needed when $\Delta = 1$.

[13] As long as $\alpha w - p > 0$ which we assume.

In the general case, when $\gamma > 0$ and $\Delta \neq 1$, both the efficiency and paternalistic (weight-related) effects are relevant. They reinforce each other when $\Delta > 1$ so that all the net subsidies and transfers to formal care are positive and exceed the Pigouvian levels. Splitting, on the other hand, is discouraged so that $\theta_d^2 - \sigma_d^1(1 - a_d^{FB1}) + \sigma_d^2(1 - 2a_d^{FB2})$ is negative as in the no-norm case discussed above. In all cases, the intuition is the same: daughters are now subject to a double jeopardy and suffer both from the social norm and from their lower weight in the family and this leads to excessive informal care. Sons, on the other hand, do not contribute to the externality. Nevertheless, their informal care is inflated (compared to the utilitarian benchmark) by the higher weight of the parents. To sum up, too much informal care is provided in the LF and this calls for subsidies on all modes of formal care and for a reduction of families in which siblings share informal care.

Finally, when $\Delta < 1$ efficiency and paternalism go in opposite directions. By continuity all net subsidies will remain positive when Δ is sufficiently close to 1, but the signs may be reversed when Δ is sufficiently small.

Note that subsidies must be gender-specific and except when $\Delta = 1$ may depend on the number of informal caregivers. With $a_d^{FB2} < a_d^{FB1}$, expressions (26)–(28) imply $\sigma_d^1 > \sigma_d^2$ when $\Delta > 1$ while $\Delta < 1$ yields the opposite result. While $\sigma_s = 0 < \sigma_d^1 = \sigma_d^2 = \varphi$ when $\Delta = 1$, the comparison between σ_s and the subsidy rates for daughters is ambiguous when Δ is sufficiently different from 1. Similarly, the comparison across genders of the net subsidies on institutional care appears to be ambiguous as well.

The main properties of the optimal subsidies on formal home and institutional care are summarized in the following proposition.

Proposition 4 *The optimal subsidies/transfers stated in Proposition 3 are gender-specific and have the following properties:*

(i) When $\Delta = 1$, so that family and social weights coincide, we have $\theta_d^1 = \sigma_d^1 = \sigma_d^2 = \varphi$. Hence, in families with at least one daughter, a uniform subsidy on all types of formal care set according to the Pigouvian rule and equal to the "marginal social damage" is sufficient. No policy is needed for male siblings.

(ii) When $\gamma = \varphi = 0$, so that there is no social norm, the subsidies on formal home care, the net cash transfers on institutional care, and the net transfer to splitting daughters have the same sign as $(\Delta - 1)$. Now the policy is solely determined by "paternalistic" considerations and it also applies to male siblings.

(iii) In the general case, when $\Delta \neq 1$ and $\gamma > 0$, both the efficiency and paternalistic (weight-related) effects are relevant.

– *When $\Delta > 1$, they reinforce each other so that the net gender-specific subsidies/transfers are positive and larger than the Pigouvian levels. The exception is the net transfer to splitting daughters which is negative.*

– *When $\Delta < 1$ efficiency and paternalism go in opposite directions and the net gender-specific subsidies/transfers may even become negative, while the net transfer to splitting daughters may become positive.*

The previous proposition illustrates the general properties of optimal unconstrained policies. Interestingly, these policies are never gender neutral even when, with $\Delta = 1$, a straight Pigouvian rule applies because sons' informal care does not contribute to the norm cost. In practice gender-specific policies may be difficult to implement because of political or institutional constraints. The government may then be constrained to design gender neutral policies. We investigate this issue in the next subsection.

6.2 Gender neutral nonlinear policies

One can approach this problem from two perspectives. The first one is to continue to use linear instruments but impose the extra constraint that the same policy applies to both genders. This solution is of course necessarily second-best only. While this approach is conceptually simple, it implies tedious calculations, as usual in linear tax models, especially when $\Delta \neq 1$ so that the envelope theorem cannot be applied; see Cremer *et al.* (2008) which, though dealing with a completely different problem, illustrates the difficulties involved. One can expect the gender neutral linear optimal rates to be given by a weighted averages of the gender-specific levels.[14]

Consequently, we can conjecture that in the case where parents have the larger weight ($\Delta > 1$) gender neutral subsidies on formal care are positive and larger than the Pigouvian level both for home and for institutional care. In the opposite case ($\Delta < 1$), the solution was already ambiguous in the non-uniform case so that conjurers about gender neutral policies become even more complicated. Negative subsidies cannot be ruled out, but their feasibility may also be debatable. Imposing a non-negativity constraint would then yield a zero subsidy in these cases.

A more ambitious approach is to allow for nonlinear instruments, without imposing extra *ad hoc* restrictions. Recall that the FB implementation considered above induces families to self-select according to fixed costs. We continue to assume that formal care is observable, while fixed costs are not, so that strictly speaking there is no additional asymmetric information. However, from a purely formal perspective, imposing gender neutrality (GN) is equivalent to assuming that gender is not observable. With nonlinear policies sons and daughters may face *ex*

[14] The FOCs for a uniform tax/subsidy are generally the sum of the FOCs for the type-specific rates. The "weighted average" conjecture requires of course that the FOCs are sufficiently well-behaved.

post different subsidy rates, but they must be offered the same options (menu of contracts) to choose from. And a gender differentiation is feasible only if it is self-selecting so that each gender prefers the formal care/subsidy bundle that is designed for them. Using the terminology of the optimal taxation literature, GN is thus equivalent to the restriction that tagging according to gender is not possible.

To stay in line with notation used in the previous section we denote the nonlinear subsidies/transfers by using boldface in particular $\boldsymbol{\sigma}_d^1$, $\boldsymbol{\sigma}_s^1$, $\boldsymbol{\theta}_d^1$, $\boldsymbol{\theta}_s^1$, etc. For the sake of implementation these are functions of *formal* care. Observe that these notations refer to total payments. The marginal subsidy is $(\boldsymbol{\sigma}_d^1)'$ which is equal to σ_d^1 when the function is linear as in the previous section. Note that strictly speaking the distinction between $\boldsymbol{\theta}$'s and $\boldsymbol{\sigma}$'s are no longer necessary because we have by definition $\boldsymbol{\theta}_i^1 = \boldsymbol{\sigma}_i^1(1)$. Furthermore recall that, in the linear case, θ's apply to a level of formal care of 1, hence they can be interpreted as subsidy rate or total payments.

We briefly sketch the main results obtained under gender neutrality below and provide some more details in the Appendix. To concentrate on the extra complexity brought about by gender neutrality, we assume $\Delta = 1$.

We start by examining under which conditions (if at all) it is possible to implement the FB by a gender-neutral policy. First observe that with GN we must have $\boldsymbol{\theta}_d^1 = \boldsymbol{\theta}_s^1$. In words, the transfer to families using institutional care must be the same for all. For all these families formal care is equal to one and with GN there is no way of screening for the type based on formal care consumed. From equations (26)–(30) and using $\Delta = 1$ all this implies[15]

$$\boldsymbol{\theta}_s^1 = \boldsymbol{\sigma}_s^1, \tag{34}$$

$$\boldsymbol{\theta}_d^1 = \boldsymbol{\sigma}_d^1 + \varphi a_d^{FB1}. \tag{35}$$

consequently, we have

$$\boldsymbol{\sigma}_s^1 = \boldsymbol{\sigma}_d^1 + \varphi a_d^{FB1}$$

which implies $\boldsymbol{\sigma}_s^1 > \boldsymbol{\sigma}_d^1$. Consequently if an IC constraint is violated at a FB implementation it must be that of daughters. Sons can only lose by mimicking daughters (by choosing $a_s = a_d^{FB1}$) because they would receive a lower subsidy and choose a level of informal care different from their preferred one. For daughters, on the other hand the choice is ambiguous. Their *IC* is given

[15] To understand (34) and (35) consider that, when $\Delta = 1$, the marginal subsidy σ_s^1 is zero, meaning that the nonlinear subsidy $\boldsymbol{\sigma}_s^1$ must be constant. Given that, when $a_s^1 = 0$, the nonlinear subsidy $\boldsymbol{\sigma}_s^1$ must take value $\boldsymbol{\theta}_s^1$, equality (34) follows. Similarly, when $\Delta = 1$, the marginal subsidy σ_d^1 equals φ and is thus constant. This implies that the nonlinear subsidy is $\sigma_d^1 = \varphi(1 - a_d^1)$. When $a_d^1 = 0$, $\boldsymbol{\theta}_s^1 = \sigma_d^1(1) = \varphi$ holds. The latter equality can be rewritten as $\boldsymbol{\theta}_s^1(\cdot) = \sigma_d^1 + \varphi a_d^1$, which explains (35).

by

$$(\alpha w - p)(1 - a_d^1) - c(a_d^1) + u(a_d^1) + \beta u(1 - a_d^1) + \boldsymbol{\sigma}_d^1 \geq$$
$$(\alpha w - p)(1 - a_s^1) - c(a_s^1) + u(a_s^1) + \beta u(1 - a_s^1) + \boldsymbol{\sigma}_s^1 - \gamma(\overline{a} - a_s^1)$$

or

$$(\alpha w - p)(1 - a_d^1) - c(a_d^1) + u(a_d^1) + \beta u(1 - a_d^1) - \varphi a_d^1 \geq$$
$$(\alpha w - p)(1 - a_s^1) - c(a_s^1) + u(a_s^1) + \beta u(1 - a_s^1) - \gamma(\overline{a} - a_s^1) \tag{36}$$

These expressions show that the caregiving daughter can get a higher subsidy by mimicking a son but she has to adopt a level of care different from the preferred one (namely a_s^{FB1}) and she would incur the norm cost $\gamma(\overline{a} - a_s^{FB1})$.

We thus have two possible regimes for the optimal GN policy. When (36) is satisfied at the FB allocation then nothing changes. The FB is implementable under GN and thus of course continues to be the best policy. Interestingly the condition is not a "knife-edge" property; in practice one can expect it to be satisfied when a_s^{FB1} and a_d^{FB1} are sufficiently different. This is of course more likely when α is not too close to one and/or the norm cost is sufficiently large. In this case gender neutrality is not a problem; we can implement the FB by offering the same *menu* of nonlinear contracts to everyone and the gender targeting will be accomplished by self-selection. Furthermore, the *marginal* subsidies will then continue to be given by the levels specified in equation (26)–(28).

When, on the other hand, (36) is violated at the FB allocation the incentive constraint is binding and we are in a second-best world. We show in Appendix D that this does not change a_d^1, because of the "no distortion at the top property", while a_s^1 is distorted downward. Intuitively, the daughter's net marginal utility of informal care is larger than that of the son's (because of the lower wage and the norm cost). Consequently a downward distortion on a_s hurts the mimicking individual (the daughter) more than the mimicked (the son) and is thus effective in relaxing an otherwise binding incentive constraint. To sum up, the marginal subsidy implementing this solution remains the same for daughters but it is now negative for sons.

7 Policies implications

Total government expenditures on LTC (including both the health and social care components) are in the range [0.5%, 3.7%] of GDP: the lowest spender is Hungary while the highest one is the Netherlands; see Table 1 in Appendix C. This variation in public expenditures mostly reflects the development of formal LTC systems, as opposed to more informal arrangements based mainly on care provided by unpaid family members. On average, the public spending

on LTC corresponds to 1.7% of GDP across OECD countries in 2015. Specifically, the 1.3% of government expenditures is devoted to the health expenditures component of LTC including palliative care and hospice care. The remaining 0.4% is devoted to the social component of LTC accounting for cash transfers, allowances, home help (e.g., domestic services) and care assistance, residential care services, and other social services (see below); OECD 2017. The subsidies and transfers we discussed in the previous section are part of the social component of the government expenditures on LTC.

Spending by government and compulsory insurance schemes on LTC has increased more rapidly than health care expenditures over the last decade. The annual growth rate was 4.6% between 2005 and 2015 across OECD countries; see Table 2 in Appendix C for country-specific figures. Projection scenarios suggest that public resources allocated to LTC as a share of GDP could double or more by 2060; OECD 2017. One of the main challenges in the future will be to strike the right balance between providing appropriate social protection to people with LTC needs while ensuring that this protection is fiscally sustainable.

Over the past couple of decades, nearly all OECD countries have been encouraging "ageing in place" policies with a mix of demand and supply-side interventions: direct expansion of home-care supply, regulatory measures and financial incentives. These policies are based on the idea that an effective and efficient way to reduce nursing home expenses is to subsidize both formal and informal home care. Our model has shown that the case for subsidizing formal home care is indeed strong. However, when it comes to *informal* care, possibly conflicting tradeoffs are involved. From a budgetary perspective formal and informal home care are cheaper which, as long as it is possible, pleads for encouraging them. However, first, women may bear most of the cost of informal care and second, depending on the parents weight in family utility, the cost supported by all informal caregivers may be further exacerbated. We show that because of these two effects, encouraging institutional care may be desirable even though its budgetary cost is larger.

More generally, we show that policies subsidizing home care fail to take into account gender issues in the provision of informal LTC. Our results suggest that, when the parent's weight in family utility is not too small, given the existing social norms about gender roles and the well known gender gaps characterizing the labor market, optimal policies should indeed "deliberately discourage" informal care through subsidies to formal LTC.

How should formal LTC be subsidized in practice? Our model shows that the best way to do so is through policies that are specific to the type of formal care and to the gender and the number of informal caregivers in the family. However, gender specific policies violate horizontal equity and are thus perceived as discriminatory. The nonlinear policy presented in Section 6.2 overcomes this problem by offering the same *menu* of different "options" to everyone. The (three)

options consist of different combinations of subsidy and (in)formal care: $(\boldsymbol{\sigma}_d, a_d)$, $(\boldsymbol{\sigma}_s, a_s)$ and $(\boldsymbol{\theta}, 1)$. Where the first two combinations are addressed to female and male caregivers respectively, whereas the last combination is for families using nursing homes. Families choose one of these options and the incentive constraint ensures that it's the one designed for them; thus no gender discrimination occurs. The differentiation is achieved by self-selection rather than by exogenous targeting. Interestingly we have shown that, under some conditions, this policy can implement the first-best. And when the first-best cannot be achieved we can still obtain a second best which involves differentiation across genders (and which performs better than a uniform policy).

8 Concluding comments

Dependency and the need for LTC are not new problems. However, until rather recently, these topics have received little attention, both in the public debate as in the economic literature. As explained by Cremer *et al.* (2012), much of this literature is empirical, but there has been an increasing number of theoretical papers over the last few years. Most of these papers look at the problem of LTC from the parent's perspective and they generally neglect welfare of the caregivers.[16] More importantly, they remain agnostic about caregivers' gender, despite the fact that daughters typically pay the larger burden of informal care. Since "each unhappy family is unhappy in its own way" the type of interaction between generations is likely to differ across families and altruistic, strategic, exchange or norm based patterns can be expected to coexist in practice. Since an all-encompassing model is still out of reach the approach so far has consisted in looking at the various scenarios in isolation.

We continue with this tradition even though we take an otherwise completely unusual and fresh look at the issue of LTC. In particular, we view the provision of LTC as a matter of family bargaining in which caregivers and their gender-specific roles are a crucial ingredients. In our setting we abstract from a number of issues which are important and have been stressed so far in the literature (these include risk, insurance, misperception and redistribution) to focus instead on the trade-off between the caregivers' welfare and their parents needs (or preferences) for informal care. While crowding out of informal care by social (or private) insurance represents a major concern in the existing literature, our paper shows that this view can be misleading. When daughters feel compelled to provide informal care, even in a globally cooperative setting there may well be too much informal care and public policy ought to subsidize formal care, both at home and in institutions even when issues of redistribution, risk or insurance are neglected. While the existing literature has shown that various policies may be desirable *in spite* of the

[16] Klimaviciute (2015) and Canta and Cremer (2019) take the welfare of caregivers into account but continue to study the decisions from the parent's perspective.

crowding out, we argue that policies may be designed to deliberately discourage informal care.

Two caveats about the Social Welfare Function are in order. First, we confess that our utilitarian (consequentialist) approach is debatable on philosophical grounds. The alternative would have been to consider a paternalistic (non welfarist) approach excluding the norm cost from social welfare. In that case, absent the issue of family bargaining, informal care under *laissez-faire* would be optimal because the externality does not matter but, the share of families using institutional care would be too low in laissez faire because daughters are wrongly discouraged by the norm. Hence, the paternalistic approach would provide a more simplistic explanation of the effects which contribute to the source of gender inequalities in LTC informal provision.

The issue of welfare relevant externalities (and the appropriate "laundering of preference") is extensively discussed for instance by Harsanyi (1982) who indeed argues that not all externalities can be considered as policy relevant. However, as we discuss in Subsection 1.2, the societal perception of traditional gender roles are indeed well documented in the empirical literature and appear to be sufficiently significant to consider them as policy relevant.

Second, the possible endogeneity of the family-specific fixed part of the cost of providing care may be an issue. One could argue that this cost is explained by earlier choices and should therefore not be considered as social cost. However, in the literature this questions appears to be mostly relevant in models which deal with redistribution. As explained by Fleurbaey and Maniquet (2011) one can then argue that redistribution should be based on characteristics for which individuals are not "responsible". Roughly speaking, from that perspective individuals who cannot work because they are handicapped should be entitled to assistance, while no transfers should be given to the "lazy". Since we do not deal with redistribution between families (preferences are quasi-linear with a constant marginal utility of income) and since our setting is static and takes past decisions as given, including the cost in welfare appears to be the most natural approach.

In addition, only part of the fixed costs are effectively endogenous. In other words, this cost is not solely explained by earlier choices, like the distance from the work location. It is also justified by material costs related to living arrangements (for example the size of the apartment or the availability of a spare room for a formal or informal caregiver, etc.) and by the family ties for which grown up children are only very partially "responsible".

Our model is very stylized and there are several directions in which it should be enhanced in future research.

First, we could introduce heterogeneity within and across genders, assuming for instance that women's wages are stochastically dominated by those of men. Whenever home care is provided, there would then be cases where the gender gap and the norm reinforce each other so that sons provide less informal care than daughters. However we would also observe cases where they

play in opposite directions so that sons might provide more care than daughters despite the social norm. The pattern of informal care arrangements would then be more diverse than in our setting. This alternative assumption might weaken the gender aspect of the norm. Specifically, the target level may be based on peer groups with similar educational background rather than on the informal care provided by all daughters. But this would bring in yet another layer of complexity.

Second, while we deal with gender-specific informal care, it is important to keep in mind that the paper is about inefficiency and not gender equality per se.

Third, while our policies can mitigate the inefficiencies brought about by these inequalities and particularly by both the social norm and the gender wage gap, they have no leverage on the source of these inequalities. The existence of the social norm is taken as given and, in our setting, there is nothing that can be done about it. The natural next step would be to make it endogenous, for instance by making it dependent on the behavior of previous generations like in Barigozzi *et al.* (2018). Even more fundamental is the gender wage gap. As long as it is present, daughters will be *ceteris paribus* natural candidates to provide informal care. While subsidizing formal care may provide a patch, only labor market policies that address the gender wage gap can provide a cure. These are not included in our model, but our analysis shows that they appear to be the only final solution to the problem that daughters provide an "excessive" amount of informal care.

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Appendix

A Critical levels of fixed cost in the *laissez-faire*

The simplified expressions are given by:

$$\widehat{k}_d^{*1} \equiv [(p-\alpha w)a_d^{*1} - c(a_d^{*1}) + \gamma\bar{a}] + \Delta[u(a_d^{*1}) + \beta[u(1-a_d^{*1}) - u(1)], \tag{A1}$$

$$\begin{aligned}\widehat{k}_d^{*2} \equiv\ & [(p-\alpha w)\left(2a_d^{*2} - a_d^{*1}\right) - 2c\left(a_d^{*2}\right) + c(a_d^{*1}) - 2\gamma(\bar{a} - a_d^{*2}) + \gamma\bar{a}] \\ & + \Delta[u(2a_d^{*2}) - u(a_d^{*1}) + \beta[u(1-2a_d^{*2}) - u(1-a_d^{*1})]],\end{aligned} \tag{A2}$$

$$\hat{k}_s^{*1} \equiv \left[(p-w)a_s^{*1} - c(a_s^{*1}) - \rho\right] + \Delta[u(a_s^{*1}) + \beta[u(1-a_s^{*1}) - u(1)]]. \tag{A3}$$

B Family welfare levels in the first best

With a utilitarian welfare function, the welfare levels obtained by setting $\Delta = 1$ are given by

$$W_{sd}^1 = \left[w + \alpha w(1-a_{sd}^1) - k_d - c(a_{sd}^1) - p(1-a_{sd}^1) - \gamma\max\{0;\bar{a}-a_{sd}^1\}\right] + \left[u(a_{sd}^1) + \beta u(1-a_{sd}^1)\right],$$

$$W_{sd}^0 = [w + \alpha w - p - \gamma\bar{a}] + \beta u(1),$$

$$W_{dd}^2 = [2\alpha w(1-a_{dd}^2) - p(1-2a_{dd}^2) - 2k_d - 2c(a_{dd}^2) - 2\gamma\max\{0;\bar{a}-a_{dd}^2\}] + [u(2a_{dd}^2) + \beta u(1-2a_{dd}^2)].$$

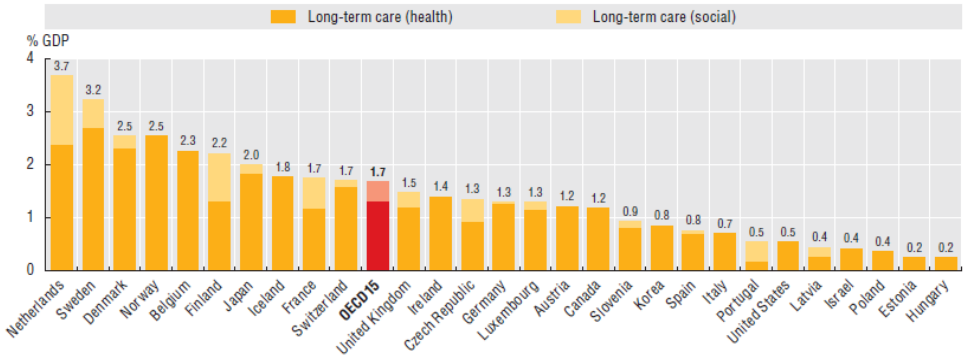
$$W_{dd}^1 = [\alpha w + \alpha w(1-a_{dd}^1) - k_d - c(a_{dd}^1) - p(1-a_{dd}^1) - \gamma\max\{0;\bar{a}-a_{dd}^1\} - \gamma\bar{a}] + \left[u(a_{dd}^1) + \beta u(1-a_{dd}^1)\right],$$

$$W_{dd}^0 = [2\alpha w - p - 2\gamma\bar{a}] + \beta u(1),$$

$$W_{ss}^1 = \left[w + w(1-a_{ss}^1) - k_d - \rho - c(a_{ss}^1) - p(1-a_{ss}^1)\right] + \left[u(a_{ss}^1) + \beta u(1-a_{ss}^1)\right],$$

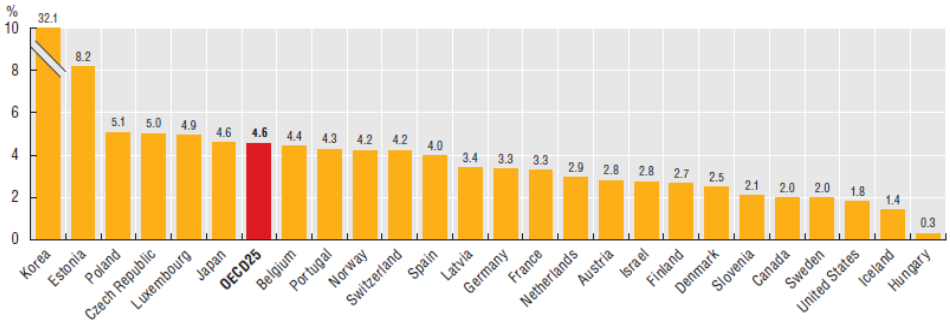
$$W_{ss}^0 = [2w - p] + \beta u(1).$$

C Tables



Note: The OECD average only includes the 15 countries that report health and social LTC.
Source: OECD Health Statistics 2017.

Table 1: Long-term care expenditure (health and social components) by government and compulsory insurance schemes, as a share of GDP, in OECD countries in 2015 (or nearest year).



Source: OECD Health Statistics 2017.

Table 2: Annual growth rate in expenditure on LTC (health and social) by government and compulsory insurance schemes, in real terms, in OECD countries, years 2005-15.

D Gender neutrality: formal analysis

Formally the optimal allocation is determined by maximizing (17) to which we add the incentive constraint (36) with the associated multiplier λ. When the constraint is satisfied at the FB, we have $\lambda = 0$ and nothing changes. When it is violated we have $\lambda > 0$ and the FOCs are modified. Concentrating on those for a_d^1 and a_s^1 it is straightforward to show that the "no distortion at the top" property holds so that the condition for a_d^1 does not change while a_s^1 is downward distorted.

To show the sign of this distortion, let us consider the FOC with respect to a_s^1:

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial a_s^1} &= \frac{\partial SW}{\partial a_s^1} - \lambda\{[w - c'(a_s^1) + p - u'(a_s^1) + \beta u'(1 - a_s^1)] + (1 - \alpha)w + \gamma\} \\ &= (1 - \lambda)[w - c'(a_s^1) + p - u'(a_s^1) + \beta u'(1 - a_s^1)] + (1 - \alpha)w + \gamma.\end{aligned}$$

Evaluating the FOC above at the FB allocation and using (21) we have:

$$\frac{\partial \mathcal{L}}{\partial a_s^1} = -\lambda[(1 - \alpha)w + \gamma] < 0.$$

because, by definition, the FOC of SW with respect to a_s^1 is equal to zero. Consequently we have a downward distortion on a_s^1. Intuitively, the daughter's net marginal utility of informal care is larger than that of the son's (because of the lower wage and the norm cost). Consequently a downward distortion on a_s^1 hurts the mimicking individual more than the mimicked and is thus effective in relaxing an otherwise binding incentive constraint.