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PUBLIC-PRIVATE INTERACTIONS AND INTERGENERATIONAL PHENOMENA IN LONG-TERM CARE FINANCING

Montoliu Montes Guillem

FACULTÉ DES HAUTES ÉTUDES COMMERCIALES

DÉPARTEMENT DE SCIENCES ACTUARIELLES

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INTERGENERATIONAL PHENOMENA
IN LONG-TERM CARE FINANCING**

THÈSE DE DOCTORAT

présentée à la

Faculté des Hautes Études Commerciales
de l'Université de Lausanne

pour l'obtention du grade de
Docteur ès Sciences Actuarielles

par

Guillem MONTOLIU MONTES

Directeur de thèse
Prof. Joël Wagner

Co-directeur de thèse
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Jury

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Prof. François Dufresne, expert interne
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I M P R I M A T U R

_____

Sans se prononcer sur les opinions de l'auteur, la Faculté des Hautes Etudes Commerciales de l'Université de Lausanne autorise l'impression de la thèse de Monsieur Guillem MONTOLIU MONTES, titulaire d'un bachelor en Economie de l'Université Pompeu Fabra, et titulaire d'un master en Finance de l'Université de Lausanne, en vue de l'obtention du grade de docteur ès Sciences actuarielles.

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Le doyen

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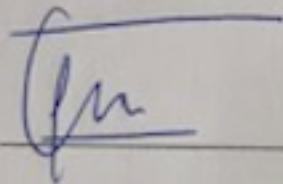
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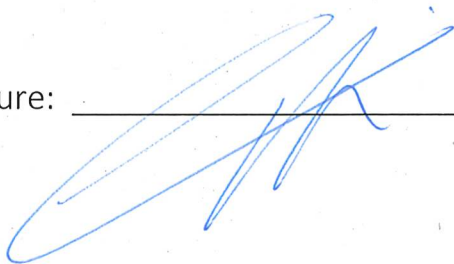Faculty of Business and Economics

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Declaration of Authorship

I, Guillem Montoliu Montes, declare that this thesis titled "PUBLIC-PRIVATE INTERACTIONS AND INTERGENERATIONAL PHENOMENA IN LONG-TERM CARE FINANCING" and the work presented are my own. I confirm that:

- This work was done wholly or manly while in candidature for a research degree at this university.

- Where any part of this thesis has previously been submitted for a degree or any other qualification at this university or any other institution, this has been clearly stated.

- Where I have consulted the published work of others, this is always clearly attributed.

- Where I have quoted from the work of others, the source is always given. With the exception of such quotations this thesis is entirely my own work.

- I have acknowledged all main sources of help.

- Parts of this thesis appeared in the publications that are indicated in the relevant chapters.

Signature

06-10-2020

Date

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Summary

This thesis aims to shed light on the interaction between the public sector, families and private insurance in the ambit of long-term care (LTC) financing. In the actual context of ageing populations, lack of informal caregivers' supply and increasing LTC needs, understanding the interactions between these three actors and its economic implications is crucial to better manage LTC risks. To this end, this thesis presents four essays based on both theoretical and empirical evidence. In the first essay, we study the theoretical effect of estate recovery on private LTC insurance demand, informal care and social welfare. We find that estate recovery tends to encourage LTC insurance purchase and reduces, and may even eliminate, the crowding out effect of public support on LTC insurance demand. We also demonstrate that a more comprehensive LTC public support financed by estate recovery helps to overcome several inefficiencies in LTC financing and can improve social welfare. In the second essay we analyse, from a theoretical and empirical perspective, the effect of estate recovery and compulsory financial assistance on the take-up of nursing home subsidies. The level of nursing home costs, the elderly's wealth and the average revenue of non-exempt inheritors are among the main theoretical and empirical drivers of the take-up decision. In the third essay, we study the effect of LTC public benefits and private insurance on informal care in Italy and Spain. Our findings tend to confirm that the effect of public support on informal care depends on the typology of public coverage for LTC, whereby access to proportional benefits negatively influences informal care reception while access to cash benefits exerts a positive effect. Finally, the fourth and last essay investigates the determinants and motives of adult children to influence their parents to purchase LTC insurance. We show that those individuals self-reporting interest about LTC insurance, living with their children and having provided informal help with personal care are more likely to influence their parents. We also find that the motives to influence parental LTC insurance ownership can be classified either as altruistic or self-interested. The findings of this thesis can provide guidance to governments and other institutions and extend the academic literature in the field, raising new questions in the analysis of LTC financing.

Résumé

L'objectif de cette thèse est l'étude des interactions entre le secteur public, les familles et l'assurance privée dans le cadre du financement des soins de longue durée. Dans le contexte actuel, marqué par le vieillissement des populations, la réduction du nombre d'aidants informels et l'augmentation des besoins en soins de dépendance, comprendre les interactions entre ces trois acteurs et leurs implications économiques est fondamental pour mieux gérer les risques liés à la dépendance. Dans ce but, cette thèse présente quatre essais. Dans le premier essai, nous étudions de façon théorique l'effet du recours sur successions sur la demande d'assurance dépendance privée, les soins informels et le bien-être social. Nous constatons que le recours sur successions a tendance à encourager l'achat d'assurance dépendance et réduit, et peut même éliminer, l'effet d'éviction de l'aide publique sur la demande d'assurance dépendance. Nous démontrons également qu'un soutien public plus généreux aux personnes dépendantes, financé par une récupération sur successions, permet de surmonter plusieurs inefficacités inhérentes dans le financement des soins de longue durée et peut améliorer le bien-être social. Dans le deuxième essai nous analysons, d'un point de vue théorique et empirique, l'effet du recours sur successions et de l'aide alimentaire sur le recours aux aides publiques à l'hébergement en maison de retraite. Le coût de l'hébergement en établissement, la richesse du résident et le revenu moyen des héritiers non-exonérés figurent parmi les principaux déterminants théoriques et empiriques de la décision de recourir aux aides publiques à l'hébergement. Dans le troisième essai, nous étudions l'effet des aides publiques et de l'assurance dépendance privée sur les soins informels en Italie et en Espagne. Nos résultats ont tendance à confirmer que l'effet du soutien public sur les soins informels dépend de la nature de la couverture publique. Tandis que l'accès à des prestations proportionnelles a un impact négatif sur les soins informels, l'accès aux prestations en espèce exerce l'effet opposé. Finalement, le quatrième et dernier essai examine les déterminants et les motivations des enfants adultes à inciter leurs parents à souscrire une assurance dépendance. Nous montrons que les personnes qui se déclarent intéressés pour souscrire une assurance dépendance pour eux-mêmes, qui vivent avec leurs enfants ou qui ont fourni une aide informelle sont plus susceptibles d'influencer leurs parents. Nous constatons également que les raisons pour influencer les parents à souscrire une assurance dépendance peuvent être classés en tant qu'altruistes et non-altruistes. Les résultats de cette thèse peuvent être riches d'enseignement pour les gouvernements et autres institutions publiques. Ils permettent aussi d'étendre la littérature académique en soulevant des nouvelles questions concernant le financement des soins de dépendance.

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Chapter 1

Introduction

The demographic transition is the process under which human populations move from the pre-industrial demographic regime, equilibrated at high birth and mortality rates, to a demographic regime equilibrated at low birth and mortality rates (Rollet, 2006). Nowadays, even the world's least developed nations are at some point of this process while the world's most developed regions (i.e. Europe, Northern America, Australia / New Zealand and Japan) have already completed their demographic transition (United Nations, 2019). In the first part of the transition, populations grow fast and get younger as mortality (especially infant mortality) is substantially reduced and birth rates remain high. In the second part of the transition, populations grow at a much lower rate and get older since the reduction in mortality concerns almost exclusively adult and elderly individuals and is followed by a rapid decline in birth rates.

The ageing of populations is, thus, certainly a sign of development for the most part of countries. However, it represents a major challenge for different domains, for instance, for labour markets or pension systems, which require a deep and thoughtful transformation. The ageing of populations not only concerns the most developed regions of the world, where the share of people aged 65 and over is projected to rise from the current 17.4% to a 27.1% by 2050 (OECD, 2019). It also affects countries such as China or Brazil, where the speed of ageing of their populations will accelerate in the following decades (OECD, 2019) as they are near the end of their demographic transition (United Nations, 2019).

The organization of long-term care (LTC) is an area that is particularly affected by the ageing of populations, since needing LTC is highly related with age. Long-term care refers to the range of services required by people dependent for an extended period of time on help with the basic activities of daily living (Colombo et al., 2011a). For example, how to deal with the negative effects of family caregiving (Moussa, 2019, Schulz and Beach, 1999), the lack of caregivers' supply (Colombo et al., 2011b) or the pressure on public budgets of increasing LTC expenditures (Brown and Finkelstein, 2008) are policy issues that need an urgent solution in several countries.

1.1. The sources of long-term care financing

LTC is predominantly financed from public expenditures (Colombo, 2012). In 2017, they represented about 1.7% of the GDP across Organisation for Economic Cooperation and Development (OECD) countries, ranging from more than 3% of the GDP in the Netherlands, Norway and Sweden to less than 0.5% of the GDP in Hungary, Poland or Estonia (OECD, 2019). Projections suggest that public resources allocated to LTC as a share of GDP could double or more by 2060 in the OECD (OECD, 2017). The important role of public schemes in LTC financing across the OECD countries is explained by the fact that LTC expenditures can be catastrophic for wide sectors of society and therefore, social protection is needed against this financial risk (OECD, 2019). It can also respond to a social demand for intergenerational equity and risk-pooling across the younger and older segments of the population (Colombo, 2012).

Families also play a major role in LTC funding, not only by financially contributing to help their dependent relatives, but also by directly providing care through what is called informal caregiving. In some countries, the importance of informal caregiving in the provision of LTC is even larger than that of public expenditures. For instance, in the United States some estimates indicate that the market value of informal care is considerably greater than the expenditures on formal care services (Norton, 2016). The importance of informal care in the provision of LTC implies that the issue of LTC financing is not only linked to ageing, but also to the observed decrease in informal care supply, driven amongst others, by family disintegration or women's work (Van Houtven and Norton, 2008). Children living outside the parental household and coresident spouses are the main providers of informal care (Laferrère and Wolf, 2006). Neighbours and friends also play a significant role in the provision of informal care in some countries. Finally, informal care is an eminently feminine phenomenon, since women represent 61% of those providing daily informal care across the OECD countries (OECD, 2019).

Private LTC insurance markets covering the financial risks linked to LTC needs have developed but with limited success. In the two largest LTC insurance markets, the US and France, 7.2 and 3 million individuals respectively are privately insured for LTC risk (Cohen, 2016; FFA, 2019). This represents around 5% and 10% of the population aged 45 or more in the US and metropolitan France respectively (US Census Bureau, 2017; INSEE, 2020). LTC insurance in the US and France has developed on the basis of different "philosophies". In the US model, inspired by health insurance, insurance benefits take mainly the form of a reimbursement of LTC expenses in the limit of a reimbursement ceiling. In France (and in general in Western Europe), LTC insurance is inspired by disability insurance and thus, payments take the form of a monthly cash benefit independent of LTC expenses (Klimaviciute, 2017). In Spain, some insurers propose LTC insurance as a complement of life insurance and policy holders can choose between a lump-sum payment and a life annuity (MAPFRE, 2018). An abundant corpus of academic literature has investigated the possible reasons behind the LTC insurance puzzle. That is, the paradox implied by the existence of LTC risk, an insurable financial risk with potential catastrophic effects and high probability of occurrence, together with a very small development of private LTC insurance. Eling and Ghavibazoo (2019) identify the main explanations provided by the literature behind the low development of LTC insurance. They include excessive loading factors, the fear of a crowding out effect on informal care, biases in LTC risk perception, lack of trust in insurers, state-dependent preferences and crowding out effects of public support, informal care and family resources. Therefore, the current conditions in LTC insurance markets, with high loadings, low interest rates and high uncertainty, create an obstacle to the development of this type of insurance.

Finally, the last source individuals have for financing their LTC needs is their own wealth. In particular, housing wealth is very often used as self-insurance for LTC (Laferrère, 2012). This is the case as housing investment is substantial in the OECD countries, especially for older people; on average, around 74% of the current 60-69-year-olds own their home in Europe (Laferrère, 2012). In this context, the main challenge is how to extract housing equity to finance LTC, given the dual nature of housing (it is both, a consumption good and an investment), its illiquidity and its indivisibility. Downsizing (selling and moving to a less expensive home), renting part of the own home, reverse mortgages or a sale in *viager* (a traditional French contract consisting on selling the house while keeping the right to live in it until death) are many forms to finance LTC needs from housing wealth (Laferrère, 2012).

1.2. Types of LTC expenditures

Another classification of LTC expenditures, complementary to that of the sources of financing, is the one by typology. Whereas the sources of LTC expenditures show *who* finances, the

typology of LTC expenses shows *what* exactly is financed. LTC expenses are typically classified between health care expenses, personal care expenses and the board and lodging costs for residents in nursing homes.

Health care requires the intervention of a nurse or a doctor and is generally covered under a public health-financing arrangement (Colombo et al., 2011c). Most OECD countries have achieved a near-universal coverage for a core set of health services, including doctor visits and hospital care, mainly through a national health system or insurance scheme (OECD, 2019).

Personal care involves help with the basic activities of daily living comprising, amongst others, feeding, getting in and out of the bed, bathing or dressing. Unlike health care expenses, coverage models for personal care vary significantly across countries. Colombo (2012) identifies three broad categories of countries according to their personal care public coverage approach. The first group includes the United States and England, where public support to personal care is conceived as a "safety net" to those otherwise unable to pay for the care themselves. Public LTC financing is a "poverty program" rather than a proper risk coverage scheme. Income and asset tests, which are particularly strict in the US, are used for determining eligibility to any publicly funded personal care. A second group of countries relies on a mixed system combining different types of programmes and benefits or has an income-related universal program for personal care. For example, Italy, the Czech Republic and Poland have non-income-related cash allowances to cover the cost of personal care combined with universal access to nursing home subject to availability. On the other hand, in France and Spain LTC benefits are available to all disabled elderly but they are subject to income-related co-payments. Finally, the last group includes those countries that provide comprehensive publicly funded personal care to all individuals assessed as eligible through one single system. They belong to this group the Nordic countries, Belgium, Germany, the Netherlands, Japan and Korea.

Finally, the board and lodging costs (also known as *hotel* costs) of residential care include the accommodation costs of nursing home residents. They comprise food, the shelter-related expenditures or the costs of entertainment activities amongst others. Board and lodging costs are typically not included in public LTC coverage (Colombo, 2012) and therefore, public support towards these costs is generally conceived as social assistance and subject to income and assets means testing. In France, Belgium and the US, local governments granting public benefits for nursing care can recover the benefits granted from the estates of the deceased beneficiaries (CASF art. L-132-8; LOCPAS art. 100-1; Greenhalgh-Stanley, 2012). In some countries, eligibility to public benefits for nursing home costs is subsidiary to financial assistance by close family members following the legal principle of alimony (Sayn, 2008).

1.3. Structure of the present thesis

Given the multiple types of LTC expenditures and sources of LTC financing, the interaction between the different actors that participate in the financing of LTC expenditures can be very complex. However, understanding such interactions and its economic implications is crucial in the actual context of ageing populations and increasing LTC needs. The aim of this study is to shed light on the interaction between the public sector, families and private insurance in the ambit of LTC financing. This thesis is composed by the introduction and four essays.

In Chapter 2 of this thesis we study, together with Christophe Courbage, the effect of estate recovery on private LTC insurance demand, informal care and social welfare. Estate recovery is a policy that consists on recovering public LTC subsidies granted from the estates of deceased beneficiaries. It might be seen as a solution for LTC financing, since an increasing number of policy makers and scholars support the idea of linking LTC public budgets to the taxation of estates (Cremer et al., 2016). This is the case as the share of inherited wealth in overall capital accumulation has been rising since the 1970's and is expected to continue rising in the future

(Piketty and Zucman, 2014). However, the literature has not paid too much attention on the interaction between estate taxation and LTC financing. To perform our analysis, we consider a theoretical model with a parent facing the risk of being dependent and his child. We find that estate recovery tends to encourage the parent to purchase LTC insurance through a bequest motive. We also show that estate recovery reduces and may even eliminate the crowding out effect of public support on LTC insurance demand. Finally, we demonstrate that a more comprehensive LTC public support financed by estate recovery helps to overcome several inefficiencies in LTC financing and can improve social welfare in a second-best context.

Chapter 3 is a joint work with Christophe Courbage and Roméo Fontaine, from the Institut National d'Etudes Démographiques (INED) in Paris. In this chapter, we study the effect of estate recovery and compulsory financial assistance on the take-up of nursing home subsidies. Indeed, in order to reduce public expenditures, many countries require users and their families to contribute to the cost of public LTC. However, cost sharing can provide disincentives to the take-up of LTC benefits. In a first step, we theoretically study the decision of a representative family to take-up a nursing home subsidy subject to estate recovery and compulsory financial assistance. In a second step, we empirically test our theoretical findings using French data of potential recipients of a similar nursing home subsidy. Our theoretical results show that the take-up decision is conflictive when the elderly's wealth is relatively high. The level of nursing home costs, the elderly's wealth and the average revenue of non-exempt inheritors are among the main theoretical drivers of the take-up decision. The empirical results confirm our theoretical findings.

In Chapter 4 we analyse, together with Christophe Courbage and Joël Wagner, the effect of LTC public benefits and private insurance on informal care in Italy and Spain. For this study we use cross-sectional data from the 6th wave of the SHARE database. Different elements drive the relationship between public and private LTC support and informal care. The principal ones are the relationship between formal and informal care, the motives for providing care and the nature of LTC benefits. The choice of Italy and Spain comes from the fact that informal care provision is rather similar in these two countries while their respective public LTC financing systems are rather different. This helps us to focus on whether the typology of LTC coverage plays a role in influencing the reception of informal care. Our findings tend to confirm that the effect of public benefits on informal care depends on the typology of public coverage for LTC, whereby access to proportional benefits negatively influences informal care reception while access to cash benefits exerts a positive effect. Our results also show that private LTC insurance seems to complement the public LTC financing system in place.

Finally, the fifth and last chapter of this thesis investigates the determinants and motives of adult children's willingness to influence their parents to purchase LTC insurance in Switzerland. This chapter is a joint project with Christophe Courbage and Joël Wagner and the data used in this study comes from a survey carried out in 2019 by our research group. We show that those individuals self-reporting interest about LTC insurance, living with their children and having provided informal help with personal care are more likely to influence their parents to purchase LTC insurance. We also find that the motives to influence parental LTC insurance ownership can be classified either as altruistic or self-interested. Our results can be useful for the specific design of both, public LTC policies and insurance products.

The findings of this thesis can provide guidance to governments and other institutions. The international dimension of this study, which uses data from four different countries, helps to offer a broad and global vision of LTC financing. In the Swiss context, this project can offer practical advice to Cantons, the Swiss Confederation and private insurers. It also extends the academic literature in the field, raising new questions in the analysis of LTC financing.

Chapter 2

Estate recovery and long-term care insurance

Estate recovery is a policy under which the State recovers part of long-term care (LTC) subsidies from the estates of deceased beneficiaries. This paper studies the effect of estate recovery on LTC insurance demand. This effect strongly relies on the bequest motive since the main purpose behind purchasing LTC insurance is to protect bequests from the financial costs of LTC. We find that the impact of estate recovery on LTC insurance depends on the level of parental bequests and on whether and how the parent anticipates the child's preferences with respect to informal care. More specifically, we show that estate recovery encourages the parent to purchase LTC insurance when his child is considered selfish or to like providing care. However, this policy could provide disincentives to LTC insurance purchase by the parent if his child is considered to dislike providing informal care. Our results also show that estate recovery reduces and may even eliminate public support crowding out of private LTC insurance demand. Finally, we characterise the welfare implications of financing LTC public support by estate recovery.

2.1. Introduction

The ageing of populations and, in particular, the growing number of elderly individuals in most industrialised countries is accompanied by an increased need for long-term care[1] (LTC). Apart from their own resources, individuals can count on three main sources for supporting and financing these increasing LTC needs: the government, the family and insurance.

LTC costs are, to a large extent, financed by public expenditures (Colombo, 2012) which represented on average about 1.7% of GDP across OECD countries in 2015 (OECD, 2017). Projections suggest that this share is expected to at least double by 2060 (OECD, 2017). Family plays also a major role in LTC funding. Not only does it often contribute financially to help dependent relatives, but also a large part of LTC needs is met in the form of informal care provided by family members, in particular children (Norton, 2016). The advent of new forms of family structure has provoked a decrease in the supply of informal care, through the disintegration of the family unit or women's work, which raises new questions about LTC financing. Finally, LTC insurance markets covering the financial risks linked to LTC needs have developed but with limited success. Explanations for this low development include the issue of long-term risks insurability, asymmetric information, LTC risk pricing, bias in risk perception and crowding out effects of public support (Brown and Finkelstein, 2009).

As a way to ensure the sustainability of public LTC financing, many policy makers and scholars support the idea of linking LTC public budgets to the taxation of estates (e.g. Cremer et al., 2016). This is especially the case as the share of inherited wealth in overall capital accumulation has been rising since the 1970's and is expected to continue rising in the future (Piketty and Zucman, 2014). In this respect, some countries have implemented estate recovery policies with an aim to recover public LTC subsidies from the estates of deceased beneficiaries. These policies exist in the U.S. and France and their implementation is currently under discussion in Switzerland, England and Wales[2]. Estate recovery differs from inheritance taxation in the sense that while the later consists of a direct tax on bequests, estate recovery can be seen as a co-payment on publicly subsidized LTC, paid from the beneficiary's bequest at the end of his life.

Another rationale for estate recovery pointed out in this paper is that it could be a mean to enhance the purchase of private LTC insurance, and therefore a potential solution to incomplete LTC insurance markets (Frank, 2012). In particular, estate recovery is very likely to impact the demand for LTC insurance through a bequest motive since the main purpose behind purchasing LTC insurance is to protect bequests from the financial costs of LTC (Pauly, 1990). Estate recovery could also enhance LTC insurance purchase as it could attenuate the crowding out of LTC insurance by public support. Indeed, Pauly (1990) suggests that the demand for private LTC insurance is undermined by the availability of public support because it replaces insurance benefits. However, estate recovery, which increases following a more generous public support, together with parental altruism, might attenuate public support crowding out of private LTC insurance.

Scant literature exists on the effect of estate recovery on LTC financing. Thiébaut et al. (2012) theoretically study the impact of a hypothetical estate recovery programme financing the *Allocation Personalisée d'Autonomie*, the French main public LTC benefit, on informal care supply. They show that it depends on the level of altruism of the offspring. Kapp (2006)

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[1] LTC is defined as "a range of services required by individuals with a reduced degree of functional capacity, physical or cognitive, and who are consequently dependent for an extended period of time on help with basic activities of daily living" (Colombo et al., 2011a).

[2] See respectively Greenhalgh-Stanley (2012) and Thiébaut et al. (2012) for an overview of the estate recovery programmes in the U.S. and France. See ATS (2018) and Cremer et al. (2016) for more details about the discussions in Switzerland, England and Wales.

discusses the public policy implications of the U.S. recovery program as an alternative for the financing of LTC, also identifying some of the main ethical issues raised by this program. Dick (2007) addresses the effect of the estate recovery program on discouraging potential Medicaid beneficiaries from asking for public help. Yet, we are not aware of any work addressing the impact of LTC estate recovery on the purchase of LTC insurance with the bequest motive as a qualifier. Our work tries to fill this gap.

To perform our analysis, we consider a theoretical model with a parent facing the risk of being dependent, who can purchase LTC insurance and who decides about the bequest to be transferred to his child. We introduce a bequest motive by assuming the parent to be perfectly altruistic as in Becker (1974) and Andreoni (1989), i.e. the parent extracts a positive amount of utility from his offspring's inheritance. In this respect, our model assumes that the parent's main driver for purchasing LTC insurance is the bequest protection motive. In practice, LTC insurance might be purchased for other reasons, for instance, to avoid burdening potential informal caregivers (Courbage and Roudaut, 2008) or to finance additional LTC services non-publicly covered (Brown and Finkelstein, 2008). However, it is reasonable to expect that the effect of estate recovery on LTC insurance demand will be strongly driven by the bequest protection motive and less influenced by the other reasons for purchasing LTC insurance. We also consider the child as a potential informal caregiver and introduce an estate recovery program partially financing the amount of subsidised public support as in Thiébaut et al. (2012).

In a first step, we assume that the parent is unable to anticipate the behaviour of his child when dependent. This allows us to focus exclusively on the bequest motive as the direct mechanism influencing the parent's decision to acquire LTC insurance in the case of estate recovery. In a second step, we consider that the parent anticipates the optimal behaviour of the child to a change in the transfer. We thus consider the possibility for the parent to influence the behaviour of the child as informal caregiver through the bequest. In that case, the parent bequeaths some of his wealth because he is altruistic but also to influence his child's behaviour.

We find that the impact of estate recovery on LTC insurance purchase depends on the level of parental bequests and on whether and how the parent anticipates the child's preferences with respect to informal care. More specifically, we show that estate recovery encourages the parent to purchase LTC insurance when he does not anticipate his child's behaviour or when he anticipates his child to be selfish or to like providing care. However, this policy could provide disincentives to LTC insurance purchase by the parent if his child is considered to dislike providing informal care. Our results also show that estate recovery reduces and may even eliminate public support crowding out of private LTC insurance demand. Hence, estate recovery can impact positively LTC insurance ownership through two channels. A direct one through the bequest motive, and an indirect one through a lower crowding out effect of public support.

Finally, we study the welfare implications of financing LTC public support by estate recovery, characterising the first best and second best solutions. We find that a more comprehensive LTC public support, financed by estate recovery, helps to overcome potential inefficiencies in LTC insurance markets and fosters informal care supply to a more efficient level from a social perspective. We also find that financing additional public LTC subsidies by estate recovery can improve social welfare.

The results obtained in this paper thus contribute to our understanding on how estate recovery influences LTC financing and might be highly beneficial to policy makers.

The paper is organised as follows. In the next section, we introduce the benchmark model and the hypotheses used. In section 2.3, we study the effect of estate recovery on the optimal levels of transfer and LTC insurance chosen by the parent in the case where he does not anticipate the behaviour of the child. In section 2.4, we address the case where the parent does anticipate the behaviour of the child. In section 2.5, we study the welfare implications of

financing LTC public support by estate recovery. Finally, a short conclusion is provided in the last section.

2.2. The model

The model set-up mainly stems from Courbage and Eeckhoudt (2012), Cremer et al. (2016) and Cremer and Roeder (2017). We consider a parent characterised by a state-dependent Von Neumann-Morgenstern (VNM) utility function and a child. The parent faces a probability p of being dependent and requiring LTC at home. According to whether he is dependent or not, his utility functions are respectively $u(x, H)$ or $v(x, H)$, with $u(x, H) < v(x, H)$. The first argument x of the utility functions represents the parent's consumption of a private good and the second argument H represents the bequest to his child. Both arguments x and H are assumed strictly positive. Therefore, we assume away corner solutions in the form of negative inheritance or wealth (for instance, when the parent cannot fully pay for his out-of-pocket LTC costs). In this regard, our representative parent is somebody wealthy enough to pay for his out-of-pocket health expenditures and leave a bequest at the same time. The parent is perfectly altruistic in the sense of Becker (1974) and Andreoni (1989), i.e. he cares about his bequest (and not about the total welfare of his child) but does not receive any "warm glow" from the act of bequeathing. The utility functions are increasing and concave both in the consumption of the private good and the bequest. The bequest received by the child is multiplied by a constant $\theta = (1 - \tau)$ with the term τ such as $0 \leq \tau \leq 1$ being equal to the inheritance tax rate. Following Cremer et al. (2016), and for simplicity, we assume that the cross-derivatives u_{xH} and v_{xH}, are negligible.

The parent is retired and has accumulated an amount of wealth w_0. In case of becoming dependent, he incurs formal LTC expenses for an amount N. The parent can receive informal care e provided by his child. Informal care has the benefit of reducing the cost of LTC at a decreasing rate. Hence, N depends on e, and $N(e)$ is such that $N'(e) < 0$ and $N''(e) > 0$. In other words, we assume informal care and formal care to be substitutes from a technical point of view[3]. The State subsidises a proportion β, with $0 \leq \beta \leq 1$, of the parent's formal LTC expenses during his life. However, a proportion ψ, with $0 \leq \psi \leq 1$, of this subsidy is recovered by the State after the parent's death from the bequest transferred to his child. Note that ψ and β are assumed to be independent of the parent's wealth.

The parent can purchase a LTC insurance policy offering a cash benefit equal to I in case of dependency. μI is the insurance premium corresponding to this contract. If $\mu = p$, the premium is actuarially fair and if $\mu > p$, the premium is loaded. The parent also decides on the amount of bequest, T and $\hat{T}$, to be transferred to his child in the states of dependency and autonomy respectively.

As for the child, we first assume that he is only interested in his wealth. He is characterised by a utility function $\bar{u}(c)$ or $\bar{v}(c)$, according to the parent being dependent or not. The utility function is increasing and concave in his wealth c, which is composed of an exogenous pre-bequest wealth z_0, his working income, with ω being his hourly wage, and the bequest received from his parent. In a second step, we assume the child is also concerned by the amount of informal care e provided to his parent through the function $b(e)$, which is added to his utility in the state of nature where the parent is dependent.

We first consider a scenario where the parent is not able to anticipate the child's behaviour. This simplification allows us to focus on the bequest motive as the direct mechanism

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[3] Empirical evidence strongly supports the hypothesis of substitutability between informal care and formal home care (see e.g. Bolin et al., 2008; Bonsang, 2009; Bremer et al., 2017).

influencing the parent's decision to acquire LTC insurance. In a second step, we consider the child in our model and his behaviour is anticipated by the parent when deciding the optimal levels of bequests and insurance.

2.3. The parent does not anticipate the behaviour of the child

In this basic scenario, the timing of the model is as follows: at $t = 0$, the government announces its policies, i.e. the levels of ψ and β. At $t = 1$, before knowing whether he is dependent or not, the parent chooses the optimal amount of LTC insurance I^*. At $t = 2$, the state of nature is revealed and the parent decides the optimal transfers T^* and $\hat{T}^*$ contingent on the state of health. Since the model is solved by backwards induction, we start by looking at the optimal bequest choices of the parent.

2.3.1. Optimal bequests

When the parent is dependent, his optimization problem at $t = 2$ can be written as:

$$\max_{T} u(x, H) = \max_{T} u\left(w_0 - (1 - \beta)N(e) + (1 - \mu)I - T, \theta\big(T - \psi\beta N(e)\big)\right) \tag{2.1}$$

The first order condition (FOC) with respect to T is given by:

$$u_T = \frac{\partial u}{\partial T} = -u_x(x, H) + \theta u_H(x, H) = 0 \tag{2.2}$$

In Appendix 2.A, we show that the second order condition (SOC) for a maximum is satisfied.

In the state of dependency, the parent's optimal transfer T^* is such that $\theta u_H(x, H) = u_x(x, H)$, i.e. such that the marginal benefit of the transfer, expressed by the additional utility from the transfer, equals its marginal cost, given by the decrease of utility due to lower consumption.

We can now analyse how this optimal transfer reacts to a change in insurance. By differentiating the FOC with respect to I, we have:

$$u_{TI} = \frac{\partial u^2}{\partial T \, \partial I} = -(1 - \mu)u_{xx}(x, H) > 0$$

which indicates a positive relationship between the transfer and insurance. This happens as when insurance increases, the parent is richer in the bad state of nature ceteris paribus, which makes the level of the transfer rise as he values both his consumption and his bequest.

Moving to the optimization problem when the parent is autonomous, it can be written as:

$$\max_{\hat{T}} v(\hat{x}, \hat{H}) = \max_{\hat{T}} u\left(w_0 - \mu I - \hat{T}, \theta\hat{T}\right) \tag{2.3}$$

The FOC with respect to $\hat{T}$ is:

$$v_{\hat{T}} = \frac{\partial v}{\partial \hat{T}} = -v_{\hat{x}}(\hat{x}, \hat{H}) + \theta v_{\hat{H}}(\hat{x}, \hat{H}) = 0 \tag{2.4}$$

which has the same interpretation as Eq. (2.2). However, it can be shown that the effect of insurance on the transfer has the opposite sign than when the parent is dependent. By differentiating the FOC with respect to I we get:

$$v_{\hat{T}I} = \frac{\partial v^2}{\partial \hat{T}\,\partial I} = \mu v_{xx}(x, H) < 0$$

which indicates a negative relationship between the transfer in the state of autonomy and insurance, contrary to the case of the transfer in the case of dependency. This happens as when insurance increases, the parent is poorer in the state of autonomy as he pays a higher premium, which makes the level of the transfer decrease in this state.

2.3.2. Optimal insurance

At $t = 1$, before the state of nature is revealed, the optimization problem of the parent can be written as:

$$\max_{I} W = pu(x, H^*) + (1 - p)v(\hat{x}, \hat{H}^*)$$
$$= pu\left(w_0 - (1 - \beta)N(e) + (1 - \mu)I - T^*(I),\ \theta(T^*(I) - \psi\beta N(e))\right) +$$
$$(1 - p)v\left(w_0 - \mu I - \hat{T}^*(I), \theta\hat{T}^*(I)\right) \tag{2.5}$$

The FOC with respect to I is:

$$W_I = \frac{\partial W}{\partial I} = p(1 - \mu)u_x(x, H) - (1 - p)\mu v_{\hat{x}}(\hat{x}, \hat{H}) = 0 \tag{2.6}$$

given that the FOCs with respect to T and $\hat{T}$ (i.e., Eq. (2.2) and (2.4) respectively) hold. In Appendix 2.A, we show that the SOC for a maximum is satisfied.

In the specific case where the premium is actuarially fair ($p = \mu$), we can provide an explicit solution for the optimal level of insurance I^*. Indeed, as the cross-derivatives u_{xH} and v_{xH} are assumed to be nil, we have two cases satisfying the FOC depending on whether the marginal utilities of consumption and inheritance are state-dependent or not.

From the FOCs with respect to T and $\hat{T}$ (Eq. (2.2) and (2.4)), we deduce that $\frac{u_x}{u_H} = \frac{v_{\hat{x}}}{v_{\hat{H}}} = \theta$. Rearranging these terms, we have that:

$$u_x = v_{\hat{x}}\, u_H / v_{\hat{H}} \tag{2.7}$$

From Eq. (2.6), in case of state-independent marginal utilities of consumption (i.e. $u_x(x, H) = v_{\hat{x}}(x, H)$ for any given value of x and H), it can easily be shown that the optimal level of insurance is such that $I^* = (1 - \beta)N(e) + T^* - \hat{T}^*$ if LTC insurance is actuarially fair. In addition, the assumption of state-independency implies that $u_H(x, H) = v_{\hat{H}}(x, H)$ according to Eq. (2.7) and therefore $T^* = \hat{T}^* + \psi\beta N(e)$. The optimal level of insurance is then given by $I^* = (1 - \beta)N(e) + \psi\beta N(e)$. It depends on the cost of formal care not covered by the public subsidy as well as on the amount recovered by the government from the bequest of the child. This is in line with Mossin's (1968) result from which full insurance is optimal under a fair premium. Indeed, from the parent's perspective, his total loss if he becomes dependent is the sum of both the out-of-pocket formal care expenses and the loss in his child's bequest from estate recovery. This explains why, in that case, the insurance indemnity purchased is higher than the out-of-pocket formal LTC expenses.

If $u_x(x, H) < v_x(x, H)$ and $u_H(x, H) < v_H(x, H)$, then $T^* < \hat{T}^* + \psi\beta N(e)$ and $I^* < (1 - \beta)N(e) + \psi\beta N(e)$ if LTC insurance is actuarially fair. This corresponds to partial insurance from the parent's perspective even if the insurance indemnity could be still higher

than the out-of-pocket formal LTC expenses. Note that Evans and Viscusi (1991) and Finkelstein et al. (2009) showed that the marginal utility of wealth in case of bad health is usually lower than the marginal utility of wealth in case of good health, therefore supporting the finding that optimal LTC insurance purchase is partial from the perspective of the parent.

2.3.3. Comparative statics

In the following section, we investigate how exogenous shocks in ψ and β affect the optimal insurance purchase by the parent. We consider these shocks as we are interested in how estate recovery and a change in the public LTC subsidy would affect the incentives of the parent to purchase LTC insurance. More specifically, we aim to unravel whether governmental intervention aiming to finance public LTC expenses by estate recovery favours or deters the demand for private LTC insurance.

If α is an exogenous parameter (i.e. ψ or β) and the optimal expected utility of the parent is given by $W\left(I^*\left(T^*(\alpha), \widehat{T}^*(\alpha), \alpha\right)\right)$, by applying the implicit function theorem, we have that $\frac{\partial I^*}{\partial \alpha} = \frac{-W_{I\alpha}}{W_{II}}$. The details of the computations are shown in Appendix 2.B and the sign of the different effects below, in Table 2.1.

Table 2.1 Comparative statics for the parent (no anticipation)

	$t = 1$	$t = 2$	
	I^*	T^*	$\widehat{T}^*$
ψ	$+$	$+$	0
β	$-$ iff $\psi < 1$ 0 iff $\psi = 1$	$+$	0

We first show that a higher ψ leads to an increase in LTC insurance purchase. This result is exclusively driven by altruistic reasons, i.e. the wish to leave a bequest to his child. As an increase in ψ reduces the amount of the child's bequest in the state of dependency, the parent's utility is reduced because of altruism. To compensate for that disutility, the parent increases the transfer T^* to the child, which reduces the parent's consumption in the state of dependency. Therefore, he has incentives to purchase more insurance. Estate recovery does not have any impact on $\widehat{T}^*$ as the child's bequest is not affected by this policy if the parent is not dependent.

Moving to the effect of an increase in the subvention rate β, this measure increases the parent's wealth in the state of dependency but decreases the child's bequest due to a higher amount recovered. As a consequence, the parental transfer to the child T^* rises. As before, LTC subsidies do not have any impact on the parent's transfer when healthy. As for the effect of a higher β on insurance demand, it depends on the value of ψ. If $\psi = 0$ the child's bequest is not negatively affected by the change in β. As the parent values both x and H, he increases the transfer but less than the increase in the public subsidy, which reduces LTC insurance demand. If $\psi < 1$, the increase in the amount recovered driven by a higher β leads to a rise in the transfer larger than when $\psi = 0$ but still lower than the increase in the public subsidy. LTC insurance demand is reduced, but as a consequence of the larger transfer, to a lower extent than when $\psi = 0$. If $\psi = 1$, as the increase in the public subsidy is fully recovered, the increase in the transfer T^* equals the increase in the public subsidy. Consequently, the final levels of parental consumption, x, and bequest, H, are unchanged following a change in β and thus, the demand for insurance of the parent is not affected.

Our findings have several policy implications. First, estate recovery can be a way to enhance private LTC insurance purchase according to our first result. Second, our results are important in terms of crowding out of private insurance by public LTC coverage. Indeed, for any $\psi < 1$, we observe the classical phenomenon of crowding out, i.e. LTC insurance demand is reduced due to the availability of public support (see e.g. Brown and Finkelstein, 2008; Costa-Font and Courbage, 2015). However, the presence of estate recovery attenuates the crowding out of public support on private insurance (see in Appendix 2.B that the magnitude of I_β^* depends negatively on ψ) because in that case the effect of the public subsidy on the transfer is more pronounced. In the extreme case of full recovery, i.e. $\psi = 1$, public support crowding out fully disappears (see Table 2.1 and I_β^* in Appendix 2.B). Estate recovery can thus be seen as a mechanism allowing to tackle the phenomenon of private LTC insurance crowding out by public support. Our results are in line with Canta et al. (2016) and more recently Fels (2020) suggesting that public LTC provision might not necessarily discourage private LTC insurance purchase.

2.4. The parent anticipates the behaviour of the child

We now assume that the parent anticipates the optimal behaviour of the child to a change in the transfer. We make that assumption to consider the possibility for the parent to influence the behaviour of the child as informal caregiver through his bequest. The parent and the child interact in the guise of a non-cooperative game. The timing of the model, based on Cremer et al. (2016) and Cremer and Roeder (2017), is as follows: at $t = 0$, the government announces its policies, i.e. the levels of ψ and β. Then, the parent and the child play the following three-stage game. At $t = 1$, the parent chooses the optimal level of LTC insurance I^*. At $t = 2$, the state of nature is revealed and the parent decides the optimal transfers T^* and $\hat{T}^*$ contingent on the state of health. Finally, at $t = 3$, the child decides on the optimal quantity of informal care e^* to provide if his parent is dependent, otherwise, he does not make any decision and consumes his initial wealth, his working income and the bequest.

We consider T^* to be chosen before e^* as we assume that the parent seeks to influence the behaviour of the child through his bequest as in Pestieau and Sato (2008), Cremer et al. (2016) or Klimaviciute et al. (2017). This assumption relies on the exchange motive according to which bequests and inter-vivos transfers are means of payment for attention and care by adult children to their elderly parents (Bianchi et al., 2008). However, bequests are not strategic as in Bernheim et al. (1985) but affect informal care provision only through their impact on the child's marginal utility of consumption. As pointed out by Alessie et al. (2014), we implicitly assume credibility i.e., after receiving promise of the transfer, the child will indeed provide services to the parent later in life. This is supported by Bernheim et al. (1985) and Peters et al. (2004) pointing out that breaking a promise made to a family member, contrarily to an arbitrary third party, might be quite costly in terms of reputation and family relations. In addition, as it will be shown later, in the context of estate recovery even children who are not altruistic have strong incentives to provide care independently of the parent's transfer, which gives more freedom for parents in their timing of bequests[4].

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[4] Our model's timing is sequential. Therefore, in the state of dependency, the child does not anticipate the effect of his actions on the parent's behaviour. A possible extension would be to consider a simultaneous timing, where the child provides care also to influence the amount of the transfer received by the parent. This will not substantially change our results, but make them (mainly the comparative statics) much more difficult to interpret.

2.4.1. The optimal behaviour of the child

As the model is solved by backward induction, we start by looking at the optimal caregiving choice of the child. Following Courbage and Eeckhoudt (2012) and Klimaviciute (2017), we study three different cases. First, we consider the case where the child is "selfish" and only cares about his wealth. Second, we assume the child to like providing care. Finally, we assume the child to dislike providing informal care.

The child only cares about his wealth

At stage two, if the parent is autonomous, the child does not have to make any decision. He just consumes his wealth, labour income and bequest. If the parent is dependent, the child faces an arbitrage between working and caring for his parent and is subject to the following optimisation problem:

$$\max_e V = \bar{u}(z_0 + \omega(1 - e) + \theta[T - \psi\beta N(e)]) \tag{2.8}$$

The first order condition (FOC) with respect to e is:

$$V_e = \frac{\partial V}{\partial e} = (-\omega - \theta\psi\beta N'(e))\bar{u}_c(c) = 0 \tag{2.9}$$

with $c = z_0 + \omega(1 - e) + \theta[T - \psi\beta N(e)]$

In Appendix 2.C, we show that the second order condition (SOC) for a maximum is satisfied. From the FOC, we see that the optimal level of informal care is given by:

$$\omega = -\theta\psi\beta N'(e^*)$$

Optimally, the child supplies informal care until the marginal economic benefit of providing care, i.e. the gain on inheritance due to the parent consuming less subsidised formal care, equals its opportunity cost, i.e. the salary ω. For this level of effort, the child's wealth is maximised.

The optimal level of informal care is independent of insurance I and of the amount of the parent's transfer T, since none of the two affects neither the marginal costs nor the marginal benefits of providing informal care. Hence, in this case, the transfer cannot be used by the parent to influence the amount of care provided by his child.

The child likes or dislikes providing care

Previously, we assumed that the child was "selfish", i.e. only concerned by his wealth and in particular the bequest he would receive from his parent. However, the child could derive some satisfaction from providing informal care (Klimaviciute, 2017). We follow Courbage and Eeckhoudt (2012) and assume that the child positively values the fact of supplying informal care to his elderly parent when he is dependent. Providing informal care entails satisfaction to the child at a decreasing rate via the function $b(e)$ which is such that $b'(e) > 0$ and $b''(e) < 0$. These preferences correspond to impure altruism as in Andreoni (1989) in the sense that the child cares only about providing informal care, and not about his parent's welfare.

Inversely, the child could also suffer some disutility when providing LTC as informal care has been shown to be detrimental for the caregiver's physical and mental health (Schulz and Beach, 1999) [5]. In this case, the child's preferences can be modelled in a similar way, the only

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[5] Klimaviciute (2017) stresses that caregiving might be associated simultaneously with both a certain degree of disutility and a certain degree of utility coming, for example, from altruistic feelings. According to her, the case

difference being that in this scenario $b(e)$ is such that $b'(e) < 0$ and $b''(e) < 0$. As in Klimaviciute (2017), we assume that providing informal care entails dissatisfaction to the child at an increasing rate. In these two cases, the child's optimisation problem becomes:

$$\max_{e} \hat{V} = \bar{u}(z_0 + \omega(1 - e) + \theta[T - \psi\beta N(e)]) + b(e) \tag{2.10}$$

The FOC with respect to e is

$$\hat{V}_e = \frac{\partial \hat{V}}{\partial e} = -(\omega + \theta\psi\beta N'(e^*))\bar{u}_c(c) + b'(e^*) = 0 \tag{2.11}$$

In Appendix 2.C, we show that the SOC for a maximum is satisfied.

If the child likes providing care, as $b'(e) > 0$, Eq. (2.11) implies $\omega > -\theta\psi\beta N'(e^*)$ at the optimal level of effort if e^* is an interior solution. The child's opportunity cost of providing informal care ω is now superior to the gain on inheritance due to the parent spending less on formal care. Hence, a child with such preferences provides care even if it represents a cost in terms of income.

If the child dislikes to provide care, i.e. $b'(e) < 0$, the optimality condition implies $\omega < -\theta\psi\beta N'(e^*)$ when e^* is an interior solution. At the optimal level of care, the child's opportunity cost is lower than the economic gain of providing informal care. Hence, the child provides care only up to a point where an extra unit of care implies an increase in income.

Interestingly, the possibility for the parent to influence informal care supply through his transfer depends on whether the child likes or dislikes providing care. Indeed, the optimal level of informal care depends positively (negatively) on the amount of the parent's transfer T if the child likes (dislikes) providing care. By differentiating the FOC with respect to T, we find that:

$$\hat{V}_{eT} = \frac{\partial \hat{V}}{\partial e \partial T} = -[\omega + \theta\psi\beta N'(e^*)]\theta\bar{u}_{cc}(c) \tag{2.12}$$

If the child likes to provide care, $b'(e) > 0$, and $\omega > -\theta\psi\beta N'(e^*)$ from Eq. (2.11), leading to $\hat{V}_{eT} > 0$. Intuitively, as the bequest in the state of dependency is larger after an increase in T, $\bar{u}_c$ in Eq. (2.11) is reduced since the child is risk averse and therefore the non-pecuniary component of e becomes relatively more attractive. To compensate, the child provides more informal care.

In the case where the child dislikes providing care, the opposite result holds. Indeed, in this case, his marginal utility of wealth decreases when T increases but here the child trades off less hours of informal care provision, which is an undesirable activity for him, against a lower bequest.

Hence, the parent can only positively influence the amount of informal care provided by his child by using the transfer when the child likes to provide care. Thus, the results obtained in Pestieau and Sato (2008) and Cremer et al. (2016) which state that bequests have a stimulating effect on informal care, strongly rely on the assumption of child's altruism.

Finally, as in the case where the child only cares about his wealth, the child's behaviour is not directly affected by insurance in our setting. However, it can be affected indirectly, through the positive effect of insurance on the optimal transfer T^* (see section 2.3.1).

"the child dislikes (likes) providing care" can be seen as a shortcut that reflects the situation when the costs (benefits) of informal care offset the utility (disutility) of caregiving.

Comparative statics

We investigate the impact of a change in ψ and β on the optimal supply of informal care. The details of the computations are shown in Appendix 2.C and the results below, in Table 2.2. In the same table, we also report the effect of T on optimal informal care derived from Eq. (2.12).

Table 2.2 Comparative statics for the child

	Selfish child	Child likes providing care		Child dislikes providing care
	e^*	e^*		e^*
ψ	+	+	iff $\frac{-N'(e)}{N(e)} > -\Gamma_c \frac{\overline{u}_{cc}}{\overline{u}_c}$	+
β	+	+	iff $\frac{-N'(e)}{N(e)} > -\Gamma_c \frac{\overline{u}_{cc}}{\overline{u}_c}$	+
T	0	+		−

where $\Gamma_c = \omega + (1-\tau)\psi\beta N'(e^*)$

Starting with the case where the child is selfish, we show that a higher percentage of subsidised care ψ recovered from the bequest increases the amount of informal care supplied. This result is similar to the one of Thiébaut et al. (2012), who argue that when ψ is higher, the child has strong incentives to provide informal care in order to reduce the amount of subsidized formal care, partially recovered by the government. Second, we find that the effect of an increase in the subvention rate β also increases informal care supply for the same rationale. If the child likes to provide care, the effects of these policies on informal care are slightly different. The effect of an increase in ψ or β on informal care is ambiguous and is positive only if $-N'(e)/N(e) > -\Gamma_c \frac{\overline{u}_{cc}}{\overline{u}_c}$. As before, a rise in ψ or β increases the marginal cost of formal care which tends to increase informal care supply. However, as the child likes providing care, the marginal economic benefit of informal care is lower than hourly wages ω. Therefore, the child could have incentives to compensate the negative shock in his bequest arising from increases in ψ or β by working a larger number of hours in the labour market if $-N'(e)$ is too low. Finally, if the child dislikes providing LTC, the effect of an increase in ψ or β on e^* is positive, as when the child is selfish.

2.4.2. Optimal bequests

It has been previously shown that higher levels of transfers stimulate informal care if the child likes to provide care while discourage it if the child dislikes providing LTC. Therefore, the parent's optimal transfer in the state of dependency is likely to change if he anticipates the influence of the transfer on the child's behaviour, i.e. if e becomes a function of T in the form $e(T)$. Under this framework, the parent's optimisation problem in the state of dependency becomes:

$$\max_{T} u(x,H) = u\left(w_0 - (1-\beta)N\big(e^*(T)\big) + (1-\mu)I - T, \theta(T - \psi\beta N(e^*(T)))\right) \qquad (2.13)$$

The FOC with respect to T associated to Eq. (2.13) is:

$$u_T = \frac{\partial u}{\partial T} = -Bu_x(x,H) + A\theta u_H(x,H) = 0 \qquad (2.14)$$

with $A = [1 - \psi\beta e'_T N'(e)] > 0$ and $B = [1 + (1 - \beta)e'_T N'(e)] > 0$.

In Appendix 2.A, we show that the SOC for a maximum is satisfied if $e_{TT} < 0$.

The optimality condition implies that in the state of dependency, the parent transfers the amount T^* such that $A\theta u_H(x, H) = B u_x(x, H)$. Since now both A and B depend on the sign of e'_T, which is driven by whether the child is selfish, likes or dislikes providing care, so is the optimal transfer. This is shown by evaluating the FOC of Eq. (2.14) at the optimal transfer when the parent does not anticipate the reaction of the child, i.e. at $\theta u_H(x, H) = u_x(x, H)$ according to Eq. (2.2). This gives:

$$\left.\frac{\partial u}{\partial T}\right|_{T^*} = -B u_x(x, H) + A u_x(x, H) = -(1 - \beta(1 - \psi)) e'_T N'(e) u_x(x, H) \tag{2.15}$$

If the child likes to provide care $e'_T N'(e) < 0$ as $e'_T > 0$ (see Table 2.2) and then, Eq. (2.15) is positive. Thus, the parent's transfer is relatively large compared to the case where he does not anticipate the reaction of the child. This happens as in this case the transfer encourages informal care supply. The transfer when the child dislikes providing care is relatively low for the opposite reason as $e'_T < 0$ and thus, $e'_T N'(e) > 0$. The parent's transfer without anticipation is optimal when the child is selfish as T does not affect informal care supply (i.e., $e'_T N'(e) = 0$).

The optimal transfer in the state of dependency still depends positively on insurance. Indeed,

$$u_{TI} = \frac{\partial u^2}{\partial T \, \partial I} = -B(1 - \mu)u_{xx}(x, H) > 0$$

as $B > 0$ by the FOC.

Finally, the problem of the optimal level of bequest when the parent is autonomous is:

$$\max_{\widehat{T}} v(\hat{x}, \widehat{H}) = \max_{\widehat{T}} u(w_0 - \mu I - \widehat{T}, \widehat{T})$$

which is equivalent to Eq. (2.3) as the child does not provide informal care in this state of nature.

2.4.3. Optimal insurance

Looking at optimal insurance purchase, the optimization problem of the parent is now:

$$\max_I W = pu\left(w_0 - (1 - \beta)N\left(e^*(T^*(I))\right) + (1 - \mu)I - T^*(I), \theta\left[T^*(I) - \psi\beta N\left(e^*(T^*(I))\right)\right]\right)$$
$$+ (1 - p)v\left(w_0 - \mu I - \widehat{T}^*(I), \widehat{T}^*(I)\right)$$

The first order condition with respect to I is

$$W_I = \frac{\partial W}{\partial I} = p(1 - \mu)u_x(x, H) - (1 - p)\mu v_x(x, H) = 0$$

given that the FOCs with respect to T and $\widehat{T}$ (Eq. (2.14) and (2.4) respectively) are holding. The SOC is also satisfied in this case (see Appendix 2.A.2.).

The FOC with respect to insurance writes as Eq. (2.6). Therefore, if the parent's preferences are state independent and the premium is actuarially fair, $I^* = (1 - \beta)N(e) + T^* - \widehat{T}^*$ as in section 2.3.2. However, the FOCs of Eq. (2.14) and Eq. (2.4) imply now $\frac{A}{B}u_H(x, H) =$

$v_{\widehat{H}}(x,H)$, with $\frac{A}{B} > 1$ (< 1) if the child is likes (dislikes) providing care. This leads to $T^* > \widehat{T}^* + \psi\beta N(e)$ if the child likes providing care (the opposite if he dislikes providing care). This inequality can be rewritten as $T^* = \widehat{T}^* + \psi\beta N(e) + \delta$ with $\delta > 0$ (< 0) if the child likes (dislikes) providing care. δ corresponds to the change in the optimal transfer T^* to the child when he is considered to like or dislike providing care compared to the case where the parent does not anticipate the reaction of the child. Hence, as $I^* = (1 - \beta)N(e) + \psi\beta N(e) + \delta$, the optimal level of insurance is different from the case of no anticipation.

2.4.4. Comparative statics

We now assume that the parent anticipates the effect of the optimal transfer T^* on the child's behaviour[6]. The results of this section, especially those on insurance, differ from those of section 2.3.3 since the parent's reaction to the Government's decisions takes into account the influence of bequests on informal care. When the child is selfish results are equivalent to the ones of Table 2.1 as the effort of the child is not influenced by the transfer from the parent. However, results might differ when the child likes or dislikes providing care since in these cases the transfer influences informal care supply. The details of the computations are shown in Appendix 2.D. The results when the child likes to provide care are first presented in Table 2.3 below.

Table 2.3 Comparative statics for the parent (child who likes to provide care)

	$t = 1$ I^*	$t = 2$ T^*
ψ	+	+
β	$-$ when $T_\beta^* < 0$ $-$ if $-\theta^2 A(A - \psi)u_{HH} > B(B - 1)u_{xx}$ (when $T_\beta^* > 0$)	$+$ if $-\xi\frac{e_T N'(e)}{N(e)}u_H < -\theta\psi BAu_{HH}$

where $\xi = 1 - \psi\big(1 + e_T N'(e)\big) > 0$ by assumption if $\psi < 1$.

We show that the parent LTC insurance purchase I^* increases when ψ increases if the child likes to provide care as the transfer in the state of dependency T^* rises. The transfer increases, firstly because as before, the child's bequest is reduced and the parent is altruistic. Secondly, because now an increase in T^* has a positive effect on informal care supply.

The effect of an increase in β on optimal insurance I^* is more complex than in the case of no anticipation as the effect of β on T^* is ambiguous. Indeed, when the child likes providing care, the levels of informal care and the child's bequest are already relatively high (see Eq. (2.11) and (2.15)). The parent has therefore less incentives to encourage, with a larger transfer, his child to offer additional informal care. This explains why the optimal transfer could decrease following an increase in β. When this happens, the parent always decreases his demand for LTC insurance leading to crowding out of public support on LTC insurance. If the transfer does not incentivise much informal care (i.e. $-e_T N'(e)$ is not very large), the effect of β on T^* is positive as in the case without anticipation (see Table 2.3). In that case, the effect of β on LTC insurance is ambiguous even if $\psi < 1$, contrarily to section 2.3.3. We provide in Table 2.3 a sufficient condition for LTC insurance to decrease with an increase in β, i.e. crowding out.

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[6] To derive this subsection results, we consider that the parent only anticipates the child's reaction to changes in his own decisions (i.e. the transfer) but not to changes in the government's policies. Otherwise, the model becomes too complex to extract interpretable results.

Interestingly, our results show that crowding in, i.e. a positive effect of the public subsidy on LTC insurance, could occur if the bequest can influence positively informal care. The intuition is that when u_{xx} in absolute value is very high, the parent is very risk averse with respect to consumption. Therefore, he could have incentives to strongly increase the transfer to incentivise his child to provide more informal care and to compensate that increase by purchasing more LTC insurance. As in Canta et al. (2016) public LTC financing might incentivise private LTC insurance if family help is taken into account.

Table 2.4 Comparative statics for the parent (child who dislikes providing care)

	$t = 1$ I^*	$t = 2$ T^*
ψ	$+$ iff $-\theta A \dfrac{u_{HH}}{u_H} > \dfrac{e_T N'(e)}{N(e)}$	$+$ iff $-\theta A \dfrac{u_{HH}}{u_H} > \dfrac{e_T N'(e)}{N(e)}$
β	$-$ if $\psi \beta C - \dfrac{e_T N'(e)}{N(e)} \dfrac{\xi}{B} > 0$	$+$

where $C = e''_{TT} N'(e) + (e'_T)^2 N''(e) > 0$ assuming $e''_{TT} < 0$.

When the child dislikes to provide care, an increase in ψ can lead to either an increase or a decrease in the transfer and therefore of LTC insurance purchase. Two opposite effects need to be considered. On one hand, an increase in ψ decreases the bequest of the child and, as the parent is altruistic, he increases the transfer. On the other hand, as the transfer creates disincentives to informal care supply, the parent reduces the transfer. If the first effect dominates the second, i.e. $-\theta A \dfrac{u_{HH}}{u_H} > \dfrac{e_T N'(e)}{N(e)}$, the parent increases the transfer and consequently the level of LTC insurance. Otherwise and surprisingly, an increase in the rate of estate recovery crowds out LTC insurance demand.

The effect of β on optimal insurance is also rather complex when the child dislikes to provide care. As in the case without anticipation (section 2.3.3), a higher subsidy increases the transfer T^* in the state of dependency. However, since an increase in the transfer discourages informal care and increases formal care expenses, a positive change in β could lead to a higher insurance demand. We provide a sufficient condition for crowding out in Table 2.4. It can be seen that crowding in might occur if the transfer strongly discourages informal care supply (i.e. if $e_T N'(e) > 0$ is relatively large). In that case the parent buys more insurance to compensate for the consequential increase in formal care expenses due to the decrease in informal care induced by the higher transfer.

2.5. Welfare analysis

While the previous sections looked at the effect of higher rates of estate recovery and LTC public subsidies on LTC insurance purchase, we now focus on characterizing the welfare implications of these policies. To that aim, we first derive the first best allocation, i.e., the resource allocation that a social planner would implement with perfect information and full control of the economy. Then, in the second-best solution, we study the total welfare effect of an increase in the LTC subvention rate β financed by an increase in the estate recovery rate ψ.

2.5.1. First-best solution

Assuming that both parents and children receive equal social weights and defining the social welfare function S^{FB} as the expected utility of a representative family, the first-best problem can be written as:

$$\max_{e,x,\hat{x},c,\hat{c}} S^{FB} = p[u(x) + \bar{u}(c) + b(e)] + (1-p)[v(\hat{x}) + \bar{v}(\hat{c})]$$

$$s.t.$$

$$p\big(x + c + N(e)\big) + (1-p)(\hat{x} + \hat{c}) = w_0 + z_0 + p\omega(1-e) + (1-p)\omega \qquad (2.16)$$

where the decision variables are informal care e and the parent's and the child's consumption in both states of nature. We denote the latter by x, $\hat{x}$, c and $\hat{c}$ respectively. Since we assume both agents to receive equal social weights, we remove the altruistic component in the parent's utility from the social welfare function; otherwise, the child's utility would be over-weighted (Chalkley and Malcomson, 1998). Following Cremer and Roeder (2016), the child's preferences with respect to informal care $b(e)$ are included in the social planner function.

In the first best solution all variables are simultaneously set, which leads to the following optimality conditions:

$$-\big(\omega + N'(e)\big)\bar{u}_c(c) + b'(e) = 0 \qquad (2.17)$$

$$u_x(x) = v_{\hat{x}}(\hat{x}) = \bar{u}_c(c) = \bar{v}_{\hat{c}}(\hat{c}) \qquad (2.18)$$

Eq. (2.17) describes the socially efficient level of informal care. As one can see from Eq. (2.11) informal care provision is inefficiently low without public intervention (i.e. $\psi = \beta = \tau = 0$). The comparison between Eq. (2.17) and Eq. (2.11) also shows that the socially efficient level of informal care is provided when $\theta\psi\beta = 1$. Given that tax rates are constrained to be between zero and one, this corresponds to $\tau = 0$ and $\psi = \beta = 1$.

The intuition behind this result is the following. A LTC subsidy recovered from the child's inheritance increases the child's marginal benefits of informal care provision and thus, fosters informal care to a more efficient level. When $\tau = 0$ and $\psi = \beta = 1$, public intervention makes children with dependent parents to fully internalize the social benefits of informal care. In other words, this policy makes the trade-off between the child's marginal costs and marginal benefits of informal care to be the socially efficient one. This result is similar to Cremer et al. (2016) who find that state-dependent taxes on the income of children with dependent parents allow to implement the first-best level of care when informal care is suboptimal without public intervention. While they consider a state-dependent income tax, implicitly subsidizing informal care provision, we show that a similar effect can be reached with estate recovery. However, when $\tau > 0$ then $\theta < 1$ and inheritance taxation is counterproductive for reaching the efficient level of informal care, as such tax reduces the child marginal benefits of informal care.

Eq. (2.18) states the equality of marginal utilities of consumption across states of nature and individuals. Hence, individualized lump-sum transfers, allowing for inter- and intra-generational redistribution, are required to fully decentralize the optimal allocation provided by Eq. (2.18). We can provide an explicit solution for the optimal intra-generational transfers when insurance is actuarially fair and marginal utilities are state-independent. If LTC insurance is fair (i.e. $p = \mu$), no public intervention is needed to decentralize the first best optimum for the

parent, as Eq. (2.6) and Eq. (2.18) are equivalent. As for the child, the hypothesis of state independency and Eq. (18) imply that lump-sum transfers must be designed such that $c = \hat{c}$. Thus, the subsidy to children with dependent parents, D, and the tax imposed to children with healthy parents, $\widehat{D}$, are given by:

$$D = (1-p)(\omega e - \delta)$$
$$\widehat{D} = p(\omega e - \delta)$$

Details of calculations are provided in Appendix 2.E. Children with dependent parents receive a subsidy equal to the monetary loss they incur in case of their parent becoming dependent. This loss equals the opportunity cost of providing care ωe minus δ, the change in the optimal transfer T^* driven by the parent's anticipation of his child preferences. If children like (dislike) providing care, $\delta > 0 (< 0)$ as shown in section 2.4.3. Interestingly, even if ψ and β are at the highest levels possible under the first best level of informal care (Eq. 2.17), they do not influence D and $\widehat{D}$. This occurs as in this specific case dependent parents fully compensate estate recovery with their transfer T^* to their children (see T^* in sections 2.3.2 and 2.4.3). The full implementation of Eq. (2.18) requires an additional inter-generational lump-sum transfer, which depends on the difference between the parent's and child's marginal utility, their initial wealth, the parent's bequest, the child's wage, the amount of care provided and the probability of dependency.

Under state-dependency, the parent's transfer is reduced and does not fully compensate state recovery as shown in section 2.3.2. Thus, additional redistribution between children is needed to implement the first best. In addition, LTC insurance markets face multiple inefficiencies in reality leading to heavy loads in insurance premiums (Brown and Finkelstein, 2009). This entails insufficient levels of insurance coverage in practice, justifying additional redistribution mechanisms from healthy to dependent parents.

2.5.2. Second best solution

We now explore the second best setting. We assume the government cannot impose lump-sum taxes and its intervention is limited to financing an increase in the LTC subvention rate β by an increase in the estate recovery rate ψ. The government's budget constraint can be written as:

$$G = p\psi\beta N(e^*) + p\tau(T^* - \psi\beta N(e^*)) + (1-p)\tau\widehat{T}^* - p\beta N(e^*) \tag{2.19}$$

The government's budget for financing LTC is the difference between the revenue received from the estate recovery program and the inheritance tax minus the expenses in subsidised formal care. The budget is in equilibrium if $G = 0$ and in deficit if $G < 0$[7].

The social welfare function in the second best setting can be written as the sum of the indirect utility functions of the parent, excluding its altruistic component, and the child, i.e.:

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[7] We assume inheritance tax τ to be a source of LTC financing as it is included in our model via the parameter θ. However, in practice, public LTC is also financed by general taxation or social contributions (Colombo, 2012). Including these instruments in our model, for example with a parameter multiplying the child's working income $\omega(1 - e)$, will not substantially change our results of sections 2.2.3 and 2.2.4. It can be easily shown that the only significant difference will be that the income tax would induce more child assistance and thus, a lower likelihood of a corner solution in $e^* = 0$.

$$S^{SB}(e^*, T^*, I^*, \psi, \beta, \tau) = \bar{\bar{W}} + \bar{\bar{V}} \tag{2.20}$$

where

$$\bar{\bar{W}} = pu(w_0 - (1-\beta)N(e^*) + (1-\mu)I^* - T^*) + (1-p)v(w_0 - \mu I^* - \hat{T}^*)$$
$$\bar{\bar{V}} = p[\bar{u}(z_0 + \omega(1-e^*) + \theta[T^* - \psi\beta N(e^*)]) + b(e^*)] + (1-p)\bar{v}(z_0 + \omega + \theta\hat{T}^*)$$
with $e^*(T^*(\psi, \beta), \psi, \beta) = e^*(\psi, \beta)$, $T^*(\psi, \beta)$, $\hat{T}^*(\psi, \beta)$ and $I^*(\psi, \beta)$.

The effect on social welfare of an increase in the public LTC subsidy financed by an increase in estate recovery can be obtained by replacing for the budget constraint in Eq. (2.20) and totally differentiating this expression with respect to β. This leads to:

$$\frac{dS^{SB}}{d\beta} = S_\beta^{SB} + S_\psi^{SB}\frac{d\psi^c}{d\beta} \tag{2.21}$$

The superscript c denotes the fact that any increase in β has to be compensated by an adjustment in ψ such that the total budget remains unchanged. Mathematically, this condition implies $\frac{d\psi^c}{d\beta} = -\frac{G_\beta}{G_\psi}$, where G corresponds to the budget constraint defined in Eq. (2.19). Assuming that an increase in the public subsidy reduces the public budget and an increase in the tax rate improves it[8], then $G_\beta < 0$ and $G_\psi > 0$ and therefore, $d\psi^c/d\beta > 0$.

An increase in β compensated by an increase in ψ is desirable as long as Eq. (2.21) is positive. The details of the computations for S_β^{SB} and S_ψ^{SB} are provided in Appendix 2.F. By substituting the specific values of S_β^{SB} and S_ψ^{SB} in Eq. (2.21) we obtain:

$$\frac{dS^{SB}}{d\beta} = p[N(e^*)(u_x - \theta(\beta d + \psi)\bar{u}_c) - (1-\beta)N'(e^*)(e_\psi^*d + e_\beta^*)u_x + (T_\psi^*d + T_\beta^*)(\theta\bar{u}_c - u_x)] \tag{2.22}$$

where $d = \frac{d\psi^c}{d\beta} > 0$.

The sign of $dS^{SB}/d\beta$ depends on the sum of three elements. The first element is the direct effect of the policy, i.e. its effect on social welfare assuming away its impact on individuals' behaviour. The second and third element of Eq. (2.22) correspond to the indirect effects of the policy on social welfare, due respectively to its effects on informal care and on the transfer when the parent is dependent.

In the absence of lump-sum taxes and any other public support, if LTC insurance is unfair, i.e. partial insurance coverage, a public LTC subsidy financed from estate recovery can compensate incomplete LTC insurance coverage. For such public policy to be welfare improving, the sign of Eq. (2.22) must be positive. We need then to consider the signs and magnitudes of the direct and indirect effects addressed previously. As for the direct effect, this policy allows for additional parental LTC coverage but at the cost of a reduction in the child's bequest. As for the indirect effects, higher ψ and β generally incentivize both informal care (see Table 2.2) and the transfer when the parent is dependent (see Tables 2.1, 2.3 and 2.4).

If ψ and β equal zero or are very low, the direct effect is positive as the cost of estate recovery to the child is relatively low. As the indirect effects are also positive, Eq. (2.22) is positive and an increase in the subsidy compensated by an increase in the estate recovery rate is welfare improving. However, if ψ and β equal one, the direct effect is negative, as the cost to the child

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[8] This assumption is rather natural. Otherwise, the government would optimally offer unrealistic corner solutions in the form of "minimal subvention rate / maximal tax rate" or vice-versa.

in terms of bequest is at its highest level. The negative direct effect offsets the positive indirect effects as the higher transfer to the child does not not fully compensate the decrease in bequest due to estate recovery if marginal utilities are state-dependent (see section 2.3.2). Eq. (2.22) is therefore negative and a decrease in the subsidy and the rate of estate recovery is welfare improving.

Hence, in contrast to the first best, the second best optimal policy in absence of lump-sum taxes would imply positive but lower than one rates of ψ and β if LTC insurance is unfair and marginal utilities are state-dependent.

To better identify if estate recovery is a desirable policy to finance public LTC, it might be useful to contrast it with an alternative policy such as inheritance taxation[9]. Two differences can be stressed between the two policies. First, as τ is not state-dependent, it affects the bequest of children whatever their parent's health, contrary to the case of estate recovery which affects only the bequest of children with dependent parents. Second, as seen previously, τ, contrarily to ψ, reduces the marginal benefits of informal care provision to the child. Thus, it is likely to create disincentives to informal care reducing social welfare.

Finally, the crowding out of private LTC insurance by public support does not have any implications for social welfare in our setting as the FOC of Eq. (2.6) is holding at the individual's preferred level of I (see Appendix 2.F).

2.6. Conclusion

Various countries have implemented, or will soon implement, estate recovery programmes as a way to improve public budgets allocated to finance growing LTC needs. In this article, we study how estate recovery can affect incentives to purchase private LTC insurance with the bequest motive as a qualifier. We also study the welfare implications of financing LTC public support by estate recovery.

We focus on the bequest motive as the desire to leave a bequest seems a major reason for the purchase of LTC insurance. Recovering LTC benefits impacts the level of inheritance if the beneficiary of LTC benefits were to become dependent and therefore should provide incentives to purchase LTC insurance. We show that this is generally but not always the case.

We consider two scenarios in our paper. In a first scenario, we assume that the parent is not able to anticipate the behaviour of his child when dependent. In that case, we show that, for a fair insurance premium and under state-independent marginal utilities, the presence of estate recovery pushes the parent to purchase an optimal amount of LTC insurance higher than his LTC expenses. A higher rate of estate recovery is also shown to increase LTC insurance demand. Finally, we show that estate recovery reduces and may even eliminate public support crowding out of private LTC insurance. This last result is in line with recent works such as Canta et al. (2016) and Fels (2020) suggesting that public LTC provision might not necessarily discourage private LTC insurance purchase.

In a second scenario, we consider that the parent anticipates the optimal behaviour of the child to a change in the transfer. The parent then bequeaths some of his wealth because he is altruistic but also to influence his child's behaviour to provide informal care. We show that the transfer from the parent to the child can modify the behaviour of the child as informal caregiver only when the child likes or dislikes providing informal care. The effect of estate recovery on LTC insurance demand is shown to be driven by both, altruistic reasons from the parent's side and more importantly by how the parent anticipates the reaction of the child to the transfer. In such a case, we show that estate recovery also provides incentives to purchase LTC insurance

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[9] Second best levels of τ and their related results are available under request.

if the child is altruistic but could provide disincentives to LTC insurance purchase if the child dislikes providing care.

These results offer some interesting implications in terms of LTC financing. First they show that estate recovery programmes provide incentives to altruistic parents to purchase LTC insurance in most cases. The only situation where estate recovery could disincentive the purchase of LTC insurance is when the parent anticipates that his child does not like providing care and decides to strongly reduce the transfer, which decreases LTC insurance purchase. In this respect, estate recovery could improve LTC financing in two different ways. The first way is by decreasing the burden of LTC expenditures on public budgets with more revenues collected from the taxation of estates, which relative importance on overall capital accumulation is expected to rise in the future (Piketty and Zucman, 2014). The second way for estate recovery to improve LTC financing is through a larger share of LTC expenditures financed from LTC insurance markets, which could complement public LTC financing. A second implication behind our results is that estate recovery can be used as a mean to tackle public crowding out of LTC insurance. Pauly (1990) argued that the non-purchase of LTC insurance by the elderly might be a perfectly rational choice in the presence of public insurance schemes. Our results show that the presence of estate recovery reduces or even eliminates public support crowding out of LTC insurance. Hence, estate recovery can impact positively LTC insurance ownership through two channels. A direct one through the bequest motive, and indirect one through a lower crowding out effect of public support.

Finally, from the welfare analysis, we find that a more comprehensive LTC public support, financed by estate recovery, helps to overcome inefficiently low levels of LTC insurance coverage and fosters informal care supply to a more efficient level from a social perspective. In that sense, such a policy can improve social welfare.

There are several limitations to this study that need to be pointed out. First, we have considered that the rates of estate recovery and LTC subsidies are fixed. One can easily imagine that estate recovery and LTC subvention rates depend on the parent's wealth and possibly the offspring's wealth. Second, we have implicitly assumed that parents automatically receive public LTC subsidies if they were to become dependent. However, estate recovery policies could provide incentives not to take-up LTC public subsidies as a way to protect bequests. Third, we have not taken into account the case of multi siblings and strategic bequests which could influence the level of transfers and informal care. Finally, the current conditions in LTC insurance markets, characterized by high loading in premiums, low interest rates and high uncertainty, create an obstacle to the development of this type of insurance. Extending our results towards these perspectives would be interesting for future research in this field.

Appendix

Appendix 2.A: Second order conditions of the parent

2.A.1. The parent does not anticipate the reaction of the child

$$u_{TT} = \frac{\partial u^2}{\partial T^2} = u_{xx} + \theta^2 u_{HH} < 0$$

$$v_{\hat{T}\hat{T}} = \frac{\partial v^2}{\partial \hat{T}^2} = v_{xx} + \theta^2 v_{HH} < 0$$

$$W_{II} = \frac{\partial W^2}{\partial I^2} = p(1-\mu)\big((1-\mu) - T_I^*\big)u_{xx} - (1-p)\mu\big(-\mu - \hat{T}_I^*\big)v_{\hat{x}\hat{x}}$$

$$= p(1-\mu)^2 \left(1 - \frac{u_{xx}}{u_{TT}}\right)u_{xx} + (1-p)\mu^2\left(1 - \frac{v_{\hat{x}\hat{x}}}{v_{\hat{T}\hat{T}}}\right)v_{\hat{x}\hat{x}} < 0 \ \text{ as } \frac{u_{xx}}{u_{TT}}, \frac{v_{\hat{x}\hat{x}}}{v_{\hat{T}\hat{T}}} < 1$$

2.A.2. The parent anticipates the reaction of the child to a change in the transfer

$$u_{TT} = \frac{\partial u^2}{\partial T^2} = \theta^2 A^2 u_{HH} - \theta\psi\beta C u_H + B^2 u_{xx} - (1-\beta)C u_x < 0$$

Where $A = [1 - \psi\beta e_T' N'(e)] > 0$, $B = [1 + (1-\beta)e_T' N'(e)] > 0$
and $C = e_{TT}N'(e) + (e_T)^2 N''(e) > 0$ assuming $e_{TT} < 0$

$$v_{\hat{T}\hat{T}} = \frac{\partial v^2}{\partial \hat{T}^2} = v_{xx} + \theta^2 v_{HH} < 0$$

$$W_{II} = \frac{\partial W^2}{\partial I^2} = p(1-\mu)\big((1-\mu) - B T_I^*\big)u_{xx} - (1-p)\mu\big(-\mu - \hat{T}_I^*\big)v_{\hat{x}\hat{x}}$$

$$= p(1-\mu)^2 \left(1 - \frac{B^2 u_{xx}}{u_{TT}}\right)u_{xx} + (1-p)\mu^2\left(1 - \frac{v_{\hat{x}\hat{x}}}{v_{\hat{T}\hat{T}}}\right)v_{\hat{x}\hat{x}} < 0 \ \text{ as } \frac{B^2 u_{xx}}{u_{TT}}, \frac{v_{\hat{x}\hat{x}}}{v_{\hat{T}\hat{T}}} < 1$$

Appendix 2.B: Comparative statics of the parent when he does not anticipate the reaction of the child

Effect of ψ

$$T_\psi^* = -\frac{u_{T\psi}}{u_{TT}} = \frac{\beta N(e)\theta^2 u_{HH}}{u_{TT}} > 0$$

$$\hat{T}_\psi^* = -\frac{u_{\hat{T}\psi}}{u_{\hat{T}\hat{T}}} = 0$$

$$I_\psi^* = -\frac{W_{I\psi}}{W_{II}} = \frac{p(1-\mu)T_\psi^* u_{xx}}{W_{II}} > 0$$

Effect of β

$$T_\beta^* = -\frac{u_{T\beta}}{u_{TT}} = \frac{N(e)(u_{xx} + \theta^2\psi u_{HH})}{u_{TT}} > 0$$

30

$$\hat{T}_\beta^* = -\frac{u_{\hat{T}\beta}}{u_{\hat{T}\hat{T}}} = 0$$

$$I_\beta^* = -\frac{W_{I\beta}}{W_{II}} = \frac{-p(1-\mu)\big(N(e) - T_\beta^*\big)u_{xx}}{W_{II}} = \frac{-p(1-\mu)}{W_{II}}\left(N(e) + \frac{u_{T\beta}}{u_{TT}}\right)u_{xx}$$

$$= \frac{-p(1-\mu)N(e)}{W_{II}}\left(1 - \frac{u_{xx} + \theta^2\psi u_{HH}}{u_{xx} + \theta^2 u_{HH}}\right)u_{xx} < (=)0 \quad \text{if } \psi < (=)1$$

Appendix 2.C: Second order condition and comparative statics of the child

SOC

$$\hat{V}_{ee} = \frac{\partial\hat{V}}{\partial e^2} = -\left((1-\tau)\psi\beta N''(e)\bar{u}_c - \big(\omega + (1-\tau)\psi\beta N'(e^*)\big)^2\bar{u}_{cc}\right) + b''(e) < 0$$

Effect of ψ

$$\hat{V}_{e\psi} = -\theta\beta\bar{u}_c N(e)\left[\frac{N'(e)}{N(e)} - \big(\omega + \theta\psi\beta N'(e)\big)\frac{\bar{u}_{cc}}{\bar{u}_c}\right]$$

Effect of β

$$\hat{V}_{e\beta} = -\theta\psi\bar{u}_c N(e)\left[\frac{N'(e)}{N(e)} - \big(\omega + \theta\psi\beta N'(e)\big)\frac{\bar{u}_{cc}}{\bar{u}_c}\right]$$

Effect of T

See Equation (2.12)

Appendix 2.D: Comparative statics of the parent when he anticipates the reaction of the child to a change in the transfer

Effect of ψ

$$T_\psi^* = -\frac{u_{T\psi}}{u_{TT}} = \frac{-\beta\theta N(e)\left(\frac{e_T N'(e)}{N(e)}u_H + A\theta u_{HH}\right)}{u_{TT}}$$

$$\hat{T}_\psi^* = -\frac{u_{\hat{T}\psi}}{u_{\hat{T}\hat{T}}} = 0$$

$$I_\psi^* = -\frac{W_{I\psi}}{W_{II}} = \frac{p(1-\mu)T_\psi^* u_{xx}}{W_{II}}$$

Effect of β

$$T_\beta^* = -\frac{u_{T\beta}}{u_{TT}} = \frac{N(e)\left(Bu_{xx} + \psi\theta^2 Au_{HH} - \frac{e_T N'(e)}{N(e)}\theta\frac{\xi}{B}u_H\right)}{u_{TT}}$$

Where $\xi = 1 - \psi(1 + e_T N'(e))$

$$\hat{T}_\beta^* = -\frac{u_{\hat{T}\beta}}{u_{\hat{T}\hat{T}}} = 0$$

$$I_\beta^* = -\frac{W_{I\beta}}{W_{II}} = \frac{-p(1-\mu)(N(e) - T_\beta^*)u_{xx}}{W_{II}} = \frac{-p(1-\mu)}{W_{II}}\left(N(e) + \frac{u_{T\beta}}{u_{TT}}\right)u_{xx}$$

$$= \frac{-p(1-\mu)N(e)}{W_{II}}\left(1 - \frac{Bu_{xx} + A\psi\theta^2 u_{HH} - \frac{e_T N'(e)}{N(e)}\theta\frac{\xi}{B}u_H}{B^2 u_{xx} + A^2\theta^2 u_{HH} - \theta\psi\beta C u_H - (1-\beta)Cu_x}\right)u_{xx}$$

Condition: $I_\beta^* < 0$ iff. $B(B-1)u_{xx} + \theta^2 A(A-\psi)u_{HH} - \theta\left(\psi\beta C - \frac{e_T N'(e)}{N(e)}\frac{\xi}{B}\right)u_H - (1-\beta)Cu_x < 0$

Appendix 2.E: Implementation of the first best

The child's consumption in the state of dependency and autonomy (c and $\hat{c}$ respectively) are:

$$c = z_0 + \omega(1 - e) + \theta[T^* - \psi\beta N(e)]$$
$$\hat{c} = z_0 + \omega + \theta\hat{T}^*$$

Lump sum transfers in the state of dependency and autonomy (D and $\widehat{D}$ respectively) must be such that the budget constraint $pD = (1-p)\widehat{D}$ holds. We additionally know that the parent's bequest T^* is equal to $T^* = \hat{T}^* + \psi\beta N(e) + \delta$ under state independency of marginal utilities and fair insurance (see section 2.4.3). If transfers must be designed so that $c = \hat{c}$, this gives the following system of equations:

$$\begin{cases} c + D = \hat{c} - \widehat{D} \\ pD = (1-p)\widehat{D} \end{cases} = \begin{cases} z_0 + \omega(1-e) + \theta[\hat{T}^* + \delta] + D = z_0 + \omega + \theta\hat{T}^* - \widehat{D} \\ pD = (1-p)\widehat{D} \end{cases}$$

The solution to the system above is $D = p(\omega e - \theta\delta)$ and $\widehat{D} = (1-p)(\omega e - \theta\delta)$. As optimal informal care in the first best implies $\theta = 1$, $D = p(\omega e - \delta)$ and $\widehat{D} = (1-p)(\omega e - \delta)$.

Appendix 2.F: Second best

$$S_\psi^{SB} = p[-\theta\beta N(e^*)\bar{u}_c - (1-\beta)N'(e^*)e_\psi^* u_x + T_\psi^*(\theta\bar{u}_c - u_x)]$$
$$S_\beta^{SB} = p[N(e^*)(u_x - \theta\psi\,\bar{u}_c) - (1-\beta)N'(e^*)e_\beta^* u_x + T_\beta^*(\theta\bar{u}_c - u_x)]$$

given that the FOCs of Eq. (2.6) and (2.11) hold and $\hat{T}_\psi^* = \hat{T}_\beta^* = 0$.

Chapter 3

On the take-up of nursing home subsidies subject to cost-sharing: Theory and Empirics

Cost-sharing measures between users and the State are a way to reduce public budgets allocated to long-term care (LTC) financing. However, they could also provide disincentives to the take-up of LTC subsidies. Our paper investigates both theoretically and empirically the effect of two specific cost sharing measures, estate recovery and compulsory financial assistance, on the decision to take-up nursing home subsidies. Our theoretical findings first show that when estate recovery is full, families only agree to take-up nursing home subsidies when they anticipate the elderly's estate will be null whether the subsidy is requested or not. We also find that lower rates of compulsory assistance and of estate recovery increase the level of take-up, but through different channels. Our theoretical model shows that the main drivers of the take-up decision are nursing home costs, the elderly's wealth and income and the number and average revenue of non-exempt inheritors. We confirm our theoretical findings empirically using French data of potential recipients of the *Aide Sociale à l'Hébergement* (ASH), a social assistance benefit subsidising nursing home costs which eligibility is tied to both estate recovery and financial assistance.

3.1. Introduction

The current demographic evolution in most industrialised countries, characterised by an increase in the number of old people and a decrease in the supply of informal care, creates increasing needs for long term care (LTC)[10]. Such trend is putting many countries under pressure to find solutions to finance LTC, which expenses are mainly publicly financed (Colombo, 2012).

Cost-sharing measures between users or their family and the State are a way to reduce public budgets allocated to LTC financing; the most common instrument for cost-sharing being co-payments, under which the care user bears a proportion of his/her total LTC expenses. Two other and less common cost-sharing instruments, linked to intergenerational phenomena, are estate recovery and compulsory financial assistance.

Estate recovery consists of recovering part of the public LTC benefits granted from the estates of deceased beneficiaries. It can be seen as a special type of co-payment, paid from the beneficiary's bequest at the end of his life. Such policy exists in some U.S. States for Medicaid benefits (Greenhalgh-Stanley, 2012) and in France (see CASF art. L132-8) and Belgium (LOCPAS art. 100-1) for social assistance to nursing home residents. In Spain, public nursing homes usually make sign an acknowledgment of debt to residents with insufficient resources, under which part of this debt is recovered from residents' estate at their death (OCU, 2013). Similar mechanisms are also implemented in the United Kingdom and New Zealand for financing nursing home costs (Colombo et al., 2011c).

Compulsory financial assistance is a legal obligation for children and other family members to provide financial assistance to their elderly in need. Such obligation exists in the civil codes of various European countries amongst which France, Belgium and Germany (Sayn, 2008). In these countries, nursing home residents' eligibility to social assistance requires close relatives to partially contribute to nursing home fees or to prove their impossibility to do so.

Although cost sharing measures can improve public LTC budgets, they could also provide disincentives to the take-up of LTC public benefits for different reasons. For instance, people with low economic resources might not apply for LTC benefits if co-payments represent a very high proportion of their income as stressed by Ramos-Gorand (2016) for France. Altruistic parents, wishing to leave a bequest, may be discouraged to ask for public benefits in the presence of an estate recovery program as discussed by Dick (2006) in the case of Medicaid for the U.S. Better understanding the take-up of LTC subsidies is important since the non-take-up phenomenon entails injustice and ineffectiveness in their implementation (Van Oorschot, 1991).

The literature on the topic of public benefits' take-up is rather extensive and mainly focuses on means-tested social assistance. Moffit (1983) provides theoretical and empirical evidence from the U.S. supporting that the decision to go on welfare has significant stigmatizing effects. Information about the existence of public benefits and low transaction costs have been found to have a significant positive effect on the take-up of minimum pension benefits in Greece and Spain (Matsaganis et al., 2010) and of subsidized complementary health insurance in France (Guthmuller et al., 2014). The degree of needs, measured by the amount of benefits and by the expected duration of eligibility, is also a key determinant of social assistance take-up in Finland and Germany (Bargain et al., 2009; Bruckmeier and Wiemers, 2012). Dick (2006) discusses the effect of estate recovery on discouraging potential Medicaid beneficiaries to ask for public help. More recently, the effect of cost sharing on the take-up of LTC benefits has been addressed

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[10] LTC is defined as "a range of services required by people with a reduced degree of physical or cognitive functional capacity, who are consequently dependent for an extended period of time on help with basic activities of daily living" (Colombo et al., 2011a).

empirically by Arrighi et al. (2015). They find that claiming for the APA, the main public LTC benefit in France, is positively related to lower co-payment rates. This coincides with Ramos-Gorand (2016) who finds that co-payments force people with low revenues to ask for a lower amount of help than the one they are entitled to.

However, no research, to the best of our knowledge, has investigated the effects of both estate recovery and compulsory financial assistance on the take up of LTC subsidies. Moreover, contrary to personal care, the financing of nursing home expenses has received little attention in the literature (Gramain et al. 2007). Yet, these expenses are substantial. For instance in France, they amounted to €7.1 billion (24% of total LTC expenditures) in 2014 (Roussel, 2017). Our paper tries to fill this gap, both theoretically and empirically, by focusing on a French public benefit entitled *Aide Sociale à l'Hébergement* (ASH), which is a social assistance benefit covering nursing home costs and which eligibility is tied to both estate recovery and financial assistance. In a first step, we theoretically study the effects of estate recovery and compulsory financial assistance on the take up of a nursing home subsidy similar to the ASH. In a second step, we empirically test the theoretical results using French data of potential recipients of the ASH. In particular, we use data from the *Capacités, Aide et REssources des seniors en Institution* (*CARE Institutions*) survey, which includes detailed information about a representative sample of people residing in nursing homes in France comprising whether or not they receive the ASH.

The theoretical findings show that when estate recovery is full, families only agree to take-up the nursing home subsidy when they anticipate the elderly's estate will be null whether the benefit is requested or not. When the elderly's wealth is higher, the take-up decision is conflictive, which hinders the benefit's take-up. We also find that deductions in compulsory assistance and estate recovery increase the take-up rate, but through very different channels. The level of nursing home costs, the elderly's wealth and the average revenue of those inheritors non-exempt from compulsory contributions are shown to be among the main drivers of the (non-)take-up decision. The empirical results confirm the theoretical findings as the length of stay in institution, the degree of dependency, the individuals' family composition and wealth are among the main drivers of ASH take up in practice.

This paper is structured as follows. Section 3.2 describes how the ASH is organised in practice. The theoretical part, composed of the baseline model, the theoretical results, extensions and the comparative statics is addressed respectively in sections 3.3, 3.4 and 3.5. Section 3.6 contains the empirical analysis, which includes the presentation of the database, the econometric model and the empirical results. The last section offers a conclusion.

3.2. The ASH: A nursing home subsidy subject to estate recovery and compulsory financial assistance

The *Aide Sociale à l'Hébergement* (ASH) is a French social assistance benefit which aim is to help elderly dependent people with limited resources to finance the costs of a nursing home. More specifically, the ASH covers the lodging costs of nursing homes, the costs of personal care (i.e. help with activities of daily living) being partially funded by the *Allocation Personalisée d'Autonmie* (APA) and the medical costs being covered by the social security and health insurance.

Social assistance in France is regulated by the *Code de l'Action Sociale et des Familles* (CASF). This law states that social assistance for elderly people is only a right for those individuals lacking sufficient financial resources (CASF art. L113-1). The ASH is a means-tested subsidy which can only be granted if the beneficiary's income is lower than a

predetermined threshold[11]. Three specific conditions are imposed to grant the ASH (IGAS, 2011).

First, 90% of the dependent individual's income must be used to cover nursing home costs, i.e. board and lodging costs (CASF art. L132-3). Second, the elderly's close family members, mainly spouses and children, have to contribute to finance such costs through a specific proportion of their income (CASF art. L132-6). Such contribution is called compulsory financial assistance (*obligation alimentaire* in French). The amount of subsidy granted, i.e. the ASH, is the difference between nursing home costs and both the individual's and his family contributions. The third condition tied to being granted the ASH is estate recovery, i.e. the government recovers the amount of subsidy granted from the recipient's estate at the time of his / her death (CASF art. L132-8).

Departments, the second administrative level below the Central Administration in France, finance and manage the ASH on a decentralised basis (IGAS, 2011)[12]. Consequently, the practical implementation of compulsory financial assistance and estate recovery across France is not homogeneous. For instance, some departments request compulsory financial assistance only to spouses and children while others request it also to grandchildren and children-in-law. The amount of compulsory assistance as well as the way it is computed can vary from one department to the other. As for estate recovery, specific downward ceilings exist in some departments while the majority of them fully recover the benefit.

The ASH is characterized by being the only social assistance benefit in France for which compulsory financial assistance is still required. Moreover, while estate recovery for other social assistance allocations is subject to downward ceilings, the ASH is generally fully recovered except if the amount of the estate is too low (IGAS, 2011). Even though compulsory financial assistance and estate recovery allow departments to lessen their LTC financial burden, they are often accused of being the main reason for the observed high rates of non-take-up. Indeed, even if 75% of nursing home residents are estimated to be eligible to this subsidy, only 20% of them request it (IGAS, 2011).

3.3. The baseline model

3.3.1. Setting

We consider a family composed by an elderly dependent individual and N inheritors. The elderly person is severely dependent and has to enter into a nursing home. As in Klimaviciute (2017) or Zweifel and Struwe (1998), we consider the elderly dependent's consumption is pre-determined, encompassed in the cost of formal care and does not provide any additional utility to him. The elderly disabled health is also assumed to be constant.

We assume inheritors jointly decide whether or not they request a public subsidy to cover the elderly's nursing home costs. Inheritors are considered as the decision makers since the elderly is assumed severely dependent and thus, not in full capacity to request a public subsidy. This subsidy is subject to estate recovery and compulsory financial assistance. In this setting, the demand for the subsidy depends on the effect of the take-up decision on the utility of each individual inheritor and on the interactions between them.

Let $u(x_i)$ be inheritor's i utility function, which only depends on his wealth x_i. If the subsidy is not requested, inheritor's i wealth is equal to $x_{0,i}$ and his utility can be written as:

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[11] In some departments, the eligibility criterion includes income and assets.

[12] France has three territorial administrative levels, the regions, departments and municipalities. Departments, the French equivalent to the US and English counties, have some competencies in health and social policies.

$$u(x_{0,i}) = u\big(z_i + (1 - \alpha_{0,i})\omega_i + \beta_i s_i H_0\big)$$

with $H_0 = w + r + \alpha_{0,i}\omega_i + \sum_{j \neq i} \alpha_{0,j}\omega_j - C \geq 0$ (3.1)

z_i is the inheritor's initial wealth and ω_i his wage. $\alpha_{0i}\omega_i$ with $0 \leq \alpha_{0i} < 1$ is an exogenous transfer from inheritor i to the elderly dependent to help him finance the nursing home costs. Inheritor i can expect a share s_i, with $0 < s_i < 1$, of the estate left by the elderly after his death H_0. The estate of the elderly is composed by his initial wealth w, his income r and the transfers from the inheritors $\alpha_{0,i}\omega_i + \sum_{j \neq i} \alpha_{0,j}\omega_j$ minus the nursing home costs C. For the sake of simplicity, we assume nursing home costs (and thus the length of the elderly's stay in the nursing home) to be known with certainty. Let β_i be inheritor's i intertemporal discount factor to account for impatience with $0 < \beta_i < 1$.

If the subsidy is requested, inheritor's i wealth is equal to x_{1i} and his utility can be written as:

$$u(x_{1,i}) = u\big(z_i + (1 - \alpha_{1,i})\omega_i + \beta_i s_i H_1\big)$$

with $H_1 = w - \psi A \geq 0$ (3.2)

$\alpha_{1,i}$ is the rate of compulsory financial assistance if the subsidy is requested, fixed by the government and assumed to be independent of nursing home costs. A corresponds to the amount of subsidy granted and ψ to the rate of estate recovery. Estate recovery is full as long as inheritance H_1 is positive. Thus, $\psi = 1$ when $w \geq A$ and $\psi = \frac{w}{A} < 1$ when $w < A$. By definition, the subsidy A is equal to the nursing home cost minus the elderly's and the inheritors' compulsory contributions[13], i.e.

$$A = C - r - \alpha_{1,i}\omega_i - \sum_{j \neq i} \alpha_{1,j}\omega_j$$ (3.3)

The take-up decision at the individual level is a binary decision. Therefore, the willingness of inheritor i to take-up the subsidy is a function of the utility difference $\Delta u_i = u(x_{1,i}) - u(x_{0,i})$. An individual inheritor is better off in case of take-up if and only if $\Delta u_i > 0$, otherwise, he is better off when the subsidy is not requested. We then have:

$$\Delta u_i > 0 \leftrightarrow u(x_{1,i}) - u(x_{0,i}) > 0 \leftrightarrow x_{1,i} - x_{0,i} > 0$$ (3.4)

which leads to the following individual take-up condition:

$$\beta_i s_i (H_1 - H_0) - (\alpha_{1,i} - \alpha_{0,i})\omega_i > 0$$ (3.5)

Inheritor i prefers to take-up the subsidy if and only if the gain in inheritance when requesting it (first term) is higher than the difference between his financial contribution in the cases of take-up and non-take-up (second term).

With N inheritors, the take-up decision is not individual, but arises from the interaction between them. We first consider a non-cooperative framework and assume the benefit is requested only when all inheritors agree to do so, i.e. if and only if $\Delta u_i > 0 \; \forall i$. Formally, this corresponds to the following family demand equation:

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[13] For ease of exposition, we assume the entire beneficiary's income r is used as a co-payment if the subsidy is requested. In practice, a percentage of the beneficiary's income is exempt from the compulsory contribution.

$$P = \begin{cases} 1 & iff \ min(\Delta u_1, \dots, \Delta u_N) > 0 \\ 0 & Otherwise \end{cases} \tag{3.6}$$

A family takes-up the subsidy (i.e. *participates*) if $P = 1$. Thus, all inheritors must agree with their contribution for the benefit to be requested. In case of disagreement, nursing home costs are assumed to be exclusively fund by the elderly's wealth, provided it is large enough[14]. Otherwise, in case of disagreement, judges set a compulsory contribution to each inheritor.

3.3.2. Eligibility and take-up decision

In the baseline model we assume that financial assistance is set as a fixed proportional rate of each inheritor's wage[15], i.e. $\alpha_{0,j} = \alpha_0$ and $\alpha_{1,j} = \alpha_1 \ \forall j \in \{1, \dots, N\}$.

An elderly is eligible as long as A in Eq. (3.3) is positive, i.e. if and only if $C - r - \sum_{j=1}^{N} \alpha_1 \omega_j > 0$ in the baseline model. This can be re-written as $C - r - \alpha_1 N \overline{\omega} > 0$ where $\overline{\omega}$ is the average inheritors' revenue. Hence, eligibility depends positively on nursing home costs and negatively on the parent's and inheritors' incomes, the number of inheritors N and the rate of compulsory assistance. The parent's wealth does not affect the eligibility criterion.

It is important to note that Eq. (3.5) and the inheritance levels H_1 and H_0 can take different forms depending on whether the elderly's wealth is higher or lower than nursing home costs. This is the case first, because the amount recovered ψA depends on whether the beneficiary's wealth is higher or lower than the subsidy granted. Indeed, we assume the Government recovers the entire of the amount granted from the beneficiary's estate as long as the estate is positive. Second, because the inheritors' contributions if the subsidy is not requested are crucially determined by whether the elderly's wealth is large enough for financing nursing home costs. Hence, to address the take-up decision, we consider separately the cases when the parent's wealth is relatively large and when it is relatively low.

Take-up with large elderly's wealth

We start our analysis assuming the elderly's wealth is sufficiently high to pay nursing home costs, i.e. $w + r \geq C$. In this scenario, if the subsidy is not requested nursing home costs are optimally exclusively funded by the parent's wealth, for example, by selling the parent's assets. In such a case, $\alpha_0 = 0$ (see footnote 14), inheritance is positive whether the subsidy is requested or not (i.e. H_1 and H_0 are positive) and estate recovery is full. Under these conditions, from Eq. (3.5) individual take-up condition, we show in Appendix 3.A.1 that inheritor i is better off requesting the subsidy when:

$$\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i > 0 \tag{3.7}$$

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[14] It is easily shown that, when the contribution $\alpha_{0,i}$ is considered a decision variable, an inheritor in our setting never decides to finance nursing home costs by a voluntary transfer of wealth. Moreover, in case of litigation between inheritors on the financing of LTC costs, laws and judges tend to prioritise the use of the elderly's wealth before compulsory contributions.

[15] For instance, French judges in case of disagreement on the payment of financial assistance to a parent in need, assign approximately the same rate of contribution to all (non-exempt) inheritors (Gramain et al., 2007). This simple rule is also applied by most French Departments when determining compulsory contributions for social assistance benefits such as the ASH (IGAS, 2011). They do not act very differently from social security, which is financed in most countries mainly from contributions proportional to revenues.

The intuition behind Eq. (3.7) is the following. Inheritors' compulsory contributions (first term) reduce the amount of the public subsidy A and thus, of estate recovery. Therefore, an inheritor earning a relatively low wage ω_i, i.e. contributing less to compulsory financial assistance (second term), might be willing to request the subsidy if the contributions of the other are relatively high, since they protect his inheritance.

With one inheritor, $\sum_{j\neq i} \alpha_1 \omega_j = 0$ and Eq. (3.7) never applies, as $(\beta_i s_i - 1)\alpha_1 \omega_i < 0$. Thus, the family is always better off not taking up the subsidy. The reason is that inheritor's i contribution $\alpha_1 \omega_i$, which makes his inheritance increase by reducing nursing home expenses, is only partially recovered from a higher inheritance since $\beta_i s_i < 1$.

In case of multiple inheritors, an interesting result is found if we assume the estate is equally divided (i.e. $s_i = \frac{1}{N}$). In such a case, Eq. (3.7) can be rewritten as:

$$\beta_i \bar{\omega} - \omega_i > 0$$

If $\beta_i = 1$ an inheritor with a revenue lower than his siblings' average is better off when the subsidy is requested. On the contrary, inheritors with revenues higher than average have no interest to request it. Therefore, a consensus for the take-up decision is impossible in families with unequal revenues; the choice of requesting the public subsidy being highly conflictual. If $\beta_i < 1$, a consensus is possible even with unequal revenues, but only for the decision of non-take-up. Hence, a lower preference for the future increases the consensus for the non-take-up decision. If the assumption of $s_i = \frac{1}{N}$ is relaxed, results do not change substantially in the sense that relatively richer inheritors (i.e. those contributing the most) are always worse-off in case of take-up.

Therefore, as the family decision rule imposes that the benefit is requested only if there is a consensus among inheritors (see Eq. (3.6)), the rate of take-up is equal to zero in this scenario.

Take-up with low elderly's wealth

We now look at the case where the elderly's wealth is not sufficient to pay nursing home costs, i.e. $w + r < C$. In this case, whether or not the subsidy is requested, inheritors are legally obliged to provide financial assistance to their relatives and therefore to contribute to nursing home costs (Gramain et al., 2007).

In the case where the subsidy is not requested, the amount of mandatory financial assistance of each inheritor is decided by a judge and assumed to be set such that inheritance equals zero[16]. Thus, we assume α_0 is set such that $H_0 = 0$, implying $\alpha_0 = \frac{C - w_0 - r}{\sum_{j=1}^{N} \omega_j}$ according to Eq. (3.1).

In the case where the public subsidy is requested, we need to distinguish the case where $A > w$ from the one where $A < w$ as each case leads to a different level of inheritance H_1.

When the benefit granted is such that $A > w$, from Eq. (3.2) the government sets $\psi < 1$ such that $H_1 = 0$ (i.e. $\psi = w/A$). Otherwise $H_1 < 0$. In other words, the public subsidy is not fully recovered from the parent's estate in this case, otherwise inheritance would be negative. Thus, $H_0 = H_1 = 0$ and the individual take-up condition of Eq. (3.5) simplifies to:

$$(\alpha_0 - \alpha_1)\omega_i > 0 \tag{3.8}$$

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[16] Gramain et al. (2007) find that compulsory assistance contributions set by judges in France are most often equal to the amount of financial needs.

Inheritor i takes-up the subsidy when compulsory financial assistance if the subsidy is not requested (α_0) is higher than when it is requested (α_1). This occurs as inheritance is null whether the benefit is requested or not. In Appendix 3.A.2 we show that Eq. (3.8) in this specific case simplifies to $\frac{(A-w)}{\sum_{j=1}^{N} \omega_j} \omega_i > 0$. This inequality always applies independently of the inheritors' characteristics as $A > w$ in this scenario by construction. In this case, there is always a consensus favourable to the take-up decision. Thus, the take-up rate is equal to 1 according to Eq. (3.6)[17].

When the subsidy granted is such that $A < w$, H_1 in Eq. (3.2) is positive and estate recovery is full, i.e. $\psi = 1$. Under these conditions, we show in Appendix 3.A.3 that the individual take-up condition of Eq. (3.5) becomes:

$$\frac{(w-A)}{\sum_{j=1}^{N} \alpha_1 \omega_j} \left[\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i \right] > 0 \tag{3.9}$$

As $A < w$, Eq. (3.9) has the same interpretation as Eq. (3.7), the take-up condition when parental wealth is relatively large. Therefore, there is never a consensus among inheritors for requesting the public subsidy in this case and the rate of take-up is equal to zero.

Actually, the results of section 3.3.2 can be summarized by the following proposition (see proof in Appendix 3.B).

Proposition 1   When compulsory financial assistance represents a fixed proportional rate of each inheritor's wage, $A > w$ is a *necessary and sufficient* condition for the subsidy to be requested by consensus.

The intuition of this result is that when $A < w$, the amount of subsidy granted is fully recovered from the beneficiary's bequest after his death. Even if getting a positive inheritance, a relatively rich inheritor will never recover the full amount of his compulsory contribution from the bequest. Therefore, he prefers not to take-up the subsidy and finance nursing home costs from the parent's assets. When $A < w$, non-take-up is also preferred by a rich inheritor even if parental assets are lower than nursing home costs, as his compulsory contribution is higher in case of take-up even after discounting the inheritance gain.

On the contrary, when $A > w$ the subsidy is not fully recovered. In this case, the Government covers the part of nursing home costs corresponding to the difference between nursing home costs and the parent's assets plus the inheritors' contributions. All inheritors agree to request the subsidy since in case of non-take-up, this difference is paid from additional proportional compulsory contributions.

Proposition 1 mainly relies on the assumptions of equality of contribution rates, full estate recovery and non-cooperative consensus. Results might be different if we relax these three assumptions as addressed in the next section.

3.4. Extensions of the baseline model

3.4.1. Unequal compulsory contribution rates

Previously, we assumed that the rates of compulsory financial assistance were set as a fixed proportion of each inheritor's revenue. However, judges and regional governments often deduct

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[17] Additional factors not included in our model such as transaction costs (Matsaganis et al., 2010) or stigma (Moffit, 1983) would tend to reduce the take-up rate in practice.

general living expenses from inheritors' revenue when determining compulsory contributions (Gramain et al., 2007; IGAS, 2011). Additionally, people unemployed, disabled and receiving minimum-income social benefits might be exempt from the payment of compulsory contributions. In this case, $u(x_{0,i})$ and $u(x_{1,i})$ become:

$$u(x_{0,i}) = u(z_i + \omega_i - \alpha_{0,i}(\omega_i - e_i) + \beta_i s_i H_0')$$

with $H_0' = w + r + \alpha_{0,i}'(\omega_i - e_i) + \sum_{j \neq i} \alpha_{0,j}'(\omega_j - e_i) - C \geq 0$

and

$$u(x_{1,i}) = u(z_i + \omega_i - \alpha_{1,i}(\omega_i - e_i) + \beta_i s_i H_1')$$

with $H_1 = w - \psi A' \geq 0$ and $A' = C - r - \alpha_{1,i}(\omega_i - e_i) - \sum_{j \neq i} \alpha_{1,j}(\omega_j - e_j)$

where e_i is a deduction on compulsory contributions for household expenses. Contribution amounts depend now on the characteristics of inheritors i and j. When their revenues are lower than their deduction (i.e. $\omega_i - e_i \leq 0$) or for exempt inheritors, $\alpha_{1,i}'$ and $\alpha_{0,i}'$ equal zero. On the contrary, when $\omega_i - e_i > 0$, inheritor's i contributory capacity is positive and exogenous compulsory contribution rates are set as $\alpha_{0,i}' = \alpha_{0,j}' = \alpha_0$ and $\alpha_{1,i}' = \alpha_{1,j}' = \alpha_1$.

We assume that α_1 is set at the same rate as before. The presence of a deduction and exempt contributors increases eligibility since $A' > A$ ceteris paribus. Concerning the take-up decision, when the parent's wealth is relatively large (i.e. $w + r \geq C$) the individual take-up condition becomes:

$$\begin{cases} \beta_i s_i \sum_{m=1}^M \alpha_1(\omega_m - e_m) > 0 & when\ \alpha_{1,i} = 0 \\ \beta_i s_i \sum_{m=1}^M \alpha_1(\omega_m - e_m) - \alpha_1(\omega_i - e_i) > 0\ when\ \alpha_{1,i} = \alpha_1 \end{cases} \quad (3.10)$$

Where $M \ni [1, N-1]$ is the number of inheritors non-exempt from compulsory contributions. The first line of Eq. (3.10) corresponds to the take-up condition of an exempt inheritor and always applies. The second is the take-up condition of a non-exempt inheritor and has the same interpretation as Eq. (3.7) (see section 3.3.2). Thus, inheritors whose contribution is larger than the average contribution will not be willing to request the subsidy. Instead, non-exempt inheritors contributing substantially below the mean will be willing to request it.

In this scenario, there is never a consensus even for the non-take-up decision. This happens as exempt inheritors always prefer to take-up the benefit, while the non-exempt either do not agree amongst themselves or agree to not take-up the benefit (see section 4.2.1). The presence of exemptions makes the choice of requesting the public subsidy even more conflictual. Thus, as we assume the decision to request the benefit is taken by consensus (see Eq. (3.6)), the take-up rate is equal to zero.

When the elderly's wealth is relatively low (i.e. $w + r < C$), similarly to section 3.3.2, α_0' is set such that inheritance $H_0 = 0$ and we have two scenarios when the subsidy is requested. In the first scenario, the subsidy granted is such that $A' > w$, inheritance is null in case of take-up, i.e. $H_1 = 0$, and estate recovery is not full, i.e. $\psi < 1$. The individual take-up condition in this case is:

$$(\alpha_{0,i}' - \alpha_{1,i})(\omega_i - e_i) > 0 \quad (3.11)$$

For non-exempt inheritors, Eq. (3.11) becomes $\frac{(A'-w)}{\sum_{m=1}^{M}(\omega_m - e_m)}(\omega_i - e_i) > 0$ given the values of α'_0 and α_1 implied by the definitions of H'_0 and A'. All non-exempt inheritors agree to take-up the benefit as in this case $A' > w$ by construction. Exempt inheritors are indifferent between requesting or not the benefit as $\alpha_{0,i} = \alpha_{1,i} = 0$ for them. Therefore, the rate of take-up is equal to one in this case.

In the second scenario when the elderly's wealth is relatively low, the benefit granted is such that $A' < w$, H_1 is positive and estate recovery is full, i.e. $\psi = 1$. In this third case the individual take-up condition is:

$$\begin{cases} \beta_i s_i(w - A') > 0 & when \ \alpha_{1,i} = 0 \\ K\left[\beta_i s_i \sum_{m=1}^{M}\alpha_1(\omega_m - e_m) - \alpha_1(\omega_i - e_i)\right] > 0 \ when \ \alpha_{1,i} = \alpha_1 \end{cases}$$

With $K = \frac{(w-A')}{\sum_{m=1}^{M}\alpha_1(\omega_m - e_m)} > 0$. As in 4.2.2, this case mirrors the one where parental wealth is relatively large. Therefore, the rate of take-up is equal to zero as there is no consensus for the take-up decision.

The following proposition summarizes our results for the case of unequal contribution rates (see proof in Appendix 3.B).

Proposition 2 When compulsory financial assistance represents a fixed proportional rate of each inheritor's *contributory capacity* and $N - M$ inheritors are exempt from compulsory assistance, $A' > w$ is a *necessary and sufficient* condition for the public subsidy to be requested by consensus.

The intuition behind this result is the same as that of proposition 1. However, the rate of take-up is higher in this case, leading to the following corollary.

Corollary 1 Deductions and exemptions on compulsory contributions increase the rate of take-up.

This is the case as $A' > A$ and thus, for the same level of wealth w, proposition's 2 condition is more likely to be true than proposition's 1. The intuition is that deductions on compulsory contributions increase the amount of subsidy granted and thus, of estate recovery. The rate of take-up increases since for more families, inheritance is null whether the benefit is requested or not (partial estate recovery).

3.4.2. Fixed deduction on estate recovery

In the baseline model we also assumed that the Government recovers all the subsidy from the beneficiary's estate as long as the estate is positive. In some cases, estate recovery might be partial. For instance in France, for some social benefits other than the ASH, the Government is more generous and estate recovery is implemented only when the estate is above a pre-determined threshold (normally €39'000 or €46'000)[18].

In this case, the setting is very similar to the one of the baseline model. The only change is that H_1 in Eq. (3.2) is such that:

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[18] For example, the minimum-income benefits for old people (ASPA) or home care financial assistance (*Aide à domicile*).

$$H_1' = w - \psi(A - \hat{e})$$

Where $\hat{e}$ is a fixed deduction on estate recovery. Differently from a deduction in compulsory contributions, an exemption on estate recovery does not affect eligibility as the amount of subsidy A in Eq. (3.2) remains unchanged. In Appendix 3.C.1 we show that when the parent's wealth is relatively large (i.e. $w + r > C$) the individual take-up condition is:

$$\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i + \beta_i s_i \hat{e} > 0 \tag{3.12}$$

The first two terms of Eq. (3.12) correspond to Eq. (3.7) and thus, have the same interpretation. The third term corresponds to the increase in inheritor's i inheritance when the benefit is requested due to the presence of a deduction on estate recovery. Contrarily to the baseline model, in this case the possibility of a consensus for the take-up decision even with large parental wealth exists. Indeed, if we assume, as before, that $s_i = \frac{1}{N}$, Eq. (3.12) becomes:

$$\beta_i \overline{\omega} - \omega_i + \frac{\beta_i}{N\alpha_1} \hat{e} > 0 \tag{3.13}$$

In this case, even inheritors with a revenue larger than the average might be willing to take-up the benefit, if the third term of Eq. (3.13) is sufficiently large. Therefore, a deduction on estate recovery creates the possibility of an agreement for the take-up decision when the elderly's wealth is relatively large. For this to happen, Eq. (3.13) must be positive for all i. Thus, the variance of inheritors' revenues, its number N or the rate α_1 should be low or their preference for the future β_i or the deduction amount $\bar{e}$ should be relatively high.

When the elderly's wealth is relatively low (i.e. $w + r < C$), inheritance in case of non-take-up is null and inheritors' contributions are compulsory in any case, we have two cases as in the baseline model. In the first case $A - \hat{e} > w$ and inheritance is null whether the benefit is requested or not. We demonstrate in Appendix 3.C.2 that the individual take-up condition is:

$$\frac{(A-w)}{\sum_{j=1}^{N} \omega_j} \omega_i > 0 \tag{3.14}$$

which coincides with the take-up condition of the baseline model when $A > w$. Eq. (3.14) always applies given that $A - w > \hat{e} > 0$ by construction. The take-up rate is, thus, equal to 1.

In the second case, $A - \hat{e} < w$ and inheritance is positive when the subsidy is requested. In Appendix 3.C.3 we show that the individual take-up condition becomes:

$$\frac{(w-A)}{\sum_{j=1}^{N} \alpha_1 \omega_j} \left(\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i \right) + \beta_i s_i \hat{e} > 0 \tag{3.15}$$

When $w < A$ we show in Appendix 3.C.3 that Eq. (3.15) always holds. When $w > A$, Eq. (3.15) has the same interpretation as Eq. (3.12). In this case thus, an agreement on the take-up decision between inheritors is also possible, contrarily to the baseline case. The following proposition summarizes the results for the case of a fixed deduction on estate recovery (see proof in Appendix D):

Proposition 3   If a fixed deduction on estate recovery is introduced in the baseline model, $A > w$ and $\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i + \beta_i s_i \hat{e} > 0$ $\forall i$ are *sufficient* conditions for the public subsidy to be requested by consensus.

The first condition mirrors proposition 1: inheritors prefer to take-up the subsidy when the elderly's wealth is relatively low. Yet this condition is sufficient, but not necessary as before, since the take-up decision is possible now when the elderly's wealth is relatively large (i.e. $H_1' > 0$) if the second condition holds. We also obtain the following corollary.

Corollary 2 A deduction on estate recovery increases the take-up rate.

The intuition is that a deduction on estate recovery raises the likelihood of an agreement for the take-up decision when the elderly's wealth is relatively large.

3.4.3. A cooperative framework

In the baseline model, we also assumed a non-cooperative framework under which inheritors' individual financial contributions are exogenous. In case of non-take-up, each inheritor contribution is assumed to be fixed by a judge. This is the case as optimally, an individual in our setting would never decide to finance nursing home costs by a voluntary transfer of wealth (see footnote 14). So, in case of take-up, inheritors' individual compulsory contributions are exogenously set by the government.

We can also model inheritors' decisions as a cooperative game. Indeed, inheritors in practice may have incentives to cooperate and adopt a contribution rule different from the one set by the judge or the Government. This is the case, first, because most families might be reluctant to go to the court when the benefit is not requested. Second, when the subsidy is requested, inheritors might share as they want the sum of their compulsory contributions set by the Government.

In a cooperative framework, if side payments among inheritors can be made without any transaction costs, the equilibrium decision of the family is always Pareto optimal. Under the Pareto-optimality assumption, the family decision corresponds to the one maximizing aggregate wealth[19].

As in the previous sections, we still have three cases depending on whether the elderly's wealth is higher or lower than nursing home costs. In Appendix 3.E.1, we show that when the parent's wealth is relatively large (i.e. $w + r \geq C$) the family take-up condition is:

$$-(1 - \beta s) \sum_{j=1}^{N} \alpha_{1,j} \omega_j > 0 \tag{3.16}$$

This condition never holds as $\beta s < 1$. At the family level, it is never optimal to request the subsidy if the parent's wealth is large enough to cover nursing home costs. The reason is that the family pays a contribution equal to $\sum_{j=1}^{N} \alpha_{1,j} \omega_j$ which is only partially recovered from a higher inheritance as $0 < \beta s < 1$. Because of full estate recovery (i.e. $\psi = 1$), the public subsidy is, at the family level, an "intergenerational credit" rather than a public benefit when the elderly's wealth is large enough to pay for nursing home costs.

When the parent's wealth is relatively low (i.e. $w + r < C$) and $A > w$, the family take-up condition is:

$$\sum_{j=1}^{N} \alpha_{0,j} \omega_j - \sum_{j=1}^{N} \alpha_{1,j} \omega_j > 0 \tag{3.17}$$

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[19] Imagine that the family decision does not maximize aggregate wealth. An alternative allocation where wealth is maximised represents a Pareto improvement as the surplus generated by the alternative allocation can be distributed to an arbitrary inheritor (or group of inheritors) without harming the others.

From the specific values of α_0 and α_1, implied by the definitions of H_1 and A, we show in Appendix 3.E.2 that Eq. (3.17) becomes $A - w > 0$. This condition always holds in this subcase and the rate of take-up is, thus, always equal to one.

In Appendix 3.E.3, we show that the take-up condition when the parent's wealth is low and $A < w$ is:

$$-(1 - \beta s)(w - A) > 0 \tag{3.18}$$

which never holds as $w - A > 0$ and thus, the subsidy is never requested.

The results of the cooperative model are very similar to those of the consensus model. Indeed, $w < A$ is also a necessary and sufficient condition for requesting the subsidy in the cooperative setting and thus, the equilibrium of Proposition 1 also applies in this case.

3.5. Comparative statics

We now investigate how eligibility and optimal take-up are affected by different exogenous shocks. These shocks concern nursing home costs, the elderly's revenue and wealth, the number of inheritors, their average revenue, the proportion of non-exempt inheritors, their average revenue and the deductions on compulsory assistance and estate recovery.

In order to develop this analysis, we rely on propositions 1, 2 and 3. The first two include the necessary and sufficient take-up conditions of the baseline and cooperative models (proposition 1) and of the model with unequal contribution rates (proposition 2). The third proposition includes the two sufficient take-up conditions of the model with a deduction in estate recovery. Rearranging the three conditions we get:

$$C - r - \alpha_1 N\bar{\omega} - w > 0 \tag{3.19}$$
$$C - r - \alpha_1 M(\bar{\omega}_M - \bar{e}) - w > 0 \tag{3.20}$$
$$C - r - \alpha_1 N\bar{\omega} - w > 0 \text{ and } \beta_i s_i \alpha_1 \sum_{j=1}^{N} \omega_j - \alpha_1 \omega_i + \beta_i s_i \hat{e} > 0 \ \forall i \tag{3.21}$$

We differentiate Eq. (3.19), (3.20) and the two components of Eq. (3.21) to find the effect of these shocks on the benefit's take-up. With the exception of parental wealth and $\tilde{e}$, the effect of these shocks on eligibility is the same as on take-up, given that $A > 0$ and $A' > 0$ define the eligibility criteria (see sections 3.3.2 and 3.4.1). The results of the comparative statics are displayed below, in Table 3.1.

Table 3.1 Comparative statics

Variable	Parameter	Eligibility	Take-up
Nursing home cost	C	+	+
Elderly's revenue	r	−	−
Elderly's wealth	w	0	−
Number of inheritors	N	− or 0	− or 0
Proportion of non-exempt inheritors	M/N	−	−
Average revenue	$\bar{\omega}$	− or 0	− or 0
Average revenue of non-exempt	$\bar{\omega}_M$	−	−
Average deduction on compulsory contributions	$\bar{e}$	+	+
Deduction on estate recovery	$\hat{e}$	0	+

Higher nursing home costs tend to increase both the eligibility and take-up rate while a higher parental revenue tends to reduce them. The elderly's wealth does not have any effect on eligibility while it has a negative effect on the take-up rate.

Concerning the variables relative to inheritors, the number of inheritors N has a negative effect on take-up and eligibility in the baseline and cooperative models (see Eq. 3.19). However, in the model with unequal contributions, only the number of non-exempt inheritors M reduces eligibility and the rate of take-up (see Eq. 3.20). The same occurs with the average inheritors' revenue $\bar{\omega}$; it has a negative effect on eligibility and take-up in the baseline and cooperative models (see Eq. 3.19) while in the model with unequal contributions, this effect is maintained only for the average revenue of non-exempt inheritors $\bar{\omega}_M$ (see Eq. 3.20).

Finally, an increase in the deduction of compulsory assistance tends to increase eligibility and take-up (see Corollary 1). On the contrary, an increase in the deduction of estate recovery has no effect on eligibility while it has a positive effect on the take-up decision, since it raises the probability of a consensus for the take-up decision when inheritance H_1 is positive (see the second condition of Eq. (3.21) and Corollary 2).

3.6. Empirical analysis

3.6.1. Data and descriptive statistics.

In the comparative statics section, we explored theoretically how the optimal take-up of nursing home subsidies subject to estate recovery and compulsory assistance is affected by different exogenous shocks. To empirically test these results, we use data from the *Capacités, Aide et REssources des seniors en Institution* (*CARE-Institutions*) survey, which looks at the living conditions of nursing home residents in France. In particular, it contains information about the socio-economic situation, health and family composition of a sample of institutionalized seniors. It also includes information on whether respondents receive the *Aide Sociale à l'Hebergement* (ASH), which is a social assistance benefit covering nursing home costs and which eligibility is tied to both estate recovery and financial assistance.

The *CARE-Institutions* survey was performed by the DREES, a public research organism working for the French ministries of Economy and Finance, Health and Social Affairs and Employment. Interviews took place from September to December 2016. 3'135 individuals aged 60 or more from around 700 institutions participated to the interviews (DREES, 2016).

Missing values for the dependent variable leave us with 3'052 observations. The subsample of respondents having at least one child contains 2'287 observations. Ideally, our analysis should only include individuals eligible to the ASH (the two previous samples clearly include both, eligible and non-eligible individuals) but unfortunately, we lack information about respondents' income, a key element of the eligibility criterion (see section 3.2). To address this issue, we generated a third sample which only contains individuals with a high likelihood of being eligible to the ASH. In section 3.3.2, we saw that an elderly is eligible if nursing home costs are larger than his/her own revenues plus the inheritors' compulsory contributions. Consequently, the third subsample only includes people receiving other social assistance benefits whose eligibility depends on income or reporting to be unable to finance their stay in institution with their own revenues. In particular, for being included in the third sample, a respondent should have (I) received means-tested housing benefits (*Aide Personnalisée au Logement*) or (II) means tested free complementary health insurance (CMU-C) or (III) financed his stay in institution by drawing on his/her savings, selling a part of his assets, making a loan or asking someone to pay for him. The subsample of eligible includes 1'651 respondents, a

54% of the full sample. Our eligibility criterion is, probably, tighter than the real one since the "real" proportion of eligible residents lies around 75% (see section 3.2).

Table 3.2 below contains a short description of the set of variables included in the empirical analysis, as well as their mean value for all the samples introduced above.

Table 3.2 Variables' description and descriptive statistics

Variable	Description	Mean All	Mean At least one child	Mean Eligible
ASH	1 if the individual benefits from the ASH	0.177	0.118	0.327
Female	1 if the individual is a woman	0.749	0.774	0.744
Age	The individual's age	86.40	87.30	85.50
Couple	1 if married / in a registered partnership	0.124	0.145	0.114
Financial wealth	1 if declaring to have financial wealth	0.323	0.337	0.385
Housing wealth	1 if declaring to have housing wealth	0.285	0.306	0.265
Education				
No diploma	1 if not having any formal school diploma	0.276	0.255	0.331
Primary	1 if having a primary school diploma	0.311	0.339	0.315
Higher than primary	1 if educ. level higher than primary school	0.218	0.211	0.190
NA	1 if not answering the question of education	0.195	0.196	0.164
GIR	Degree of dependency, according to the French GIR scale	2.807	2.744	2.837
Length of stay	Number of years living in an institution	3.90	3.30	4.30
Institution status				
Private profit	1 if living in a private for profit institution	0.197	0.204	0.138
Private non-profit	1 if living in a private non-profit institution	0.295	0.290	0.296
Public hospital	1 if living in a public hospital institution	0.263	0.255	0.290
Public non-hospital	1 if living in a public non-hospital institution	0.245	0.251	0.276
N children	Number of children	1.82	2.44	1.78
N of children SPC +	Number of children in a high SPC[*]	0.494	0.661	0.482
N of children NA	Number of children not answering his SPC	0.716	0.959	0.580
Exempt child	1 if the individual has a disabled or unemployed child	0.045	0.059	0.054
Observations	Number of observations	3'052	2'287	1'651

[*] *High socio-professional category: Includes manager, teacher, technician, foreman, craftsman, merchant and liberal profession*

18% of respondents declare to benefit from the ASH. The rate of beneficiaries in the subsample of eligible is much higher and represents 33% of the total.

Our sample is mainly feminine (75% of women) as it is normally the case for older populations. Indeed, the average respondent in our sample is very old (86.4 years old). Concerning the civil state, only 12% of respondents are married or have an official partner. Given that life expectancy at birth in France is 85 years for women and 79 years for men (Beaumel and Papon, 2020), widow are logically the predominant group in our sample. Additionally, 32% of respondents own some financial wealth and 29% some housing wealth. Surprisingly, the rate of respondents owning some financial wealth larger in the subsample of eligible (38.5%). Most respondents have no formal education or only a primary school diploma.

The average respondent in our sample is relatively dependent, with a score of 2.81 in the GIR, a scale from 1 to 6 where 1 is the highest level of dependency, and has been living around 4 years in an institution. Roughly 50% of surveyed live in a private institution and the other 50% in a public one. The rate of respondents living in a private institution (especially in a

private for profit) is much lower in the subsample of eligible. Additionally, respondents have in average 1.8 children and 4.5% of individuals report to have a disabled or unemployed child.

Qualitatively, we do not observe large differences between the full sample and the subsample of eligible, except in the rates of ASH beneficiaries and resident in public institutions, which are larger in the subsample.

3.6.2. Econometric specification

The family demand equation of Eq. (3.6) can be defined as a function of different observed variables relative to the elderly (i.e. nursing home costs, wealth…) and the inheritors (i.e. its number, proportion of non-exempt…). Therefore, Eq. (3.6) can be viewed as a latent variable model of the form:

$$P = \begin{cases} 1 & iff \ P^* > 0 \\ 0 & Otherwise \end{cases} \tag{3.22}$$

$$P^* = \alpha + X_1^T \beta_1 + X_2^T \beta_2 + \varepsilon \tag{3.23}$$

Where P^* is a latent variable, X_1 a vector of observed variables relative to the elderly and X_2 a vector of inheritors' characteristics. The superscript T denotes a transposed vector. If we assume that X_1 and X_2 are exogenous and $\varepsilon \sim N(0,1)$, the model of Eq. (3.22) and (3.23) constitutes a probit regression model. This model can be estimated by maximum likelihood using the CARE-institutions data introduced in section 3.6.1.

3.6.3. Results

Table 3.3 presents the numerical results of different probit regressions calibrated from the model of Eq. (3.22) and (3.23). The variable *ASH*, presented in Table 3.2, is the dependent variable. The rest of variables of Table 3.2, which include proxies of the different shocks analysed in section 3.5, are used as independent variables.

In the first column, we present the results for the full sample. In the second column, we present the results for the subsample of respondents having at least one child, including more detailed information on the individuals' children. The third column shows the results of column's 1 model on the subsample of eligible. Finally, column 4 displays the results of column's 2 specification on the subsample of eligible with at least one child.

Table 3.3 Results of the probit models (average marginal effects)

Dependent variable: ASH	All	At least one child	Eligible	Eligible & at least one child
GIR (ref : 4)				
1	0.037*	0.033	0.033	0.043
	(0.021)	(0.022)	(0.033)	(0.036)
2	−0.001	0.005	−0.004	0.014
	(0.017)	(0.017)	(0.027)	(0.030)
3	0.013	0.014	0.016	0.038
	(0.019)	(0.021)	(0.031)	(0.036)
5	−0.028	−0.004	−0.049	−0.016
	(0.026)	(0.029)	(0.041)	(0.047)
6	−0.036	−0.007	−0.058	−0.003
	(0.029)	(0.035)	(0.047)	(0.062)
Length of stay	0.008***	0.006***	0.015***	0.017***
	(0.011)	(0.001)	(0.002)	(0.003)
Age (in log)	−0.593***	−0.507***	−0.550***	−0.769***
	(0.054)	(0.065)	(0.059)	(0.109)
Inst. status (ref : PNP†)				
Private profit	−0.084***	−0.057***	−0.094***	−0.075**
	(0.001)	(0.148)	(0.031)	(0.032)
Public hospital	0.051***	0.050***	0.078***	0.075**
	(0.017)	(0.176)	(0.026)	(0.030)
Public non-hospital	0.049***	0.047***	0.047*	0.065*
	(0.017)	(0.174)	(0.025)	(0.028)
Financial wealth	−0.090***	−0.058***	−0.183***	−0.140***
	(0.013)	(0.014)	(0.022)	(0.024)
Housing wealth	−0.126***	−0.107***	−0.158***	−0.147***
	(0.015)	(0.015)	(0.024)	(0.026)
Education (ref: No diploma)				
Primary	−0.052***	−0.044***	−0.058***	−0.058***
	(0.016)	(0.017)	(0.025)	(0.027)
Higher than primary	−0.088***	−0.056***	−0.071***	−0.051
	(0.017)	(0.019)	(0.028)	(0.033)
NA	−0.012	−0.015	−0.009	−0.000
	(0.020)	(0.021)	(0.031)	(0.036)
Female	−0.166	−0.015	−0.015	−0.015
	(0.148)	(0.016)	(0.023)	(0.027)
Couple	−0.048**	−0.032*	−0.062*	−0.026
	(0.019)	(0.018)	(0.033)	(0.034)
N of children (ref : 1)				
0	0.112***	–	0.126***	–
	(0.196)		(0.030)	
2	−0.019	−0.002	−0.011	−0.002
	(0.172)	(0.019)	(0.031)	(0.032)
3	−0.011	0.007	−0.038	−0.017
	(0.199)	(0.022)	(0.032)	(0.036)
4 or more	−0.007	0.011	−0.020	−0.009
	(0.020)	(0.024)	(0.329)	(0.039)
N of children SPC + (ref: 0)				
1	–	−0.060***	–	−0.094***
		(0.016)		(0.030)
2	–	−0.071***	–	−0.118***
		(0.021)		(0.039)
3 or more	–	−0.098***	–	−0.145***
		(0.025)		(0.060)
N of children NA (ref : 0)				
1	–	0.003	–	0.026
		(0.019)		(0.032)
2	–	−0.031	–	0.005
		(0.022)		(0.043)
3 or more	–	−0.005	–	0.028
		(0.026)		(0.045)
Exempt child	–	0.066**	–	0.114**
		(0.031)		(0.046)
Pseudo R² ††	0.261	0.197	0.299	0.260

*Robust standard errors are reported in parentheses. * significance at 10% level, ** significance at 5% level, *** significance at 1% level.*
Number of observations: 3'052, 2'287, 1'651 and 1'167 respectively. †Private Non Profit. ††Mc Fadden's Pseudo R².

Interestingly, the respondent's degree of dependency, as measured by the GIR, is not consistently related with the reception of the ASH. The number of years the individual has been living in an institution is positively associated to the reception of ASH benefits, while older people have a lower likelihood of receiving the ASH. Furthermore, residing in a public institution has a strong positive effect on the reception of the ASH while residing in a private for profit nursing home has the opposite effect. Having some financial or housing wealth is strongly and negatively related with receiving the ASH. Indeed, with the exception of the logarithm of age, in all models either the variable *Financial wealth* or the variable *Housing wealth* is the one with the largest marginal effect in absolute value. The respondent's education, which can be considered a proxy of his/her income, is negatively associated with the reception of ASH benefits. Finally, we do not find a significant gender gradient in the take-up of the nursing home subsidy.

Moving to the effect of family composition, being married or in a registered partnership is negatively but not always significantly related with receiving ASH benefits. Not having children is positively and significantly correlated with the take-up of ASH benefits. For the subsample of respondents with at least one child (i.e. columns 2 and 4), the effect of the number children is not significant. However, some characteristics of the respondents' children are strong determinants of the take-up of nursing home subsidies. Indeed, the number of children in a high socio-professional category strongly reduces the respondent's likelihood of take-up. Quantitatively, this effect is quite strong. Instead, those individuals with a disabled or unemployed child (i.e. exempt from compulsory contributions) have a higher likelihood of receiving ASH benefits. Finally, we do not find strong differences between the different models. The only relevant divergence is that we find stronger effects for most of the variables of interest on the models ran on the subsample of eligible individuals (columns 3 and 4).

The results of the probit regressions are globally in line with section's 3.5 theoretical results. The GIR, length of stay and respondent's age can be considered as proxies of nursing home costs (i.e. C in Table 3.1). Indeed, the higher the individual's degree of dependency, the more resources he/she will need for being cared *ceteris paribus*. A longer stay in a nursing home also implies higher costs. Therefore, it is logical to expect older people to face lower nursing home expenditures since their expected length of stay is lower. Thus, the significant positive effect of the variable *Length of stay* and the negative effect of age show that higher realised and expected nursing home costs are related to a higher take-up rate in practice. The non-significant effect of the respondent's degree of dependency (GIR) could be explained by the fact that the ASH only covers board and lodging costs. We expect these costs to be less affected by the resident's severity of dependency than health or personal care costs.

As for the positive impact of residing in a public institution versus a private one is due to the fact that most beds available to social assistance recipients are located in public institutions. The negative effect of owning some financial or housing wealth mirrors the theoretical negative effect of elderly's wealth on take-up displayed in Table 3.1. The negative effect of education, which can be interpreted as a proxy of the respondent's revenue, coincides with the theoretical effect of income on the take-up decision. Unfortunately, as we lack precise information about respondents' earnings, we cannot quantify the exact empirical impact of income on the dependent variable.

Finally, the negative effect of being married and the positive impact of not having children mirror the theoretical negative effect of the number of inheritors on take-up found in section 3.5 (see Table 3.1). This result is rather logical, as the lower the number of inheritors, the lower the number of relatives subject to compulsory assistance. Actually, people not married without children are not subject to compulsory assistance in most departments (see section 3.2). However, for respondents with at least one child (columns 2 and 4) it is not the number of inheritors which determines the most the take-up decision but their characteristics, i.e. their

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socio-professional situation or the presence of exempt children. The negative empirical effect of the variables *N of children CSP+* and *Exempt child* mirrors the theoretical negative impact of the proportion of non-exempt inheritors and their average revenue on the take-up decision (see Table 3.1).

3.7. Discussion and conclusion

Cost-sharing policies, which aim is to make the user or his family to participate to the financing of public LTC benefits, can be seen as a potential solution to LTC financing. However, these policies can provide disincentives to the take-up of public benefits, which has various negative individual and social consequences. In this article, we study from a theoretical and empirical perspectives how estate recovery and compulsory financial assistance affect the take-up of nursing home subsidies.

Our theoretical findings show that when estate recovery is full, families only agree to take-up the LTC subsidy when they anticipate the elderly's estate will be null whether the benefit is requested or not. When the elderly's wealth is higher, the take-up decision is conflictive, which hinders the benefit's take-up. This occurs as compulsory contributions operate a redistribution amongst the elderly's inheritors. Those who lose with the redistribution (the richest inheritors) are against the take-up decision. We also find that deductions in compulsory assistance and estate recovery increase the take-up rate, but through very different channels. Indeed, exemptions in compulsory assistance increase the amount of LTC benefit and thus of estate recovery. This makes the rate of take-up increase since for more families, the elderly's estate is null if the benefit is requested leading up to partial estate recovery. Instead, a deduction in estate recovery increases the take-up rate by raising the chances of an agreement for the take-up decision when the elderly's estate is large. We also show that the level of nursing home costs, the elderly's wealth and income, the number of inheritors non-exempt from compulsory contributions and their average revenue are the main theoretical drivers of the (non-)take-up decision. The empirical results are globally in line with the theoretical findings. Indeed, we find that the elderly's wealth and his number of children in a high socio-professional category strongly reduce the demand for the ASH. The elderly's length of stay in institution, his age, his marital status and the fact of having a disabled or unemployed child are the other main empirical determinants of the take-up decision.

Our results might be useful for policy makers. For instance, we show that a hypothetical reform of the ASH eliminating either compulsory financial assistance or estate recovery would have important structural differences. Additionally, our theoretical results can easily be generalised to all social assistance benefits subject to estate recovery and/or compulsory financial assistance. Concerning our empirical results, they reveal the profile of those people more likely to not receive the ASH despite being entitled to it. This has important policy implications, since the non-take-up phenomenon entails injustice and ineffectiveness in the implementation of social assistance (Van Oorschot, 1991).

This study has several limitations. First, we lack precise information about respondents' income. Having such information would have allowed us to identify more precisely the subgroup of eligible individuals and the exact take-up rate. Additionally, given that we cannot use income as an independent variable, we do not know exactly its empirical effect on the take-up decision. Second, financial and housing wealth are assumed equivalent in the theoretical model although housing wealth is rather illiquid, making it difficult to access it quickly. Finally, we have not considered that the take-up decision might depend on the trade-off between being cared at home or in institution. Extending our results towards these directions would be interesting topics for future research.

Appendix

Appendix 3.A: Individual take-up conditions of the baseline model and the model with unequal contribution rates

3.A.1. Take-up with large elderly's wealth (i.e. $C < w + r$)

In this case $H_0 > 0, H_1 > 0$ and $\alpha_0 = 0$. The individual take-up condition of Eq. (3.5) becomes:

$$\beta_i s_i (H_1 - H_0) - \alpha_1 \omega_i > 0.$$

Replacing H_0, H_1 and A from their values in Eq. (3.1), (3.2) and (3.3) and given that $\psi = 1$ we get:

$$\beta_i s_i \left(w - C + r + \sum_{j=1}^{N} \alpha_1 \omega_j - w - r + C \right) - \alpha_1 \omega_i > 0$$
$$\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i > 0$$

3.A.2. Take-up with low elderly's wealth (i.e. $C > w + r$) and $w < A$

In this case $H_0 = 0, H_1 = 0$ and $\alpha_0 > 0$. The individual take-up condition of Eq. (3.5) becomes:

$$(\alpha_0 - \alpha_1)\omega_i > 0$$

Replacing α_0 and α_1 from their values implied by $H_0 = 0$ and A in Eq. (3.1) and (3.3) we get:

$$\left(\frac{C - w - r - C + r + A}{\sum_{j=1}^{N} \omega_j} \right) \omega_i > 0$$
$$\left(\frac{A - w}{\sum_{j=1}^{N} \omega_j} \right) \omega_i > 0$$

3.A.3. Take-up with low elderly's wealth (i.e. $C > w + r$) and $w > A$

In this case $H_0 = 0, H_1 > 0$ and $\alpha_0 > 0$. The individual take-up condition of Eq. (3.5) becomes:

$$\beta_i s_i H_1 - (\alpha_1 - \alpha_0)\omega_i > 0$$

Replacing H_1 from its value in Eq. (3.2) and α_0 and α_1 from their values implied by $H_0 = 0$ and A in Eq. (3.1) and (3.3) and given that $\psi = 1$ we get:

$$\beta_i s_i (w - A) - \left(\frac{w - A}{\sum_{j=1}^{N} \omega_j} \right) \omega_i > 0$$
$$\frac{w - A}{\sum_{j=1}^{N} \alpha_1 \omega_j} \left(\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i \right) > 0$$

For the model with unequal contribution rates, the demonstrations for a non-exempt individual are identical to those of the baseline model but replacing ω_j by $\omega_j - e_j$, ω_i by $\omega_i - e_i$, $\sum_{j=1}^{N} \alpha_1 \omega_j$ by $\sum_{m=1}^{M} \alpha_1 (\omega_m - e_m)$, α_0 by α_0' and A by A'. For an exempt individual, the same changes apply except that $\alpha_{0,i} = \alpha_{1,i} = 0$.

Appendix 3.B: Proof of propositions 1 and 2

From section's 3.3.2 results we get three cases:

Eq. (3.8): $H_0 = 0$ and $H_1 = 0 \Leftrightarrow w < A$. Subsidy requested (consensus for take-up)
Eq. (3.7): $H_0 > 0$ and $H_1 > 0 \Rightarrow w > A$. Subsidy not requested (no consensus for take-up)
Eq. (3.9): $H_0 = 0$ and $H_1 > 0 \Rightarrow w > A$. Subsidy not requested (no consensus for take-up)

They can be summarized in the following truth table:

Input condition 1 $w < A$	Input condition 2 Take-up	Output
T	T	T
T	F	F
F	T	F
F	F	T

Which corresponds to the truth table of the logical equality. This is equivalent to state that $w < A$ is a necessary and sufficient condition for the take-up of the subsidy. Proposition 2 is proved in an identical way but replacing A by A'.

Appendix 3.C: Individual take-up conditions of the model with a deduction in estate recovery

3.C.1. Take-up with large elderly's wealth (i.e. $C < w + r$)

In this case $H_0 > 0, H_1' > 0$ and $\alpha_0 = 0$. The individual take-up condition of Eq. (3.5) becomes:

$\beta_i s_i (H_1' - H_0) - \alpha_1 \omega_i > 0$.

Replacing H_0, H_1' and A from their values in Eq. (3.1), (3.11) and (3.3) and given that $\psi = 1$ we get:

$\beta_i s_i \left(w - C + r + \sum_{j=1}^{N} \alpha_1 \omega_j + \hat{e} - w - r + C \right) - \alpha_1 \omega_i > 0$
$\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i + \beta_i s_i \hat{e} > 0$

3.C.2. Take-up with low elderly's wealth (i.e. $C > w + r$) and $w < A - \hat{e}$

In this case $H_0 = 0, H_1' = 0$ and $\alpha_0 > 0$. The individual take-up condition of Eq. (3.5) becomes:

$(\alpha_0 - \alpha_1)\omega_i > 0$

Replacing α_0 and α_1 from their values implied by $H_0 = 0$ and A in Eq. (3.1) and (3.3) we get:

$\left(\frac{C - w - r - C + r + A}{\sum_{j=1}^{N} \omega_j} \right) \omega_i > 0 \Leftrightarrow \left(\frac{A - w}{\sum_{j=1}^{N} \omega_j} \right) \omega_i > 0$

3.C.3. Take-up with low elderly's wealth (i.e. $C > w + r$) and $w > A - \hat{e}$

In this case $H_0 = 0, H_1' > 0$ and $\alpha_0 > 0$. The individual take-up condition of Eq. (3.5) becomes:

$$\beta_i s_i H_1' - (\alpha_1 - \alpha_0)\omega_i > 0$$

Replacing H_1' from its value in Eq. (3.11) and α_0 and α_1 from their values implied by $H_0 = 0$ and A in Eq. (3.1) and (3.3) and given that $\psi = 1$ we get:

$$\beta_i s_i\big(w - (A - \hat{e})\big) - \left(\frac{w-A}{\sum_{j=1}^{N}\omega_j}\right)\omega_i > 0 \text{ (when } w - A < 0 \text{ always holds)}$$

$$\frac{w-A}{\sum_{j=1}^{N}\alpha_1\omega_j}\left(\beta_i s_i \sum_{j=1}^{N}\alpha_1\omega_j - \alpha_1\omega_i\right) + \beta_i s_i \hat{e} > 0$$

Appendix 3.D: Proof of proposition 3

From section 3.4.2 results we get three cases:

Eq (14): $H_0 = 0$ and $H_1 = 0 \Longleftrightarrow w < A - \hat{e}$. Subsidy requested (consensus for take-up)
Eq (12): $H_1 > 0$ and $H_2 > 0 \Longrightarrow w > A > A - \hat{e}$. Subsidy requested *iff*
    $\beta_i s_i \sum_{j=1}^{N}\alpha_1\omega_j - \alpha_1\omega_i + \beta_i s_i \hat{e} > 0 \ \forall i$
Eq (15): $H_1 = 0$ and $H_2 > 0 \Longrightarrow w > A - \hat{e}$. Subsidy requested:
    when $w - A < 0$ or
    iff $\frac{(w-A)}{\sum_{j=1}^{N}\alpha_1\omega_j}\left(\beta_i s_i \sum_{j=1}^{N}\alpha_1\omega_j - \alpha_1\omega_i\right) + \beta_i s_i \hat{e} > 0 \ \forall i$ (when $w - A > 0$)

They can be summarized in the following truth tables:

Input condition 1 $w < A$	Input condition 2 Take-up	Output
T	T	T
T	F	F
F	T	T
F	F	T

As $w < A - \hat{e} \rightarrow w < A$; when $w < A$ Eq. (3.14) always holds. Input condition 1 summarizes thus, Eq. (14) and Eq. (3.15) conditions. The table above corresponds to logical implication. This is equivalent to state that $w < A$ is a sufficient condition for the take-up of the subsidy.

Input condition 3 $\beta_i s_i \sum_{j=1}^{N}\alpha_1\omega_j - \alpha_1\omega_i + \beta_i s_i \hat{e} > 0 \ \forall i$	Input condition 2 Take-up	Output
T	T	T
T	F	F
F	T	T
F	F	T

As $0 < \frac{(w-A)}{\sum_{j=1}^{N} \alpha_1 \omega_j} < 1$, when $w - A > 0$, it is easily shown that when Eq. (3.12) is holding Eq. (3.15) holds as well. Input condition 3 summarizes, thus, Eq. (3.12) and Eq. (3.15) take-up conditions. The above table corresponds to logical implication. This is equivalent to state that $\beta_i s_i \sum_{j=1}^{N} \alpha_1 \omega_j - \alpha_1 \omega_i + \beta_i s_i \hat{e} > 0 \; \forall i$ is a sufficient condition for the take-up of the subsidy.

Appendix 3.E: Family take-up conditions in the cooperative setting

As the family choses the option that maximizes aggregate wealth, the family demand equation can be written as:

$$\begin{cases} ASH = 1 & iff \quad \Delta X > 0 \\ ASH = 0 & Otherwise \end{cases}$$

Where:
$\Delta X = X_1 - X_0$
$X_0 = \sum_{j=1}^{N} z_j + (1 - \alpha_{0,j})\omega_j + s\beta H_0$ is the aggregate wealth when the subsidy is not requested
$X_1 = \sum_{j=1}^{N} z_j + (1 - \alpha_{1,j})\omega_j + s\beta H_1$ is the aggregate wealth when the subsidy is not requested

We assume $s\beta < 1$. Replacing X_1 and X_0 in the demand equation by their specific values leads to the following family take-up condition:

$$s\beta(H_1 - H_0) - \left(\sum_{j=1}^{N} \alpha_{1,j}\omega_j - \sum_{j=1}^{N} \alpha_{0,j}\omega_j\right)$$

3.E.1. Take-up with large elderly's wealth (i.e. $C < w + r$)

$H_0 > 0, H_1 > 0, \alpha_{0,j} = 0 \; \forall j$ and $\psi = 1$. The family take-up condition becomes:

$$s\beta\left(w - C + r + \sum_{j=1}^{N} \alpha_{1,j}\omega_j - w - r + C\right) - \sum_{j=1}^{N} \alpha_{1,j}\omega_j > 0$$
$$-(1 - s\beta)\sum_{j=1}^{N} \alpha_{1,j}\omega_j > 0$$

3.E.2. Take-up with low parental wealth (i.e. $C > w + r$) and $w < A$

$H_0 = 0, H_1 = 0$ and $\alpha_{0,j} > 0$. The family take-up condition becomes:

$$\sum_{j=1}^{N} \alpha_{0,j}\omega_j - \sum_{j=1}^{N} \alpha_{1,j}\omega_j > 0$$
$$A - w > 0$$

3.E.3. Take-up with low parental wealth (i.e. $C > w + r$) and $w > A$

$H_0 = 0, \alpha_{0,j} > 0, H_1 > 0$ and $\psi = 1$. The family take-up condition becomes:

$$s\beta H_1 - \left(\sum_{j=1}^{N} \alpha_{1,j}\omega_j - \sum_{j=1}^{N} \alpha_{0,j}\omega_j\right) > 0$$
$$s\beta(w - A) - (C - r - A - C + r + w) > 0$$
$$-(1 - s\beta)(w_0 - A) > 0$$

Chapter 4

The effect of long-term care public benefits and insurance on informal care from outside the household: Empirical evidence from Italy and Spain

This article uses cross-sectional data from the Survey of Health, Ageing, and Retirement in Europe (SHARE) database to test the effect of both long-term care (LTC) public benefits and insurance on the receipt of informal care provided by family members living outside the household in Italy and Spain. The choice of Italy and Spain comes from the fact that informal care is rather similar in these two countries while their respective public LTC financing systems are different. Our results support the hypothesis of LTC public support decreasing the receipt of informal care for Spain while reject it for Italy. They tend to confirm that the effect of public benefits on informal care depends on the typology of public coverage for LTC whereby access to proportional benefits negatively influences informal care receipt while access to cash benefits exerts a positive effect. Our results also suggest that private LTC insurance complements the public LTC financing system in place.

4.1. Introduction

The ageing of populations in most industrialised countries is accompanied by an increase in the needs for long-term care (LTC)[20]. Informal caregivers, mainly relatives or family members, and in particular children, meet a large part of LTC needs (Norton, 2016). Informal care, therefore, contributes to attenuate LTC expenditures' increases. The currently observed reduction in the supply of informal care is thus a crucial issue in LTC financing. However, providing informal care could also be detrimental for the caregiver's physical and mental health and employment participation (Moussa, 2019; Baji et al., 2019). Thus, better understanding the determinants of informal care is crucial in designing LTC financing programmes. Several factors, such as the degree of dependency, the number of children, family disintegration, geographical remoteness, women's work, fertility rates and the amount of inheritance, can influence the amount and the organization of informal help (Van Houtven and Norton, 2008).

The availability of public and private LTC financing can also influence informal care. In that respect, public LTC support has mainly been shown to decrease informal care. For instance, Ettner (1994), Pezzin et al. (1996) and Stabile et al. (2006), using North American surveys and experimental data, show that increased availability of publicly financed home care is associated with an increase in its utilization and a decline in informal caregiving. However, this hypothesis has been questioned by Motel-Klingebiel et al. (2005), who show that the extent to which older people rely on family help is independent of the welfare estate regime in which they live.

The availability of private LTC insurance has also been discussed as potentially reducing informal care. This phenomenon, first introduced by Pauly (1990) and labelled intra-family moral hazard, refers to the disincentive of informal caregivers to provide care because their dependent elderly has insurance coverage against formal LTC costs. It occurs as LTC insurance protects the parent's bequest from the costs of formal care in case of dependency, thus weakening the child's main incentive to provide care. Naturally, the same analysis can also be transposed to public LTC benefits as stressed by Zweifel and Strüwe (1998).

Various elements need to be taken into account when addressing the effect of LTC coverage on informal care. The first one being the relationship between formal and informal care as addressed by Ettner (1994), Pezzin et al. (1996) and Stabile et al. (2006). If formal and informal care are substitutes, the availability of subsidised formal care should decrease informal care. Nevertheless, the strength of such substitutability depends on the degree of dependency and on the type of home care considered (Bolin et al. 2008). Indeed, for severe levels of dependency and high-skilled home care, formal and informal care seem to be complements rather than substitutes (Bonsang, 2009).

A second element that might drive the effect of LTC financing availability on informal care is the nature of LTC benefits. In that respect, Klimaviciute (2017) has theoretically shown that intra-family moral hazard is attenuated when insurance benefits are fixed and not proportional to LTC expenses. The intuition being that with proportional insurance benefits, benefits are received only if formal care is consumed while fixed benefits do not depend on formal care consumption. Implicitly, proportional benefits protect more the parent's bequest from the costs of formal care than fixed benefits. The same reasoning could apply to public LTC benefits being either in kind, i.e. rather proportional as received conditionally on the receipt of formal care, or in the form of cash allowances, i.e. rather fixed.

A third element that could influence the link between LTC coverage and informal care is linked to the motives for providing informal care. In particular, apart from the bequest protection motive, informal care can also be provided for altruistic reasons or as a moral

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[20] LTC is a mix of social and health care provided on a daily basis, formally or informally, at home or in institutions, to people suffering from a loss of autonomy in their daily living activities.

obligation (Klimaviciute et al., 2017). In the case of altruistic caregivers, Courbage and Eeckoudt (2012) and Bascans et al. (2017) show that more LTC insurance could even increase optimal informal care provision, questioning the existence of a negative effect of insurance on informal care. As for the moral obligation motive, the potential negative effect of insurance on informal care could also be attenuated if caregivers have the feeling they are compelled to take care of their dependent relatives.

The aim of this paper is to investigate empirically the impact of LTC public benefits and LTC insurance ownership on the receipt of informal care by dependent individuals. This article looks at this issue in Italy and Spain using data from the Survey of Health, Ageing, and Retirement in Europe (SHARE) database which deals with the health, lifestyle and financial situation of individuals aged 50 and over in the majority of European countries. We restrict our analysis to care provided by family members living outside the household, excluding help provided by co-resident relatives and other caregivers such as neighbours and friends, which has been shown to be much less sensitive to public and private support (Mellor, 2001, Greonu and De Boer, 2016). Thus, even if omitted caregivers represent a significant source of informal care, their inclusion into the analysis would come at the cost of a large increase in our estimates' heterogeneity.

The choice of Italy and Spain stems from the fact that informal care is rather similar in these two countries while their respective public LTC financing systems are rather different. Indeed, sociologists such as Reher (1998) suggest a division between Southern Europe "strong family ties" and Northern Europe "weak family ties" countries. The moral obligation motive for caregiving is central in "strong family ties" countries, given that in Southern Europe and in Latin-speaking communities, as opposed to Northern European countries, much of the help given to dependent people is expected to come from the family (Costa-Font, 2010, Gentili et al., 2017). However, the nature of public LTC benefits is different in the two countries, proportional to LTC expenses in Spain and mainly in form of cash benefits in Italy. Hence, by studying two relatively similar countries in terms of values and family ties, cultural heterogeneity tends to disappear, allowing us to focus on whether the typology of LTC coverage plays a role in influencing the receipt of informal care. In addition, according to Motel-Klingeibel et al. (2005), another source of heterogeneity between welfare regimes could come from differences in the development of welfare services. By selecting Italy and Spain, which have similar ratios of LTC public spending as a percentage of GDP (OECD, 2018), we aim to control also for this second source of heterogeneity.

Our results show that in Spain individuals having access to public LTC benefits are less likely to receive informal care by non-co-resident relatives than those individuals who do not benefit from public LTC support. The opposite is found for Italy. Our findings tend to confirm that the effect of public benefits on informal care depends on the typology of public coverage for LTC whereby access to proportional benefits negatively influences informal care receipt while access to cash benefits exerts a positive effect. Our results also show that private LTC insurance is positively related to the receipt of informal care provided by family members living outside the household in Italy and negatively in Spain even if these results are not always significant at the usual confidence levels. Hence, private LTC insurance seems to complement the public LTC financing system in place, explaining why the direction of the marginal effect of private LTC insurance on informal care follows the one of public LTC support. Such results can be highly relevant in terms of LTC financing policies.

The article is organised as follows. In section 4.2, we present briefly the ways LTC financing is organised in Italy and Spain. Section 4.3 describes the database and the variables used. The econometric analysis and the results are presented in section 4.4. Section 4.5 consists of robustness checks of the results of section 4.4. The final section offers a conclusion.

4.2. LTC financing in Italy and Spain

4.2.1. LTC risk coverage in Italy

In Italy, the cost and design of public LTC related services is highly fragmented and is shared simultaneously between the State, the regions, and the municipalities (Costa-Font et al., 2012). Cash benefits are the most important pillar of the Italian LTC public intervention in terms of expenditure and number of older people affected (Costa-Font et al., 2012). The main cash benefit, established by the law of 11 February 1980 (Gazzeta Ufficiale, 1980), is the indennità di accompagnamento made available by the Social Security in the whole country to severely disabled people needing the permanent help of a relative to carry out the activities of daily living. There exist also some cash benefits provided by the regions, provinces and municipalities (Tediosi and Gabriele, 2010). Public home help for personal care and domestic tasks as well as institutional care are managed by municipalities in coordination with the National Health Service.

Whereas health care services for elderly are free of charge in Italy, public home help for personal care and domestic tasks is means-tested and users can pay up to its full cost. There is a wide variation in the co-payment modalities as they are defined by municipalities (Tediosi and Gabriele, 2010). The indennità di accompagnamento is universal and not means-tested and was set at €508 per month in 2015 independently of the age and place of residence of the recipient. It was granted to 363'868 individuals at the end of 2015 (INPS, 2015). This cash benefit, which was initially thought as a measure to support informal caregivers, now serves as well to remunerate private home help, in particular help given by migrant workers (Costa-Font et al., 2012).

In order to be declared eligible for the indennità di accompagnamento, an individual needs to be assessed by a health commission in a specialized centre or clinic after an appropriate period of observation or hospitalization (Gazzeta Ufficiale, 1971) as 100% disabled and dependent, i.e. in need of continuous assistance or unable to walk without the permanent help of a relative. For other regional and municipal LTC services and cash benefits, eligibility criteria are not homogeneous, and each region has a specific dependency classification system taking into account mainly activities of daily living (ADL) limitations and to a lower extent instrumental activities of daily living (IADL) limitations (Tediosi and Gabriele, 2010).

Finally, the private LTC insurance market is rather thin in Italy (Bucher-Koenen et al., 2015). Some insurance companies offer private LTC coverage, with products consisting of a life annuity in case of permanent or full dependency.

4.2.2. LTC risk coverage in Spain

In Spain, the regions and the municipalities offer universal LTC public coverage following the 39/2006 Law (BOE, 2006). The prestaciones y servicios para la autonomía y la dependencia, i.e. the dependency benefits and services, are granted to all individuals recognized as dependent regardless of their age, geographical location and financial situation. This subsidy can be either in kind in the form of formal care or financial as a percentage of formal care cost. According to the law, in kind subsidies have priority over the financial ones. In kind formal care can be provided at home, in nursing homes and in so called "day" or "night" centres. Financial subsidies can only be used to purchase formal LTC (if publicly provided LTC is not available) or to purchase specific personal assistance services. Exceptionally, if formal care is not available, these personal assistance services can be offered informally by relatives living in the

same household as the dependent elderly (BOE, 2013)[21]. In 2015, 745'720 individuals received the prestaciones y servicios para la autonomía y la dependencia, either as in kind or financial subsidies (Jiménez-Martin et al., 2016).

The system is financed via general taxation and means-tested co-payments of the users. The average co-payment is estimated to be €304, €412 and €662 per month for moderately, severely and major dependent respectively, which represents about 50% of the total cost (del Pozo-Rubio et al., 2017). The assessment of users' participation to the total cost of LTC is complex due to regional heterogeneity (del Pozo-Rubio et al., 2017, Montserrat and Montejo, 2012).

Severity of dependency is evaluated by a socio-medical team following a visit and an interview at the place of residence of the person applying for public benefits. The evaluation tool is a unified scale that has been approved in 2011 by the Spanish government under the Royal Decree 174/2011 (BOE, 2011). In order to be eligible to public services and subsidies, an individual has to be declared at least as moderately dependent, i.e. needing help to perform several ADL at least once a day or needing limited or not continuous help to be autonomous. Initially, only individuals recognised with major and severe dependency were covered by the public LTC system and it was not until mid-2015 that moderately dependent individuals became eligible to public coverage (Jiménez-Martin et al., 2016).

Finally, in Spain, the private LTC insurance market is rather small with 37'225 insured in 2015 (Dirección General de Seguros y Fondos de Pensiones, 2015). However, the market is quite dynamic and shows high growth rates. Between 2012 and 2015, the number of insured experienced a growth rate of 29%, probably due to a low starting point (Dirección General de Seguros y Fondos de Pensiones, 2013). Private insurance benefits can be either in the form of a pre-determined lump-sum or in the form of an annuity. Their eligibility criteria are tighter than the public ones, as private companies only recognize severe dependency corresponding to individuals needing a very high or permanent amount of support to stay autonomous.

We summarize the main characteristics of the Italian and Spanish LTC financing systems in Table 4.1 below.

Table 4.1 Summary of the Italian and Spanish LTC financing systems

	Italy	Spain
Public LTC organization	– LTC benefits offered by the State, regions and municipalities – *Indennità d'accompagnamento* (the most important benefit) provided by the State	– Public LTC benefits offered and managed by regions and municipalities – Law 39/2006 unifies the basic aspects of the public LTC financing system
Eligibility	– *Indennità* is granted to severely disabled, regardless of age	– All those recognized at least as moderately dependent, regardless of age
Typology of benefits	– Cash benefits mainly (such as the *indennità d'accompagnamento*).	– In kind at home or in an institution – Financial subsidies to formal care – Financial subsidies to at home informal care (if formal care is not available)
Financing	– *Indennità* is financed by Social Security – No co-payments	– General taxation – Means-tested co-payments
Private insurance	– Life annuity granted to permanent or full dependent	– Lump-sum payment or life annuity granted to severely dependent

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[21] This "exception" represented 36.5 % of all public LTC subsidies granted in Spain in 2015 (Jiménez-Martin et al., 2016). The Spanish subsidy to informal care is conceived, however, as a proportional benefit since it finances a given amount of hours of informal help plus the caregiver's contribution to social security. Additionally, since this subsidy targets mainly co-resident caregivers (BOE, 2013), its presence will not modify our conclusions relative to the Spanish LTC system in the following sections.

4.3. Available data and variables

4.3.1. Data

We use the SHARE database to empirically study the effect of both public support and private LTC insurance ownership on the receipt of informal care in both Italy and Spain. SHARE is a multidisciplinary, longitudinal and cross-national micro-database containing information on health-related variables, labour market variables, economic variables and other variables (including education, housing, social support and family structure) of a representative sample of European individuals aged 50 years or older and their spouses. The first wave of SHARE was released in 2004. SHARE follows the design of the U.S. Health and Retirement study and the English Longitudinal Study of Ageing. For more details on the survey, readers should refer to Börsch-Supan and Jürges (2005).

For the purpose of our study, we use data from the sixth wave of the SHARE database. The fieldwork of the sixth wave was completed in 2015, released in 2017 and contains information about 68'231 individuals from 18 different European countries. We discard the use of data from other waves as the Spanish public LTC system was not fully in place until mid-2015.

The subset of SHARE regarding Italy and Spain contains 10'949 observations, 5'313 corresponding to Italy and 5'636 to Spain. A restriction to individuals having at least one mobility, ADL or IADL limitation leaves us with 5'097 observations, 2'417 from Italy and 2'680 from Spain. In addition, due to missing values for some variables, 236 and 336 observations are lost in the Italian and Spanish samples respectively (19 respectively 10 are lost for missing information on limitations). Thus, our final sample includes 4'525 observations, 2'181 corresponding to Italy and 2'344 to Spain. Finally, for models including the control variables Net wealth and Regional dummies, additional missing values leave us with a total of 3'760 and 3'932 observations respectively.

4.3.2. The variables

In this section, we present the variables used in our analysis, in particular informal care receipt and LTC coverage, along with their descriptive statistics.

Informal care receipt

In SHARE, individuals are asked if any family member, friend or neighbour from outside or inside their household gave help to them and from whom they were given care. Additionally, respondents receiving care from outside the household can indicate what type of help they received, and more specifically, whether the help received was in the form of personal care (e.g., dressing, bathing, getting out of bed), practical household help (e.g., home repairs, transportation, shopping), or help with paper work (e.g., filling out forms, setting financial or legal matters). Interviewed individuals are allowed to declare having received any combination of these three types of help simultaneously.

Based on these answers, we generate three categories of informal care which are informal care in general (simply denoted informal care), informal care for ADL and informal care for IADL, as shown in Table 4.2 below. The first category of informal care includes those individuals declaring that they received at least one type of help amongst help with personal care, practical household help, and help with paperwork. In informal care for ADL we include those individuals declaring having received help with personal care. The informal care for IADL group encompasses those declaring having received practical household help or help with paperwork.

Table 4.2 summarizes for both Italy and Spain whether individuals receive help or not in our sample, the identity of their main caregiver and the type of care they receive by individuals living outside their household.

Table 4.2 Informal care from outside the household by country

	Number of observations		% of N		
	Italy	Spain	Italy	Spain	Difference
Size of the sample (*N*)	2'181	2'344	100%	100%	–
Receipt of help					
Total	580	638	26.59%	27.22%	−0.63%
Outside the household	451	449	20.68%	19.16%	1.52%
Inside the household	185	287	8.48%	12.24%	−3.76%***
Caregiver's identity					
Family member, outside household	347	402	15.91%	17.15%	−1.24%
Other, outside household	104	47	4.77%	2.01%	2.76%***
Family member, inside household	177	269	8.12%	11.48%	−3.36%***
Other, inside household	8	18	0.37%	0.77%	−0.40%
Informal care from outside the household by type and caregiver					
Informal care for IADL	424	416	19.44%	17.75%	1.69%
Family member	325	372	14.90%	15.87%	−0.97%
Other	99	44	4.54%	1.88%	2.66%***
Informal care for ADL	163	209	7.48%	8.91%	−1.43%*
Family member	138	193	6.33%	8.23%	−1.90%**
Other	25	16	1.15%	0.68%	0.47%

*The significance levels of the two-tailed Welch's t-test for difference in means are coded as follows: * significance at 10% level, ** significance at 5% level, *** significance at 1% level.*

In both countries, around 27% of the interviewed declare to receive informal care. In Italy, 21% of the sample declares to receive informal care from outside the household and an 8.5% from inside. In Spain, these rates represent a 19% and a 12% of the sample respectively. Some individuals receive simultaneously both types of care in our sample. Indeed, the sum of those respondents receiving informal care from outside and inside the household exceeds in both countries the number of individuals receiving informal care in general.

Family members from outside the household play a dominant role in providing care, supplying around 60% of total informal care in both countries (347 observations from 580 in Italy and 402 from 638 in Spain). Additionally, in Italy and Spain, more than 90% of those respondents who receive help from outside the household receive it as care for IADL (i.e. 424 respondents over 451 in Italy and 416 over 449 in Spain). Nevertheless, informal care for ADL plays also an important role, representing 36% (163 over 451) of the total amount of care received from non-co-resident in Italy and 47% (209 over 449) in Spain. A substantial number of individuals declares receiving both, help with ADL and IADL simultaneously. Concerning informal care provided by co-resident caregivers, we do not know, unfortunately, exactly its type, even if from the phrasing of the question identifying these caregivers in SHARE we can think that they provide help with ADL only or both types of help simultaneously.

In both countries, help with ADL from outside the household and care from inside the household is almost exclusively provided by family members. Neighbours and friends provide, mainly, only care for IADL and thus, seem to support a lower caregiving burden. From Table 4.2 we also see that despite the existence of important differences between the Italian and Spanish public LTC financing systems, the differences between both samples concerning

informal care are rather weak. The main differences, significant at the 1% level, concern caregiving by non-family members, which is significantly more present in Italy, and caregiving from inside the household, which is more common in Spain.

In the econometric analysis, we examine the effect of public LTC benefits and insurance on informal care receipt provided by relatives living outside the household. Our dependent variable accounts, thus, for around 60% of all informal care received by respondents. Help received by co-resident relatives and other caregivers is excluded and categorized as a zero, since pooling all informal care in a single item would result in a highly heterogeneous dependent variable. This occurs on two grounds. First because it seems reasonable to expect that informal care provided inside the household, mainly by spouses, is much less sensitive to public and private LTC coverage than other forms of informal care (Mellor, 2001). Second, because compared to relatives, neighbours and friends perform other tasks, have different motives to provide care and their role seems to be complementary to that of spouses and children (Greonu and De Boer, 2016).

We also decided to treat informal care for ADL and IADL as two separate dependent variables in the econometric analysis. The reason is that they could be provided for different reasons. As shown by Bonsang (2009), Van Houtven and Norton (2004) and Bolin (Bolin et al., 2008), informal care is rather a substitute of less intensive formal care such as help with IADL, but can be a complement to more intensive care such as personal home care. Thus, both types of care could be influenced to a different extent by public LTC support and insurance.

LTC coverage

In the survey, individuals are further asked to declare if they own public, private voluntary or private mandatory LTC insurance, or no coverage at all. Public LTC insurance corresponds to insurance or financing provided by the State. Despite the terminology in SHARE, public LTC financing in Italy and Spain does not correspond strictly to a public LTC insurance scheme but to public benefits as indicated in section 4.2. Private mandatory LTC insurance corresponds mainly to private group insurance provided through the employer while private voluntary LTC insurance corresponds to voluntary supplementary or complementary individual insurance.

Table 4.3 reports how individuals in our sample are covered for LTC related expenses.

Table 4.3 LTC coverage by country

	Number of observations		% of the total N		
	Italy	Spain	Italy	Spain	Difference
Size of the sample (N)	2'181	2'344	100%	100%	–
LTC coverage					
Does not own LTC coverage	1'834	1'648	84.09%	71.84%	12.25%[***]
Owns LTC coverage	347	660	15.91%	28.16%	−12.25%[***]
Type of LTC coverage					
Public	313	596	14.35%	25.43%	−11.08%[***]
Private mandatory insurance	6	20	0.28%	0.85%	−0.58%[***]
Private voluntary insurance	31	65	1.42%	2.77%	−1.35%[***]

The significance levels of the two-tailed Welch's t-test for difference in means are coded as follows: [*] significance at 10% level, [**] significance at 5% level, [***] significance at 1% level.

With regard to the types of LTC coverage, we note that the sum of public, private voluntary and private mandatory coverage can exceed the total number of observations of those owning LTC coverage. This arises as the same individual can have multiple types of coverage at the same time, e.g. public benefits and private voluntary insurance.

In both countries, LTC coverage is mainly provided by the State. In Italy, 14% of the respondents in our sample report having public LTC coverage, and very few report being covered with private voluntary or mandatory LTC insurance. In Spain, the proportion of those receiving public LTC benefits is higher than in Italy with around 25% of the sample declaring being covered by the public system while the number of individuals owning private LTC insurance is much lower and represents around 3% of the total. It should be stressed that the number of individuals privately covered in our sample is very low (37 individuals in Italy, 84 in Spain) which could influence the precision of our results related to private insurance.

One explanation of such discrepancy in public LTC coverage between the two countries could come from eligibility criteria. In Italy, the main LTC benefit (i.e. the indennità d'accompagnamento) is only attributed to severely dependent individuals, while in Spain, eligibility to public LTC benefits also includes moderately dependent individuals. The large share of individuals not having any financial LTC coverage in both countries could be explained, in addition to eligibility criteria, by the belief that care should be exclusively a matter of the family, by insufficient information about public LTC programs, by the complexity of the application process to public LTC or by the presence of co-payments, among others.

Other variables

In the econometric analysis, we control the effect of public LTC coverage and LTC insurance on informal care receipt with a series of additional variables.

Firstly, we consider the effect of formal home care utilisation on informal care. We use formal care utilisation as a control variable because our objective is to investigate whether public benefits and private insurance, and not the receipt of formal care, provides incentives or disincentives to informal care. Additionally formal care availability, which can be proxied by formal care use, could be simultaneously correlated with public LTC support take-up, private LTC insurance ownership and informal care. We define the variable formal care as indicating if the individual received home help with personal care (e.g. dressing, eating or using the toilet), domestic tasks (e.g. cleaning, ironing, cooking, meals-on-wheels) or other activities such as filling a drug dispenser by paid professional workers during the previous twelve months. Following Bolin et al. (2008), we also consider highly qualified health care in the form of a binary variable indicating whether the respondent has been in a hospital overnight during the last year and on the number of the interviewee's visits to a doctor during the previous twelve months. We separately treat formal home care and health care as their relationship with informal care might be different according to the literature (Bolin et al., 2008).

The respondent's degree of dependency is included as a control since it is the most important driver of informal care provision according to the literature (Greonu and De Boer, 2016). Following Courbage and Roudaut (2009), the level of dependency can be defined through the self-reported number of limitations the individual has with a set of movements (walking 100 metres, sitting for two hours, etc.), ADL (dressing, using the toilet, bathing, etc.) and IADL (phoning, using a map, taking medicines, etc.). The respondent's self-reported health is also considered, since it can also be an important determinant of informal care besides its positive correlation with the severity of dependency.

As the family structure is very likely to simultaneously affect the supply of informal care and the decision to purchase voluntary LTC insurance (Van Houtven et al., 2015; Van Houtven and Norton, 2004), we consider a large set of controls describing the respondent's household and family composition. We include the number of members living in the respondent's household and his/her number of children, as well as a set of binary variables such as being married, widow, having a co-resident child, and having a daughter.

We include three classical demographic controls, i.e. the respondent's gender, age, and whether he/she lives in an urban area or not. Finally, we also include net wealth (including housing assets) and a binary variable for whether the interviewee has given a material or financial gift larger than 250€. This is done to control for a possible omitted variable bias as wealth and financial gifts are likely to be simultaneously correlated with informal care (i.e. if bequest or exchange motives for providing care are present), public LTC benefits eligibility (via means-tested co-payments) and private LTC insurance purchase. We do not to include income, education and employment situation as controls since most individuals of the sample have left the labour market. Lastly, we include for Spain a binary variable indicating if the interview was performed in Catalan as cultural and institutional differences between the Catalan-speaking population and the rest of Spaniards, simultaneously affecting informal care receipt and LTC insurance ownership, are likely to be present in our dataset.

Descriptive statistics

Table 4.4 provides a summary and description of the set of variables considered in the econometric models. Sample mean values are reported separately for Italy and Spain.

Table 4.4 Variables' description and sample means

Variable	Description	Italy	Spain	Difference
Dependent variables				
Informal care	1 if having received at least one type of help amongst help with personal care, practical household help, and help with paperwork by a family member from outside the household	0.159	0.172	–0.013
Informal care for ADL	1 if having received help with personal care (dressing, eating, using the toilet...) by a family member from outside the household	0.063	0.082	–0.019**
Informal care for IADL	1 if having received practical household help (gardening, shopping…) or help with paperwork such as filling out forms by a family member from outside the household	0.149	0.159	–0.010
Independent variables				
LTCI public	1 if reporting to own LTC insurance or financing provided by the State	0.144	0.254	–0.110***
LTCI private	1 if reporting to own private mandatory or voluntary / supplementary LTC insurance	0.017	0.036	–0.019***
Formal care	1 if having received professional or paid personal care, help with domestic tasks or help with other activities such as filling a drug dispenser during the last year	0.116	0.172	–0.056***
Hospital	1 if having been in a hospital overnight during the last 12 months	0.177	0.202	–0.025**
Doctor	Number of doctor visits during the last year	11.950	8.337	3.613***
Mobility limitations	Number of mobility limitations (walking 100 meters, sitting for 2 hours, climbing stairs…)	3.364	3.958	–0.594***
ADL limitations	Number of limitations in Activities of Daily living (getting in / out of bed, bathing or showering…)	0.529	0.682	–0.153***
IADL limitations	Number of limitations in Instrumental Activities of Daily Living (phoning, personal laundry…)	1.059	1.529	–0.470***
Health	Respondent's self-reported health	2.214	2.103	0.111**
Household members	Number of people living in the respondent's household, excluding lodgers	2.263	2.224	0.039
Married	1 if reporting to be married or in a registered partnership	0.644	0.626	0.018
Widow	1 if reporting to be widow	0.165	0.191	–0.026**
N children	Interviewee's number of living children	1.997	2.264	–0.267***
Co-resident children	1 if reporting to have a child living in the same household	0.251	0.190	0.061***
Has daughter	1 if reporting to have at least one living daughter	0.630	0.668	–0.038***
Care other	1 if having received informal care by a neighbour or a friend from outside the household	0.048	0.020	0.028***
Care inside	1 if having received informal care by somebody from inside the household	0.085	0.122	–0.037***
Age	Interviewee's age	70.713	74.331	–3.619***
Female	1 if the interviewee is a woman	0.628	0.613	0.015
Urban	1 if the interviewee lives in a big city, the suburbs or outskirts of a big city or a small town	0.341	0.419	–0.078***
Net wealth (in €)	Self-reported net wealth, in euro	200'423	205'396	–4'972
Gift	1 if the interviewee has given any material or financial gift of 250€ or more in the last 12 months	0.296	0.096	0.200***
Catalan	1 if interviewed in Catalan (Spain)	–	0.167	–

Number of observations: 2'181 in Italy and 2'344 in Spain (with the exception of the variable Net wealth).
The significance levels of the Welch two-tailed t-test for difference in means are coded as: * significance at 10% level, ** significance at 5% level, *** significance at 1% level.

There is a significant overlap on the dependent variables *Informal care* and *Informal care for IADL,* as more than 90% of those who receive help by family members living outside the household receive it as care for IADL. While SHARE distinguishes private mandatory and voluntary LTC insurance, we merge them into one type of private insurance (variable LTCI private) to work with a variable maximizing the number of individuals privately covered. The informal care and insurance related variables' sample means reflect the trends commented earlier in section 4.3.2. Additionally, Italians are less likely to receive formal home care when compared to Spaniards which is consistent with the observed differences in public LTC coverage. In both countries the average household is composed of 2.2 members and surveyed individuals have on average about 2 children. Roughly 63% of the individuals are married, around 18% are widow and between 20 to 25% of respondents live with their children.

4.4. Econometric analysis

4.4.1. Econometric specification

In our econometric analysis we run three probit models on the three binary variables defining informal care provided by family members from outside the household (see Table 4.4). This type of regression is suited when the dependent variable takes only two values. More formally, for each country, we model an individual's probability of receiving informal care by the following equation:

$$IC_i^j = \alpha + \beta_1^j LTC_i + \beta_2^j X_i + \varepsilon_i \tag{4.1}$$

where IC_i^j with $j = 1, 2, 3$ corresponds to the three dummy variables defining informal care in an aggregate way ($j = 1$), for ADL ($j = 2$) and for IADL ($j = 3$). While the superscript j is linked to the three regressions, the subscript i is linked to the observations, i.e. the responses from the surveyed individuals. LTC_i refers to the two variables defining public and private LTC financing and X_i to the independent variables in Table 4.4 selected as control variables. Assuming the error term ε_i is normally distributed with mean zero, Eq. (4.1) can be estimated using a probit model[22].

We consider as control variables for the final model only those variables in Table 4.4 which fulfil two criteria. The first is to decrease the Akaike information criterion (AIC) (Greene, 2011) and the second is to be statistically significant at the 10% level. These criteria ensure that the selected variables improve the model's goodness of fit without raising substantially the risk of overfitting. For the degree of dependency, only the variable with the highest explanatory power among the three mobility, ADL and IADL limitations is included, because of the large collinearity existing between them (i.e. $\rho > 0.6$). The selection of covariates is performed in the joint regression model with IC^1 as dependent variable (first column of Table 4.6). We retain this selection across the other models to have a unified specification.

Controls were tested under different forms (linear, binary and categorical) and we retained the one improving the most the AIC. Alternative specifications including more controls were also tested for all regressions. Results did not change substantially, validating our method for the selection of covariates. Finally, we also investigate the relationship between LTC financing and the probability of formal care use. In this case, our dependent variable is the formal home care utilization variable and LTC financing, informal care receipt by family members and the selected controls are used as explanatory variables.

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[22] Another empirical strategy could have been to estimate a simultaneous equation model for both formal and informal care without cross effects between both types of care. We considered this strategy but results were very imprecise and non-significant due to the relatively low number of observations in our samples.

4.4.2. Empirical results

The numerical results from the model calibration are presented in Table 4.5.

Table 4.5 Empirical results by type of care and by country. Dependent variables are indicated in the first row

	Informal care (IC^1)		Informal care ADL (IC^2)		Informal care IADL (IC^3)		Informal care (IC^1)		Formal care (FC)	
	Italy	Spain	Italy	Spain	Italy	Spain	Italy	Spain	Italy	Spain
(Intercept)	−1.994***	−1.280***	−2.706***	−1.871***	−2.048***	−1.479***	−1.895***	−0.977**	−2.317***	−2.687***
	(0.350)	(0.341)	(0.485)	(0.443)	(0.357)	(0.346)	(0.398)	(0.383)	(0.388)	(0.340)
LTCI public	0.233**	−0.434***	0.294**	−0.214***	0.258***	−0.435***	0.227**	−0.478***	0.244**	0.150*
	(0.093)	(0.085)	(0.124)	(0.103)	(0.094)	(0.086)	(0.099)	(0.095)	(0.102)	(0.077)
LTCI private	0.413	−0.339	0.187	−0.104	0.477*	−0.402*	0.425	−0.272	0.530*	0.386**
	(0.268)	(0.226)	(0.456)	(0.275)	(0.269)	(0.239)	(0.293)	(0.248)	(0.273)	(0.180)
Formal care	0.084	0.370***	−0.005	0.240**	0.085	0.310***	0.105	0.394***	–	–
	(0.101)	(0.087)	(0.129)	(0.104)	(0.103)	(0.087)	(0.110)	(0.097)		
Informal care	–	–	–	–	–	–	–	–	0.073	0.357***
									(0.099)	(0.087)
Hospital	0.129	0.208***	0.194*	0.284***	0.100	0.182**	0.141	0.218**	0.251***	0.084
	(0.102)	(0.082)	(0.115)	(0.098)	(0.091)	(0.083)	(0.097)	(0.091)	(0.095)	(0.083)
IADL limitations	0.073***	0.108***	0.135***	0.149***	0.067***	0.108***	0.068***	0.111***	0.086***	0.123***
	(0.016)	(0.014)	(0.019)	(0.017)	(0.016)	(0.015)	(0.018)	(0.016)	(0.016)	(0.014)
Health	−0.112**	−0.242***	−0.135**	−0.280***	−0.118**	−0.214***	−0.134***	−0.298***	−0.158***	−0.107***
	(0.046)	(0.048)	(0.084)	(0.065)	(0.047)	(0.048)	(0.050)	(0.053)	(0.053)	(0.046)
HH members										
2	−0.476***	−0.377***	−0.432***	−0.211***	−0.493***	−0.396***	−0.382***	−0.406***	−0.499***	−0.256***
	(0.087)	(0.088)	(0.118)	(0.113)	(0.088)	(0.089)	(0.096)	(0.098)	(0.094)	(0.086)
3	−0.546***	−0.672***	−0.484***	−0.434***	−0.569***	−0.654***	−0.516***	−0.639***	−0.544***	−0.542***
	(0.119)	(0.123)	(0.164)	(0.159)	(0.122)	(0.125)	(0.135)	(0.134)	(0.133)	(0.122)
4 or more	−0.737***	−0.782***	−0.452***	−0.590***	−0.731***	−0.732***	−0.645***	−0.824***	−0.637***	−0.912***
	(0.153)	(0.162)	(0.196)	(0.211)	(0.156)	(0.163)	(0.177)	(0.182)	(0.171)	(0.184)
N children	0.028	0.048**	0.064*	0.023	0.032	0.034	−0.014	0.058**	−0.026	−0.026
	(0.029)	(0.022)	(0.037)	(0.028)	(0.029)	(0.023)	(0.033)	(0.025)	(0.033)	(0.024)
Has daughter	0.158*	0.397***	0.244**	0.375***	0.151*	0.380***	0.246***	0.428***	−0.048	−0.034
	(0.084)	(0.090)	(0.120)	(0.120)	(0.085)	(0.092)	(0.092)	(0.101)	(0.092)	(0.086)
Age	0.018***	0.008**	0.015***	0.006	0.018***	0.010***	0.019***	0.005	0.020***	0.023***
	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)
Female	0.109	0.103	0.082	0.061	0.117	0.146*	0.097	0.071	0.174**	0.149**
	(0.074)	(0.074)	(0.103)	(0.094)	(0.075)	(0.075)	(0.080)	(0.082)	(0.083)	(0.073)
Urban	−0.149**	−1.247***	−0.048	−0.143	−0.200**	−0.266***	−0.172**	−0.261***	0.188**	0.027
	(0.074)	(0.072)	(0.102)	(0.092)	(0.076)	(0.074)	(0.082)	(0.079)	(0.080)	(0.073)
Wealth quartiles										
2nd	–	–	–	–	–	–	−0.052	0.269**	–	–
							(0.100)	(0.109)		
3rd	–	–	–	–	–	–	−0.399***	−0.058	–	–
							(0.112)	(0.102)		
4th	–	–	–	–	–	–	−0.178*	−0.017	–	–
							(0.105)	(0.010)		
Catalan	–	−0.527***	–	−0.455***	–	−0.492***	–	−0.378	–	0.279***
		(0.113)		(0.156)		(0.114)		(0.137)		(0.095)
Pseudo R^2 †	11.30%	21.29%	19.35%	26.17%	11.59%	18.67%	12.21%	23.13%	14.93%	19.13%
N	2'181	2'344	2'181	2'344	2'181	2'344	1'850	1'910	2'181	2'344

Robust standard errors are reported in parentheses.
* *significance at 10% level,* ** *significance at 5% level,* *** *significance at 1% level.*
† *Mc. Fadden's pseudo R^2*

In Italy, public LTC support is found to impact significantly and positively informal care (IC^1) in the first regression. The opposite result is found for Spain, where public LTC coverage has a significant negative impact on informal care provided by family members. This result would tend to confirm our initial hypothesis that different public LTC financing typologies may have a different impact on informal care. On the one hand, in Italy, public LTC is characterized by a mixed system consisting of a universal national cash benefit granted to severely dependent (the *indennità d'accompagnamento*), complemented by a very heterogeneous set of additional cash and in-kind benefits provided and regulated at the regional and municipal levels. On the other hand, in Spain, while either in-kind or financial benefits are also granted to moderately dependent, they depend on formal care consumption. Hence, in Spain, benefits are received conditionally on the receipt of formal care which is likely to provide disincentives for informal care. This does not necessarily happen in Italy where cash benefits, the most important pillar of public LTC support, are not conditioned on the receipt of formal care and have more strict eligibility criteria. In Italy, cash benefits can be used to compensate informal caregivers which may explain the positive relationship between public coverage and informal care. Hence, such cash benefits would fulfil their initial role thought to support informal caregivers (Costa-Font et al., 2012). These first findings would tend to support the hypothesis of LTC public support decreasing the receipt of informal care for Spain but would reject it for Italy.

Regarding the effect of private LTC insurance on informal care, its effect is positive for Italy and negative for Spain, but not significant at the relevant levels (*p*-value of 12.3% in Italy and 13.3% in Spain). Private insurance, whose indemnities take the form of cash benefits, seems to complement the public LTC financing system in place. This could explain why the coefficient corresponding to this variable has the same sign as the one of public LTC coverage. For instance, the negative relationship in Spain could be explained by the fact that private benefits complement the public system and are used to finance co-payments and/or additional formal care costs not fully covered by public benefits.

When informal care is defined only in terms of help with ADL or with IADL (second and third columns in Table 4.5) our results do not importantly change. When care is defined as informal care for IADL, the main difference is that the effect of private LTC insurance becomes statistically significant at the 10% level in both countries. Additionally, the estimate corresponding to public LTC suffers from an important reduction in Spain when informal care is defined as help with ADL. As help with ADL is a more intense form of care, this result is consistent with the findings of Bonsang (2009) and Bolin (2008) showing that formal and informal care are weaker substitutes if the intensity of care is high.

In the fourth column, we run a regression with the general definition of informal care as the dependent variable by additionally controlling for the individual's net assets including housing wealth. More specifically, we include three dummies related to the country specific quartiles of the sample wealth distribution. When including this variable, the sample size is substantially reduced due to the presence of missing values. Our results show that the coefficients corresponding to public LTC benefits do not suffer relevant changes whereas those corresponding to private LTC insurance are reduced and become non-significant. Further, we find that wealth has a non-linear effect on informal care.

The fifth set of results contains the regression models using formal care as dependent variable. As laid out above, we control for informal care receipt and for the rest of the variables except wealth (results do not change when we include it). As suspected, in Spain, where public LTC support is conditioned to formal care receipt, we find a positive association between LTC coverage, both public and private, and formal home care. In Italy, where the system is mixed, we find as well public and private LTC coverage to be positively associated with formal home care. Hence, on the one hand, in Spain, LTC public benefits increase formal care and decrease

informal care. On the other hand, in Italy, LTC public benefits increase both formal and informal care receipt.

Concerning the rest of the control variables, formal care is not significantly correlated with informal care in Italy, while it is significantly positively correlated with the three categories of informal care in Spain. A causal interpretation for this control variable's marginal effect is beyond the scope of this paper. Indeed, we include formal care utilisation in the regression as an independent variable to control for the effects of public support and private insurance in both countries by formal home care availability. Having been in the hospital is significantly and positively associated with the three categories of informal care as well as with formal care. The number of IADL limitations is positively and significantly related to the receipt of both informal and formal care and a better health has the opposite effect on both variables. The number of members in the respondent's household has a very significant increasing negative effect on both informal care from outside the household and formal care. The remaining variables proxying co-residential informal care (i.e. the marital status or having a co-resident child or caregiver) are not included as they become non-significant once we control by *Household Members*. Having a daughter, which can be considered as a proxy of informal care supply (Bonsang, 2009), is significantly positively related to the probability of receiving informal care from outside the household. Age is positively and strongly related with having received both informal and formal care, with the exception of informal care for ADL in Spain (*p*-value of 0.102). In most cases, being a woman cannot be significantly related with care receipt. Finally, individuals speaking Catalan are less likely to receive informal care from a family member living outside the household and more likely to receive formal care than the rest of Spaniards.

We also computed the correlation matrix between independent variables and performed variance inflation factor (VIF) checks on all regressions. No major correlations nor high values on these tests were found, indicating the absence of major multicollinearity.

4.4.3. Joint regressions

In this subsection, we check if the differences found between Italy and Spain in the effects of LTC financing on informal care receipt by family members from outside the household are statistically significant in addition of having different signs. To do so, we run the regressions of Table 4.5 where informal care is the dependent variable without splitting the data in two country samples. We include a country dummy for *Italy* and the interactions *LTCI public*Italy* and *LTCI private*Italy*. We remove the dummy variable *Catalan* as we focus on the international differences. The results of this model are displayed below, in Table 4.6.

Table 4.6 Empirical results of the joint regression models for informal care. Dependent variables are indicated in the first row

	Informal care (IC^1)	Informal care ADL (IC^2)	Informal care IADL (IC^3)	Informal care (IC^1)
(Intercept)	−1.554***	−3.148***	−1.691***	−1.346***
	(0.244)	(0.282)	(0.249)	(0.257)
LTCI public	−0.363***	−0.178*	−0.370***	−0.420***
	(0.081)	(0.100)	(0.083)	(0.090)
LTCI private	−0.315	−0.111	−0.373	−0.242
	(0.226)	(0.271)	(0.235)	(0.241)
Formal care	0.243***	0.140*	0.210***	0.270***
	(0.065)	(0.079)	(0.066)	(0.072)
Hospital	0.157***	0.235***	0.131*	0.166**
	(0.060)	(0.073)	(0.061)	(0.065)
IADL limitations	0.096***	0.145***	0.094***	0.095***
	(0.010)	(0.012)	(0.011)	(0.012)
Health	−0.182***	−0.214***	−0.173***	−0.216***
	(0.033)	(0.046)	(0.033)	(0.036)
HH members				
2	−0.429***	−0.317***	−0.455***	−0.414***
	(0.061)	(0.080)	(0.062)	(0.067)
3	−0.632***	−0.475***	−0.631***	−0.611***
	(0.084)	(0.112)	(0.086)	(0.093)
4 or more	−0.789***	−0.532***	−0.759***	−0.791***
	(0.110)	(0.142)	(0.112)	(0.125)
N children	0.054***	0.046**	0.045**	0.045**
	(0.017)	(0.022)	(0.018)	(0.019)
Has daughter	0.256***	0.303***	0.249***	0.308***
	(0.060)	(0.083)	(0.062)	(0.067)
Age	0.011***	0.010**	0.013***	0.010***
	(0.003)	(0.004)	(0.003)	(0.003)
Female	0.095*	0.068	0.122**	0.070
	(0.052)	(0.069)	(0.053)	(0.057)
Urban	−0.160***	−0.069	−0.196***	−0.204***
	(0.051)	(0.067)	(0.051)	(0.056)
Wealth quartiles				
2nd	−	−	−	−0.128*
				(0.071)
3rd	−	−	−	−0.202***
				(0.075)
4th	−	−	−	−0.101
				(0.078)
Italy	−0.024	−0.049	−0.030	−0.043
	(0.055)	(0.074)	(0.056)	(0.061)
Italy * LTCI public	0.622***	0.485***	0.653***	0.689***
	(0.123)	(0.160)	(0.126)	(0.134)
Italy * LTCI private	0.785**	0.273	0.902***	0.751**
	(0.347)	(0.542)	(0.356)	(0.377)
Pseudo $R^{2\,\dagger}$	15.28%	22.42%	15.08%	16.63%
N	4'525	4'525	4'525	3'760

Robust standard errors are reported in parentheses.
* significance at 10% level, ** significance at 5% level, *** significance at 1% level.
† Mc. Fadden's pseudo R

The effect of public LTC coverage in Spain is still significant at the 1% level when informal care is defined in general (columns 1 and 4) and as help with IADL (column 3). When informal care is defined as help with ADL, the effect of public LTC coverage is reduced substantially and the negative effect in Spain is only significant at the 10% level, which is consistent with the previous section's findings, i.e. the effect of public LTC coverage is lower when informal care is defined as help with ADL. Concerning private LTC insurance, the results found previously are maintained as the effect of this variable is negative and not significant in general.

Looking at the country dummy, we find, as in the descriptive statistics, that despite the important differences between the Italian and Spanish public LTC systems, there are virtually no differences in the probability of receiving informal care. The country dummy is not significant in any case.

Considering the interaction *LTCI public*Italy*, our previously observed differences hold and are even found to be highly significant whatever the definition of informal care used. Concerning the effect of private LTC insurance ownership, differences are significant at the 5% level only when informal care is defined using the general definition and with help for IADL (columns 1, 3 and 4). The differences found previously are then robust and economically relevant given the significance of these interaction terms.

Finally, regarding the other control variables, no substantial changes are observed.

4.5. Robustness

4.5.1. Controlling for regional fixed effects

As stressed earlier, important heterogeneity at the regional level is present in the Italian and Spanish public LTC systems. In Italy the main public LTC benefit is granted at the national level but regions and municipalities also fund additional forms of cash and in kind public support. In Spain, public LTC support is regulated at the national level by the law 39/2006 but Autonomous Communities are left with a great deal of discretion for determining co-payment rates and some characteristics of the benefits granted.

To address such heterogeneity, we again run a selection of the regressions of Table 4.5 and include a set of binary control variables corresponding to the regions in Italy and the Autonomous Communities in Spain. In Table 4.7, we report the coefficients corresponding to public and private LTC coverage. We do not estimate the model where wealth is included as a control as this alternative specification does not substantially affect the coefficients corresponding to public and private LTC coverage (see Table 4.5).

Table 4.7 Probit regression models controlling for regional fixed effects

	Informal care (IC^1)		Informal care ADL (IC^2)		Informal care IADL (IC^3)	
	Italy	Spain	Italy	Spain	Italy	Spain
(Intercept)	−2.020***	−1.615***	−2.270***	−2.452***	−2.060***	−2.012***
	(0.405)	(0.458)	(0.562)	(0.666)	(0.416)	(0.475)
LTCI public	0.380***	−0.433***	0.373**	−0.243**	0.426***	−0.453***
	(0.113)	(0.099)	(0.157)	(0.121)	(0.114)	(0.102)
LTCI private	0.153	−0.192	−3.449	−0.152	0.239	−0.402
	(0.358)	(0.249)	(100.738)	(0.315)	(0.361)	(0.270)
Controls (excl. wealth)*	YES	YES	YES	YES	YES	YES
Regional dummies**	YES	YES	YES	YES	YES	YES
Pseudo $R^{2\,\dagger}$	14.57%	22.97%	23.76%	27.70%	15.12%	22.91%
N	1'903	2'029	1'903	2'029	1'903	2'029

Robust standard errors are reported in parentheses.
* *significance at 10% level,* ** *significance at 5% level,* *** *significance at 1% level.*
* *Control variables used in section 4.2 excluding wealth.*
** *Regional binary variables based on the NUTS 2 classification (Regions for Italy and Autonomous Communities for Spain).*
† *Mc. Fadden's pseudo R*

The inclusion of regional fixed effects does not substantially change the results reported in Table 4.5. The coefficients corresponding to public LTC coverage keep the same sign and increase their significance, despite that the sample is slightly reduced due to missing observations (missing regional information). The coefficients corresponding to the effect of private LTC insurance ownership keep the same sign but are non-significant at the usual confidence levels in all models. Finally, we also find that regional fixed effects are important determinants of informal care supply in both samples as pseudo R^2 are larger in all regressions.

4.5.2. Eligibility criteria

As a way to make sure that those who declare in the survey to have LTC coverage, either public or private, receive indeed an indemnity, we decide in the following to only consider those individuals who are strongly dependent and declare to have two or more ADL limitations. By considering the subsamples for Italy and Spain, we focus on those individuals who are most likely to be eligible for LTC benefits since by definition of the eligibility criteria only those with a high degree of dependency are eligible for LTC benefits. Our choice of the criterion having two or more ADL limitations is based on the Spanish public LTC benefits eligibility rule as laid out in section 4.2. This criterion is also in line with the practice of other European countries having a public LTC insurance scheme such as France (MODAPA, 2014) and Germany (Zuchandke et al., 2012).

Table 4.8 shows the results of the different regressions with the selected subsamples. From the model specification we removed the formal care, hospital, health and demographic control variables as well as wealth following the Bayesian information criterion (BIC)[23] (Greene, 2011), with the objective of maximizing the degrees of freedom of this second econometric estimation given the reduced number of observations in the subsamples.

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[23] The BIC is used as, compared to the AIC, it penalizes more those models with a large number of parameters.

Table 4.8 Probit regression models on a subsample of individuals with two or more ADL limitations

	Informal care (IC^1)		Informal care ADL (IC^2)		Informal care IADL (IC^3)		Informal care (IC^1)
	Italy	Spain	Italy	Spain	Italy	Spain	Pooled sample
(Intercept)	−0.912***	−0.689***	−1.199***	−0.978***	−1.075***	−0.748***	−0.679***
	(0.256)	(0.248)	(0.272)	(0.257)	(0.266)	(0.251)	(0.188)
LTCI public	0.725***	−0.706***	0.665**	−0.584***	0.731***	−0.746***	−0.613***
	(0.261)	(0.168)	(0.266)	(0.174)	(0.263)	(0.173)	(0.163)
LTCI private	–	−0.613	–	−0.396	–	−0.537	–
		(0.460)		(0.457)		(0.462)	
IADL limitations	0.072**	0.096***	0.082***	0.103***	0.068**	0.102***	0.086***
	(0.028)	(0.025)	(0.030)	(0.026)	(0.029)	(0.026)	(0.018)
HH members							
2	−0.550***	−0.507***	−0.533**	−0.497**	−0.554***	−0.613**	−0.532***
	(0.206)	(0.207)	(0.212)	(0.207)	(0.209)	(0.208)	(0.144)
3	−0.914***	−0.958***	−0.991***	−0.929***	−1.040***	−0.901***	−0.959***
	(0.277)	(0.257)	(0.298)	(0.265)	(0.293)	(0.257)	(0.186)
4 or more	−1.325***	−1.539***	−1.132***	−1.252***	−1.268***	−1.483**	−1.495***
	(0.388)	(0.363)	(0.391)	(0.360)	(0.391)	(0.363)	(0.263)
N children	0.081	0.091**	0.124	0.093**	0.086	0.091**	0.097***
	(0.064)	(0.039)	(0.066)	(0.039)	(0.065)	(0.039)	(0.033)
Has daughter	0.371*	0.533***	0.262	0.437***	0.506**	0.509***	0.458***
	(0.216)	(0.189)	(0.227)	(0.197)	(0.226)	(0.193)	(0.139)
Catalan	–	−0.571**	–	−0.503**	–	−0.569**	–
		(0.248)		(0.262)		(0.253)	
Italy	–	–	–	–	–	–	−0.398***
							(0.310)
Italy * LTCI public	–	–	–	–	–	–	−1.363***
							(0.310)
Pseudo $R^{2\ \dagger}$	11.55%	17.45%	12.02%	15.00%	12.81%	16.97%	14.26%
N	267	368	267	368	267	368	635

Robust standard errors are reported in parentheses.
* significance at 10% level, ** significance at 5% level, *** significance at 1% level.
† Mc. Fadden's pseudo R^2

The results of this second set of regressions confirm the findings of the previous section. In Italy, we observe a significantly positive effect of public LTC coverage on informal care across all three categories of informal care while in Spain this relationship is consistently negative. Regarding private insurance, we obtain a non-significant negative effect on the probability of receiving informal care in Spain. Note that in Italy we could not include this variable in the regression analysis as no individuals declaring to own private LTC insurance remained in the subsample. In the regression with the pooled sample the effects of public LTCI and the interaction are maintained and the country dummy is negative and highly significant, showing that the probability of receiving care for this subgroup of population is higher in Spain.

In addition, we find that the marginal effects of public LTC coverage on the probability of receiving informal care and their significance levels are larger than in the previous section in both countries despite the sharp reduction in the sample size. Regarding the control variables, with the exception of the number of IADL limitations, coefficients are larger in absolute value but no changes in their sign are observed.

4.5.3. Bootstrapping the empirical coefficients' distribution

We further control the robustness of our results using the bootstrap method. The bootstrapping technique, pioneered by Efron (1979), consists of a Monte-Carlo simulation randomly drawing a large number of samples from the original set of observations, running the regression model and computing the distribution statistics of the obtained regression coefficients. This makes it possible to estimate the empirical distribution of a given estimator (or set of estimators) with the objective of checking the robustness of the analytical approximation of its values and confidence intervals. Since we work with a non-linear model (i.e. a probit model) and small sample sizes, our context is propitious for the use of such resampling techniques (Wooldridge, 2010).

For each country, we start by selecting 5'000 random samples from the initial data. The number of observations in each of these samples corresponds to the size of the original dataset, i.e. 2'181 observations for Italy and 2'344 for Spain. Note that in random sampling a same individual can be selected twice (i.e. sampling with replacement). Using the generated samples, the different probit models defined in section 4.2 are estimated. As in section 4.5.1., we do not estimate the model that includes wealth. This way, we obtain 5'000 sets of the bootstrapped estimates. From these estimates, it is straightforward to extract their expected values and confidence intervals.

In Table 4.9, we first present the results of the bootstrapping for the parameters defining LTC coverage ownership in Italy. We provide the simulated coefficients' two-tailed 95% confidence intervals and mean values.

Table 4.9 95%-confidence intervals and expected values of the LTCI public and private parameters in Italy

	Informal care (IC^1)	Informal care ADL (IC^2)	Informal care IADL (IC^3)
LTCI public	[0.045 | 0.406]	[0.035 | 0.534]	[0.073 | 0.435]
	0.233	0.290	0.258
LTCI private	[−0.274 | 0.856]	[−3.863 | 0.874]	[−0.217 | 0.925]
	0.370	−1.080	0.435

In Italy, we observe that the 95%-confidence intervals of the parameters corresponding to public LTC coverage do not include zero (no sign change) which allows us to conclude on the robustness of the positive effect of public LTC financing on informal care. Moreover, the expected values of public LTC parameters are very close to the parameter estimates presented in Table 4.5. Therefore, the hypothesis that public support crowds out informal care is still rejected for Italy in the case of public LTC financing.

The bounds of the confidence intervals surrounding the estimates corresponding to private LTC insurance are of opposite signs making it impossible to judge on the trend of the marginal effect. Thus, no valid conclusions can be extracted for this parameter following the bootstrap exercise. Table 4.10 below presents the results of the bootstrapping for the parameters defining LTC insurance ownership in Spain.

Table 4.10 95%-confidence intervals and expected values of the LTCI public and private parameters in Spain

	Informal care (IC^1)	Informal care ADL (IC^2)	Informal care IADL (IC^3)
LTCI public	[−0.621 | −0.276] −0.443	[−0.436 | −0.019] −0.222	[−0.627 | −0.272] −0.444
LTCI private	[−0.913 | 0.075] −0.370	[−1.002 | 0.396] −0.211	[−0.997 | 0.004] −0.442

In the case of the coefficients corresponding to public LTC coverage in Spain, the 95%-confidence intervals are below zero for all types of informal care, underlining the consistently negative sign of these estimates. Additionally, as in the Italian case, no relevant differences between the simulated expected values and the parameters reported in section 4.4 are noticed and in any of these three cases. Therefore, the bootstrap results support the hypothesis that public support decreases informal care in the Spanish public LTC system.

The 95%-confidence intervals of the coefficients corresponding to private LTC insurance contain both, negative and positive values, and thus no valid conclusions for these marginal effects can be extracted.

4.6. Conclusion

This article uses cross-sectional data from the sixth wave of the SHARE survey to test the effect of both LTC public benefits and private insurance on the receipt of informal care by non-co-resident family members in Italy and Spain.

The choice of Italy and Spain comes from the fact that informal care is rather similar in these two countries while their respective public LTC financing systems are rather different. Indeed, on the one hand, these two Southern European countries are considered as "strong family ties countries" and therefore are rather similar in terms of family values with family members representing the main source of informal care. On the other hand, the nature of public benefits is very different, proportional to formal care expenses in Spain, and mainly in the form of cash benefits independent of formal care expenditures in Italy.

We consider three categories of informal care and dissociate informal care for ADL from informal care for IADL, as these two kinds of care can be provided for different reasons and then be influenced to a different extend by insurance.

Our results support the hypothesis of LTC public coverage decreasing informal care for Spain. However, for Italy, we find a consistent positive and significant relationship between LTC public coverage and the probability of receiving informal care by non-co-resident family members. Regarding the effect of private LTC insurance on informal care, we also find significant opposite results for the two countries except when informal care is defined as informal care for ADL. In that case, private LTC insurance positively impacts informal care in Italy and negatively in Spain.

These results tend to confirm that the effect of public benefits on informal care is influenced by the typology of public LTC coverage. In Spain benefits, either in kind or financial, depend on the consumption of formal care. Hence, benefits are received only if formal care is consumed. The use of formal care is therefore encouraged, thus providing much less incentives to offer informal care.

In Italy, public benefits are mainly in the form of cash benefits independent of formal care expenses, complemented by additional regional and municipal LTC services. Therefore, LTC benefits are not necessarily linked to formal care consumption as it happens in Spain. The

positive relationship between LTC public coverage and informal care in Italy seems to be explained by the fact that cash benefits can be used to directly provide financial compensation or incentives to informal caregivers. Hence, such cash benefits fulfil their initial role which was thought as a measure to support informal caregivers (Costa-Font et al., 2012).

Our results also show that in both countries, private LTC insurance, whose benefits are cash and fixed, seems to complement the public LTC financing system in place. This could explain why the direction of the marginal effect of private insurance on informal care follows the one of public LTC coverage and the positive sign of the interaction term in section 4.4.3. Nevertheless, the number of individuals privately covered in our sample is very low and thus, our results regarding private insurance might be quite imprecise. Additionally, the current conditions in LTC insurance markets, characterized by high loading in premiums, low interest rates and high uncertainty, should further limit the development of this type of insurance. A deeper analysis on the potential complementary role of private LTC insurance with public LTC programs can be an interesting topic for future research.

There are several limitations to this study that need to be pointed out. First, our results apply to informal care provided by family members living outside the household and not to informal care received by co-resident and other caregivers such as neighbours and friends. Yet, we focus on the most common type of informal care according to our data and including alternative forms of informal care in the dependent variable would come at the cost of an increase in the main estimates' heterogeneity, making them more difficult to interpret. The second limitation concerns the fact that LTC benefits in Italy are restricted to severely dependent individuals while in Spain they can cover those moderately limited as well. While we partially control for this difference, the degree of needs differently impacts eligibility criteria in Spain and Italy, and could influence the relationship between informal care and LTC coverage. A third limitation is that children altruism could justify the positive relationship between LTC coverage and informal care found in Italy as it increases the marginal benefit of supplying care and even to a higher extent in the presence of LTC coverage (Bascans et al. (2017); Klimaviciute (2017)). However, we are unable to control for this phenomenon with our data.

To conclude, whether a LTC system is more or less prone to influence, positively or negatively, informal care might lead to different economic policies. According to our results, a model similar to the Italian public system mainly based on fixed benefits would provide few disincentives, even any, to informal care givers. This would help to attenuate LTC expenditures' increases. While, a model similar to the Spanish public system with proportional benefits provides disincentives to informal caregivers and then could be socially beneficial by reducing the burden of caregiving in terms of health and lower employment participation. Further research on these issues and for other countries should be developed to generalise our results.

Chapter 5

On children's motives to influence parents' long-term care insurance purchase

Long-term care (LTC) is not only a concern for elderly individuals but also for their adult children. Therefore, they might have strong incentives to have their parents purchasing LTC insurance. This article investigates both the determinants and motives of adult children willingness to influence their elderly parents' LTC insurance purchase decision in Switzerland using data from a 2019 survey. We show that those individuals self-reporting interest about LTC insurance, living with their children and having provided informal help with personal care are more likely to influence their parents LTC insurance purchase than others. We also find that the motives to influence parental LTC insurance ownership can be classified either as altruistic, i.e. related to parental wellbeing, or as self-interested, i.e. related to the child's wellbeing. Whereas relatively poor respondents tend to influence their parents mainly for altruistic reasons, relatively rich individuals or expecting to pay large out-of-pocket LTC costs in case of dependency are more likely to influence their parents for self-interested motives.

5.1. Introduction

The ageing of populations in most industrialised countries is accompanied by an increase in the needs for long-term care (LTC), i.e. care for people dependent on help with their daily living activities. LTC is not only a concern for elderly individuals but also for their adult children (Courbage and Eeckhoudt, 2012). Therefore, adult children may take a considerable interest in whether and how their parents' LTC needs are covered. In particular, they might have strong incentives to have their parents purchasing LTC insurance for several reasons.

First, adult children are the main providers of informal care, which could be detrimental for their physical and mental health (Schulz and Beach, 1999) as well as for their employment participation (Moussa, 2019). Second, children may pay themselves for their parents' LTC expenditures, especially if they have the feeling they are compelled to take care of their dependent relatives (Klimaviciute et al., 2017). They may also become legally obliged to financially support their parents if they have exhausted their resources to cover their LTC needs. This is especially the case in countries such as Switzerland, Germany, France or Belgium, where their respective civil codes explicitly force adult children to assist their parents in need (Sayn, 2008). Hence, having parents purchasing LTC insurance covering the cost of formal care might relieve children for their informal care duties and allow them to avoid tapping into personal wealth to finance the possible LTC needs of their parent. In addition, LTC insurance makes possible for elderly parents to protect their children's future inheritance from the cost of LTC (Pauly, 1990).

While these motives are rather self-interested, adult children might also be attentive to their parents' LTC coverage for altruistic reasons simply because they are concerned about their elderly parents' wellbeing. Adult children might see insurance coverage as bringing useful and complementary services to their parents. Alternatively, they might also want to avoid to their parents the financial distress inherent to the event of needing LTC.

In this article we investigate both the determinants and motives of adult children willingness to influence their elderly parents' LTC insurance purchase decision in Switzerland using data from a survey carried out in 2019. This survey, amongst other things, focuses on the willingness and motives of middle aged individuals (40 to 65 years old) to encourage their parents to buy LTC insurance. It also contains information about the respondents' economic and professional situation, their sociodemographic characteristics, their attitude towards LTC risk and their support to elderly dependent relatives.

We are aware of only a few papers looking at the role of adult children in their elderly parents' LTC insurance purchase decision. Cohen et al. (2000) conduct a survey stressing that primary informal caregivers play an important role in the purchase of LTC insurance by their elderly relatives in the U.S. Related to this, Zhou-Richter et al. (2010) use a survey in Germany showing that the more adult children are informed about LTC risk, the more likely private LTC insurance is purchased, either by the adult children themselves on behalf of their parents or by the parents under the influence of their adult children. Sperber et al. (2014) carry out a survey in the U.S. showing that adult children could successfully influence their parents to purchase LTC insurance by framing insurance with respect to their values concerning autonomy for themselves and their children. On the theoretical side, Courbage and Eeckhoudt (2012) look at both the optimal levels of insurance and of informal care chosen by the child to protect his parent against LTC risks. They show that in the presence of child altruism, LTC insurance stimulates the offer of informal care.

The main contribution of our article is twofold. First, it identifies a set of variables, including socioeconomic factors, family characteristics and parental LTC needs, which help to predict the interest of adult children in having their parents covered against LTC risk. In that respect, our article is of an exploratory nature and thus, all potential explanatory variables are equally

important *ex ante*. Second, it investigates the main characteristics of the motives for children to influence their parents to purchase LTC insurance. No empirical study on this topic exists for Europe with the exception of Germany (Zhou-Richter et al., 2010). However, while Zhou-Richter et al. (2010) focus on the role played by children's information about LTC risk, our article points out to multiple channels through which adult children could influence their parents' demand for LTC insurance.

We show that those individuals self-reporting interest about LTC insurance, living with their children and having provided informal help with personal care are more likely to influence their parents LTC insurance purchase than others. As for the motives to influence parental LTC insurance ownership, we find that they can be classified either as "altruistic", i.e. related to parental wellbeing, or as "self-interested", i.e. related to the child's wellbeing. We also find that whereas relatively poor respondents tend to influence their parents mainly for altruistic reasons, i.e. to avoid their economic ruin, relatively rich individuals or expecting to pay large out-of-pocket LTC costs in case of dependency are more likely to influence their parents for self-interested motives, i.e. to protect their bequest, to avoid providing informal care or to avoid their legal responsibilities towards their parents in need.

Our results can be useful both for policy makers and insurers as knowing the profile of those children willing to influence their parents' LTC coverage and their motivations might be useful for the specific design of public LTC policies and LTC insurance products.

This article is structured as follows. In Section 5.2, we present the dataset and the variables used. Section 5.3 empirically addresses the determinants of adult children' willingness to influence parents LTC insurance purchase, while section 5.4 studies the motives of such a decision. Finally, some concluding remarks are provided in section 5.5.

5.2. Data and variables

5.2.1. Data and dependent variables

In February 2019, we ran a survey on a representative sample of adults residing in Switzerland aged between 40 and 65 years old. The survey covers several topics related to LTC financing including the determinants of private LTC insurance demand and informal care provision as well as the respondents' understanding about financial risks related to LTC. Respondents were also asked for their attitudes towards risk and the future, their socio-demographic characteristics and their professional and economic situation.

The survey contains information about 1'066 individuals with (by construction) 40% of individuals with non-dependent parents and 60% with dependent parents. To ensure an adequate representation of all the socio-demographic groups of interest, the sample was additionally stratified by gender, age group (3 categories) and linguistic region (2 categories). Given the nature of our research question, we restrict our final sample to those respondents having at least one parent or parent-in-law alive. This leaves us with a final dataset containing 881 observations.

The main dependent variable aims to capture the willingness of children to influence their parents' or in-laws' coverage against LTC risk by coding the answer to the following question:

Have you tried to influence or are you willing to influence your parents or parents-in-law to subscribe a LTC insurance?[24]

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[24] The dependent variable relates to several time periods, being past and present periods. Instead most independent variables such as parents' LTC needs or informal care provision relate to the last twelve months (see Table 5.1). This small divergence, which objective was to simplify the wording of the dependent variable's question, could

The answer to this question is binary and respondents could choose among the options "Yes" and "No". This question was asked at the end of the survey, when the definition of LTC insurance[25], the different concepts of LTC financing and the average amount of out-of-pocket LTC expenditures in Switzerland had been already presented to respondents. Those respondents who answered affirmatively to the previous question were additionally asked about the motives they had to influence their parents or in-laws to subscribe a LTC insurance. They include:

– *I would like to avoid my parents' / in-laws' economic ruin.*
– *My parents' / in-laws' savings are not enough to pay for their LTC expenses.*
– *I could avoid the burden of providing care to my parents / in-laws.*
– *I will protect my future bequest, by avoiding my parents / in-laws to pay for formal care.*
– *I am legally responsible to help my parents / in-laws if they do not have enough means.*

Answers are constructed as a Likert-type scale with 5 items, with item 1 being equal to *Totally Disagree* and item 5 being equal to *Completely Agree*. The first two motives can be qualified as "altruistic", since they reveal that adult children would like to influence their parents or in-laws to improve their welfare. The last three motives can be referred as "self-interested" since they reveal those respondents who would like to influence their parents / in-laws to improve their own wellbeing. Naturally, individuals' preferences in practice could include a combination of both altruistic and self-interested motives (Andreoni, 1989).

5.2.2. Independent variables

To study the determinants of adult children's willingness to influence their parents' LTC insurance purchase, we consider the respondent's socioeconomic situation, family composition, parental LTC needs and individual preferences, as well as some other classical control variables.

We first start by considering various socioeconomic factors including the respondent's working status, highest level of education, revenues, main residence ownership and parental level of wealth. This last variable is defined as the maximum wealth between the respondent's parents' and in-laws' wealth. The *a priori* direction of the socioeconomic gradient is not straightforward. For example, the legal obligation motive might be more present in the middle and middle-low classes while the bequest motive should be more present in the middle-high classes.

We also consider several variables describing the main characteristics of the respondents' family structure including marital status, number of individuals residing in the respondents' household, number of children younger than 18 living in the household and the frequency of the respondent's contacts with siblings. As indicated previously, influencing parental LTC coverage might be closely related to the degree of concern for the parents' wellbeing, the strength of family ties or the presence of young children in the household.

Having a dependent parent as well as providing informal care by the respondent are also included as explanatory variables. We also consider the respondent's parent degree of dependency, the nature of informal care provided (ADL, IADL, administrative activities, etc.), the respondent's self-reported degree of physical and psychological burden when providing

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create some bias if the period where children tried to influence their parents does not correspond with a period where their parents were dependent, children provided care, etc.

[25] In the survey, LTC insurance is defined as "a complementary insurance that, against the payment of a premium, guarantees to the purchaser a financial protection in the future if she/he has difficulties carrying out activities of daily living".

informal care and the pathologies faced by dependent parents, if any (i.e. mental disease, neurological pathology, etc.).

Finally, additional variables related to the preferences of the respondent and his perception of LTC financial risks are also considered. They include self-reported interest about LTC insurance, whether the respondent would like to be cared by the family in case of dependency (as a proxy of the individual's preference for informal care) and expectations about out-of-pocket LTC payments in case of dependency. The usual controls such as the respondent gender, age, nationality and self-reported health are also included. Detailed information about the variables considered is reported in Table 5.1, which contains the list of all the variables used in the empirical analysis and their brief description.

Table 5.1 Variables used and description

	Variable	Question in the survey	Answers / Categories
	Dependent variable		
1	Willingness to influence	Have you tried or are you willing to influence your parents or in-laws to subscribe a LTC insurance?	Yes, No
	Socioeconomic factors		
2	Working status	What is your current profession?	Employed, retired, other
3	Education	What is your highest level of education?	Mandatory, high school, and higher education
4	Income	What is your monthly net income?	≤3000, 3001-5000, 5001-7000, 7001-9000, >9000, DK
5	Housing	Concerning your main residence, are you…	Tenant, owner, other
6	Parental wealth	How do you estimate your parents' net wealth? And your in-laws' net-wealth?	Very low, low, high, very high
	Family characteristics		
7	Household members	How many people are there in your household including you?	1, 2, 3, 4 or more
8	Married	What is your civil status?	Married, Not Married
9	# of co-resident children	How many children younger than 18 are there in your household?	0, 1, 2 or more
10	Contact with siblings	During the last 12 months, how often have you contacted your siblings? Think only about the person you contacted the most often if you have several siblings.	Never, less than every two weeks, every two weeks, weekly, several times a week, daily
	Parent LTC needs		
11	LTC needs	During the last 12 months, did any of your parents / in-laws have any difficulty to carry out independently a daily living activity (take a bath or a shower, go to the toilet, to get dressed…)?	Yes, No
12	Intensity of dependency	With how many daily living activities did your father / mother (-in-law) have functional limitations?	0, 1, 2, 3, 4 or more
13	Activity	With which activities (ADL, IADL, administrative tasks or emotional support) have you helped your father / mother (-in-law) during the last twelve months?	Matrix with 4 variables. Yes, No.
14	Informal care burden	Self-reported burden of informal care, built from an index composed by 7 questions.	Scale. 0, 0.5, 1, 1.5, … ,7
15	Pathology	Do / did any of your parents or in-laws suffer from any of the following diseases: a mental, musco-skeletal, cardiovascular or neurological problem or cancer?	Matrix with 5 variables. Yes, No
	Preferences		
16	Out of pocket LTC costs	If you became dependent, how much do you think you will have to pay out-of-pocket for LTC?	Nothing, little part, important part, almost all, DK
17	Interest in LTC insurance	Are you interested on subscribing a LTC insurance?	Not at all, few interest, fair interest, strong interest
18	Help with ADL by family	If you became dependent, would you like receive personal care from relatives, neighbours or friends?	Yes, No
19	Planning	In general, are you interested on planning the future?	Scale 1-10
20	Risk Aversion	In general, are you a person willing to take risks?	Scale 1-10
	Control Variables		
21	Language	Language of the questionnaire	German, French
22	Gender	You are a…	Male, Female
23	Swiss	Which is your nationality? In case of double-nationality, please indicate your nationality at birth.	Non-Swiss, Swiss
24	Age	How old are you?	40-45, 46-50, 51-55, 56-60, 61-65
25	Health	How do you perceive your own health status in general?	Very bad, bad, fair, good, very good

5.2.3. Descriptive statistics

Table 5.2 provides some descriptive statistics of the dependent variable.

Table 5.2 % of respondents willing to influence their parents or in-laws to purchase LTC insurance and their motivations

	% of N	% of N				
Willingness to influence						
YES	27.13%					
NO	72.87%					
Motivation to influence		Strongly agree	Agree	Neutral	Disagree	Totally disagree
Avoid parents' / in-laws' ruin	-	52.72%	24.69%	14.23%	4.60%	3.77%
Insufficient parental savings	-	41.00%	23.85%	22.18%	10.46%	2.51%
Avoid providing help	-	17.15%	21.34%	30.96%	14.64%	15.90%
Bequest motive	-	15.48%	20.50%	28.03%	12.97%	23.01%
Legal responsibility	-	17.57%	20.92%	24.27%	16.74%	20.50%
Size of the sample (*N*)	881	239				

In our sample 239 individuals, representing 27.13% of total respondents, replied that they tried to influence or are willing to influence their parents or in-laws to subscribe LTC insurance. When it comes to the self-reported motives of surveyed individuals to influence their parents' or in-laws' LTC insurance decisions, the two "altruistic" motives, i.e. avoiding the parents' economic ruin and insufficient savings, find the strongest support. Indeed, 77% and 65% of those respondents willing to influence their parents to purchase LTC insurance indicate to *Agree* or *Strongly Agree* with the first and second motive respectively. Much less support is found for the "self-interested" motives, i.e. to avoid the burden of helping them, to protect bequest or because children are legally responsible of their parents in case of necessity. Indeed, the rate of agreement (*Agree* or *Strongly Agree*) for each of these motives lies around 37%.

Table 5.3 provides additional descriptive statistics for all the sample and for the subsample of respondents willing to influence their parents to purchase a LTC insurance.

Table 5.3 Descriptive statistics (mean) for all the sample and for the subsample of respondents willing to influence

	All	*Willing*		*All*	*Willing*		*All*	*Willing*
Dependent variable								
Willingness to influence								
Yes	0.729	1						
No	0.271	0						
Socioeconomic factors								
Working status			**Income**			**Housing**		
Employed	0.781	0.808	3'000 or less	0.118	0.100	Tenant	0.654	0.611
Retired	0.065	0.059	3'001 - 5'000	0.230	0.213	Owner	0.334	0.377
Other	0.154	0.134	5'001 - 7'000	0.199	0.197	Other	0.013	0.013
Education			7'001 - 9'000	0.133	0.130	**Parental wealth**		
Mandatory	0.060	0.067	More than 9'000	0.134	0.201	Very low	0.120	0.180
High school	0.577	0.502	DK	0.186	0.159	Low	0.497	0.498
Higher education	0.363	0.431				High	0.284	0.289
						Very high	0.019	0.034
Family characteristics								
Household members			**Married**			**Contact with siblings**		
1	0.217	0.143	No	0.389	0.331	Never	0.176	0.188
2	0.342	0.326	Yes	0.611	0.670	Less every 2 weeks	0.324	0.272
3	0.179	0.193	**# co-resident children**			Every two weeks	0.141	0.096
4 or more	0.262	0.339	0	0.669	0.557	Weekly	0.159	0.176
			1	0.152	0.036	Several times a week	0.146	0.176
			2 or more	0.179	0.255	Daily	0.055	0.092
Parent LTC needs								
LTC needs			**Help ADL**			**Mental**		
No	0.351	0.289	No	0.792	0.686	No	0.863	0.829
Yes	0.649	0.711	Yes	0.208	0.314	Yes	0.137	0.172
Intensity of dependency			**Help IADL**			**Musco**		
No dependent	0.351	0.289	No	0.694	0.632	No	0.644	0.615
1	0.156	0.142	Yes	0.307	0.368	Yes	0.356	0.385
2	0.144	0.138	**Help admin**			**Cardio**		
3	0.127	0.151	No	0.740	0.686	No	0.773	0.690
4 or more	0.225	0.280	Yes	0.260	0.314	Yes	0.227	0.310
			Help company			**Neuro**		
			No	0.702	0.649	No	0.929	0.908
			Yes	0.299	0.352	Yes	0.072	0.092
			Informal care burden			**Cancer**		
			= 0	0.589	0.498	No	0.959	0.962
			Conditional to > 0	1.236	3.267	Yes	0.041	0.038
Preferences								
OOP LTC costs			**Interest in LTCI**			**Help ADL family**		
DK	0.125	0.121	Not at all	0.150	0.029	No	0.484	0.427
Nothing	0.209	0.159	Few	0.436	0.339	Yes	0.517	0.573
Little part	0.252	0.259	Fair	0.346	0.511	**Planning**	7.518	7.799
Important part	0.254	0.272	Strong	0.068	0.121	**Risk aversion**	5.645	5.870
Almost all	0.160	0.188						
Control variables								
Language			**Age**			**Health**		
German	0.670	0.682	40-45	0.309	0.381	Very bad	0.015	0.013
French	0.330	0.318	46-50	0.220	0.218	Bad	0.115	0.100
Gender			51-55	0.221	0.176	Fair	0.321	0.389
Male	0.499	0.490	56-60	0.144	0.164	Good	0.403	0.372
Female	0.501	0.511	61-65	0.106	0.092	Very good	0.146	0.126
Swiss								
Not Swiss	0.193	0.268						
Swiss	0.807	0.732						
N	881	239		881	239		881	239

Most respondents are employed, live in a rented accommodation and have a high school education level. Additionally, most individuals qualify their parental wealth as low or very low. The monthly income distribution is relatively uniform with the modal class at CHF 3001-5000. Regarding the family characteristics, 56% of respondents live in a household with 1 or 2 individuals, around 60% are married and around one third co-resides with young children under the age of 18. Very few respondents have regular contact with their siblings. Concerning the variables related to the respondent parents' LTC needs, 42% of the surveyed declare to provide some form of informal help, among which 20% provide help with ADL (personal care) and 31% with IADL (practical household help). 41% of the surveyed (almost all of those who provide care) declare to suffer from some burden related to informal help provision. Concerning the individual preferences, most of the interviewed report being aware that they will face some out-of-pocket expenditures in case of dependency. They mainly show few or a fair interest in LTC insurance. Finally, 80% of our sample is Swiss and only 13% of respondents declare to have a bad or very bad health.

The descriptive statistics of the subsample of those willing to influence their parents gives a first approximation of the relationship between the dependent and independent variables. Indeed, the size and sign of the difference in the means of the whole sample and the subsample is closely related to the degree and direction of the association between the dependent and the independent variables. The largest differences in means concern the variable *Interest in LTC insurance*, followed by the variables *number of co-resident children*, *help ADL* and *informal care burden*.

In the next sections, we first investigate the determinants of the respondents' willingness to influence their parents or in-laws to purchase a LTC insurance. Second, we study the different motives to influence parents' on in-laws' LTC coverage.

5.3. The determinants of the willingness to influence parents' LTC insurance coverage

We first aim to shed light on the direction and magnitude of the relationship between the set of independent variables considered and the main dependent variable.

5.3.1. Econometric specification

We perform a series of probit regressions obtained from the following model:

$$WI_i = \alpha_j + \beta_1^j SOC_{j,i} + \beta_2^j FC_{j,i} + \beta_3^j LTC_{j,i} + \beta_4^j PRE_{j,i} + \beta_5^j CV_{j,i} + \varepsilon_{j,i} \tag{5.1}$$

where the subscript j corresponds to each multivariate regression estimated and the subscript i is linked to the individual observations. WI_i is a binary variable quantifying respondent's i willingness to influence his/her parents or in-laws to subscribe a LTC insurance. $SOC_{j,i}$ refers to the socioeconomic factors of Table 5.1 selected as independent variables for equation j. Similarly, $FC_{j,i}$ encompasses the variables selected related to family composition, $LTC_{j,i}$ those related to the respondent parents' LTC needs and $PRE_{j,i}$ those linked to the respondent's preferences. Finally, $CV_{j,i}$ includes the control variables selected for the model j and $\varepsilon_{j,i}$ is a set of random variables *i.i.d.* following a standard normal distribution.

The set of independent variables included into each specific model is obtained from the optimisation of the Bayes (BIC) or the Akaike (AIC) information criteria. More specifically, a variable is included in our model only if it decreases the selected criterion. This ensures that the

selected variable improves the model's goodness of fit without raising substantially the risk of overfitting[26]. It should be stressed that the binary variable *LTC needs* is included in all regressions regardless the information criteria. This is done to control for the fact that dependent individuals are over-represented in our data due to the sampling design (see section 5.2.1). We additionally performed variance inflation factor (VIF) checks on all regressions. No high values were found for these tests, confirming the absence of multicollinearity issues in our results.

5.3.2. Empirical results

The numerical results of the different multivariate models calibrated from Eq. (1) are presented in Table 5.4. We report there average marginal effects (AME), i.e. the mean of all individuals' marginal effects for each variable or category.

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[26] The BIC is defined as $\ln(N)\,K - 2\log\hat{L}$, where N is the sample size, K the number of parameters of a given model and $\log\hat{L}$ its log-likelihood. The AIC is defined as $2K - 2\log\hat{L}$. These criteria are minimized using the function "step" of the R statistical software.

Table 5.4 Multivariate probit models (average marginal effects)

Dependent variable: Willingness to influence	Model 1 (BIC)	Model 2 (AIC)	Model 3 (AIC alternative)	Model 4 ("Healthy" parents)
Income (ref: Less than 9'000)				
More than 9'000	–	–	0.103**	0.105*
			(0.043)	(0.062)
DK	–	–	0.011	0.043
			(0.037)	(0.051)
# of co-resident child (ref: 0)				
1	0.081**	0.081**	0.082**	0.034
	(0.040)	(0.040)	(0.040)	(0.040)
2 or more	0.162***	0.164***	0.155***	0.134**
	(0.039)	(0.039)	(0.039)	(0.039)
LTC needs (ref: No)	−0.003	−0.021	−0.024	−0.026
	(0.035)	(0.038)	(0.037)	(0.053)
Help ADL (ref: No)	0.124***	0.113**	0.110**	0.210
	(0.040)	(0.048)	(0.048)	(0.174)
Help IADL (ref: No)	–	−0.099**	−0.104***	−0.134**
		(0.040)	(0.039)	(0.062)
Informal care burden (linear)	–	0.015**	0.016***	0.026*
		(0.006)	(0.006)	(0.014)
Cardio (ref: No)	0.093**	0.107***	0.105***	0.075
	(0.038)	(0.038)	(0.038)	(0.085)
Planning	–	0.013*	0.012*	0.003
		(0.007)	(0.007)	(0.009)
Interest in LTCI (ref: No)				
Few	0.158***	0.156***	0.157***	0.157***
	(0.028)	(0.029)	(0.029)	(0.033)
Fair	0.341***	0.330***	0.324***	0.333***
	(0.034)	(0.034)	(0.034)	(0.041)
Strong	0.416***	0.418***	0.418***	0.386***
	(0.066)	(0.066)	(0.066)	(0.089)
Gender (ref: Male)	–	0.050*	0.058**	0.023
		(0.028)	(0.028)	(0.038)
Swiss (ref: Non-Swiss)	–	−0.071*	−0.073**	−0.039
		(0.036)	(0.036)	(0.052)
N	881	881	881	446
Pseudo $R^{2\,\dagger}$	10.93%	11.63%	11.83%	7.70%
AIC	917.36	910.19	908.06	444.94
BIC	960.39	977.12	984.55	510.55

Robust standard errors are reported in parentheses.
* significance at 10% level, ** significance at 5% level, *** significance at 1% level. † Mc. Fadden's adjusted pseudo R.

The model of the first column is the one minimizing the Bayes information criterion. It corresponds to the model with less parameters, as this criterion puts a stronger penalty when an additional variable is included in the specification. Therefore, by construction, the model optimizing the BIC displays the strongest determinants of the dependent variable.

Our first results indicate that self-reported interest about LTC insurance, having co-resident children (especially more than two) and providing informal care for ADL (personal care) are respectively the main determinants of being willing to influence parents or in-laws to subscribe

LTC insurance. Having the respondent's parent suffering from a cardiovascular disease is also a strong determinant of the dependent variable. The effect of self-reported interest about LTC insurance mirrors the results of Zhou Richter et al. (2010), who show that parents strongly increase their demand for LTC insurance if their adult children had purchased it for themselves. Following Zhou Richter et al. (2010)'s interpretation, self-interest about LTC insurance by adult children can be seen as a proxy for LTC risk awareness. Hence, those who are more aware about LTC risks are more likely to influence LTC insurance purchase by their parents. It means also that if one recognises the usefulness of LTC insurance for himself or herself it seems rather natural that he or she would find it useful for his or her parents. As for having co-resident children, it may leave less time and resources to middle age individuals to take care of their own elderly parents and then provides further incentives to influence them to purchase LTC insurance. Finally, providing informal help with personal care (ADL) is known to adversely impact the caregiver's physical and psychological health (Roth et al., 2015, Musich et al., 2007). Hence having parents purchasing LTC insurance covering the cost of formal care might relieve children for their informal care burden. This would explain why providing informal help with personal care is a strong driver of the decision to influence parent LTC insurance purchase.

The model of the second column corresponds to the one optimizing the Akaike information criterion. This specification includes more variables than the one of the first column, as the penalty of the AIC on the number of parameters is lower. The effect of informal care provision is slightly different in this second specification. As before, helping parents (or in-laws) with their ADL is positively and significantly associated with the dependent variable. Moreover, the self-reported burden of informal care provision is now included in the model and has a significantly positive effect. However, after controlling for these two variables, providing help with IADL (i.e. practical household help) has, surprisingly, a negative and significant effect on influencing parental LTC coverage. As providing informal care for ADL is more intense than for IADL, it seems that influencing LTC insurance purchase would not be necessarily done to replace informal care but rather to reduce the burden of intense and painful care provision. Our findings are consistent with Bonsang (2008) who finds that informal care decreases the use of formal domestic help but complements paid personal care. Additionally, being a woman and showing interest in planning the future have a weak positive effect on influencing parents, while being Swiss has a negative effect. Interestingly, neither the respondents' nor his/her parents' or in-laws' economic situation are associated with the dependent variable whatever the model considered. Finally, the binary variable *LTC needs* is also not significant at the usual confidence levels whatever the models of Table 4.

5.3.3. Robustness checks

In order to test the robustness of the first two columns' results, we performed four checks. In the first check, the models maximizing the BIC and AIC (columns 1 and 2 of Table 4) were estimated using a logit instead of a probit multivariate regression. Results are very similar both qualitatively and quantitatively although the fit is slightly better in the probit models. The second check consisted of testing the independent variables of Table 1 under different forms (e.g., linear in the cases of age and health, binary in the cases of income and parental wealth, categorical for informal care burden, etc.). The third check consisted of regressing the dependent variable on all the independent variables individually, in a series of simple regressions[27]. Finally, the fourth check controlled for the potential eligibility of elderly parent to LTC insurance.

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[27] The results of the logit models and the simple regressions are available upon request.

The model of the last column corresponds to the specification maximizing the AIC consistent with the two last checks. To build the model of the third column, we allowed alternative definitions for the independent variables and checked the effect of those variables not included in the first two models that were significant in the univariate regressions. The only change with respect to the previous model is that the binary factor "Income > 9'000", corresponding roughly to the last decile of the Swiss net income distribution (FSO, 2020), is incorporated as a determinant and has a positive and significant effect. Hence, adult children with very high incomes are more likely to influence their parent LTC insurance purchase decision. This result could be explained by the fact that very high income individuals have a higher opportunity cost of providing informal care or have more resources available to pay themselves LTC insurance for their parents.

Finally, for the fourth check, we ran the third column's model on a subsample of respondents whose parents are not dependent or only need little help[28]. This allows to make sure that respondents' parents are eligible to LTC insurance, given that they are not dependent yet[29]. Our results do not change much in the last model. Self-reported interest about LTC insurance, having more than two co-resident children and informal care provision are still the strongest determinants of the dependent variable. Moreover, the sign and magnitude of these variables' coefficients are similar. However, the degree of significance of the variable *# co-resident children* and of those defining informal care provision is lower. Indeed, due to the large reduction in the sample size, standard errors are much higher.

5.4. The motives to influence parents' LTC coverage

After having looked at the determinants of respondents' willingness to influence their parents' or in-laws' LTC insurance coverage, we now focus on the respondents' self-reported motives to influence parental LTC insurance purchase. In particular, we study the relationship between the five motives to influence LTC coverage presented in section 5.2.2 and the profile of those respondents who tend to agree with the "altruistic" versus the "self-interested" motives.

In this subsection we analyse the subsample of 239 individuals (27.1% of total respondents) who replied that they tried to influence or were willing to influence their parents or in-laws to subscribe LTC insurance. The descriptive statistics (see Table 5.3) indicate that this subset of respondents largely agreed with the first two motives, i.e. avoiding the parents' economic ruin and insufficient savings, while their degree of agreement was lower for motives three to five, i.e. avoiding to provide informal care, the bequest motive and the legal responsibility motive.

To further study the relationship between the set of motives, we compute the covariance and correlation matrices of respondents' degree of agreement on the different motives. The individuals' degree of agreement is quantified by coding from 1 to 5 their different answers, with 1 corresponding to the lowest degree of agreement (Totally disagree) and 5 to the highest (Strongly agree). Therefore, we assume that the degree of agreement as defined by this measure is approximately continuous. The motives' covariance and correlation matrices are displayed in Table 5.5.

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[28] We follow Klimaviciute et al. (2019) and consider a respondent to have "healthy" parents if he/she declares not to have a parent with 2 or more limitations in activities of daily living. The threshold of 2 limitations is largely used to qualify for LTC insurance benefits and public support (Frank, 2012; Courbage et al., 2020).

[29] Another possibility to address this issue would be to consider a subsample of respondents below 50 years old, thus, with relatively young parents. However, with this option our sample size is dramatically reduced. Moreover, LTC insurance purchase at older ages is possible nowadays through hybrid policies combining LTC and life insurance.

Table 5.5 Covariance (left) and correlation (right) matrix of the different motives' degree of agreement

	Avoid ruin	Insuff. savings	Avoid Help	Bequest	Legal Resp.	Avoid ruin	Insuff. savings	Avoid Help	Bequest	Legal resp.
Avoid Ruin	1.165					1				
Insuff. savings	0.522	1.272				0.428	1			
Avoid Help	0.227	−0.021	1.681			0.162	−0.014	1		
Bequest	0.118	0.073	0.830	1.877		0.080	0.047	0.468	1	
Legal resp.	0.108	0.040	0.409	0.595	1.907	0.072	0.026	0.229	0.315	1

In general, the intensity of agreement across the different motives is positively correlated, with the exception of "Insufficient savings" and "Avoid help", which correlation is negative but very low. This implies that in general respondents tend to agree (or disagree) together with the five motives. From Table 5, we also easily distinguish two groups. On one side, we have the altruistic motives "Avoid Ruin" and "Insufficient savings" with a correlation of 43%. On the other side, we have the self-interested motives "Avoid Help", "Bequest" and "Legal Responsibility" which correlation lies between 23% and 46%. The correlation between elements of the different groups is, instead, much lower.

In a second step, we perform a Principal Components Analysis (PCA) on the covariance matrix of Table 5. The objective is double. First, it allows to further study the relationship existing between the five motives. Second, it allows to study the profile of respondents agreeing to a specific group of similar motives, either altruistic or self-interested. A summary of the different motives' PCA is displayed in Table 5.6.

Table 5.6 PCA on the degree of agreement for the different motives (eigenvectors in the columns)

	t_1	t_2	t_3	t_4	t_5
Avoid Ruin	0.267	0.844	−0.008	0.244	−0.563
Insufficient Savings	0.130	0.971	0.111	−0.237	0.489
Avoid Help	0.956	−0.056	−0.561	0.619	0.243
Bequest	1.122	−0.123	−0.353	−0.670	−0.149
Legal Responsibility	0.912	−0.174	1.009	0.137	0.024
Eigenvalues	3.09	1.70	1.47	0.97	0.64
% of variance	39.30	21.65	18.67	12.27	8.11
cumulative % of variance	39.30	60.95	79.61	91.89	100

We focus on the first two dimensions of the PCA, which explain around 60% of the total variance. According to Table 5.6, their corresponding principal components are:

$$Z_1 = 0.267\,Y_1 + 0.130\,Y_2 + 0.956\,Y_3 + 1.122\,Y_4 + 0.912Y_5$$
$$Z_2 = 0.844\,Y_1 + 0.971\,Y_2 - 0.056\,Y_3 - 0.123\,Y_4 - 0.174\,Y_5$$

where $Y_k \in [Y_1, \ldots, Y_5]$ corresponds to the degree of agreement on the kth motive. The first principal component Z_1 is the variable which variance is the highest. As all the coefficients are positive, Z_1 can be interpreted as the degree of agreement on the five motives in general. An individual with a high (low) value of Z_1 will tend to agree (disagree) with the five motives all together. The second component Z_2 has positive coefficients in the first two variables (Avoid Ruin and Insufficient Savings) and negative coefficients in the others (Avoid Help, Bequest and Legal Responsibility). The component Z_2 mirrors the two groups of motives identified

previously, i.e. the "altruistic" and "self-interested" motives. Individuals with high Z_2 will tend to influence their parents' insurance coverage thinking of their elderlies' interest while individuals with low Z_2 thinking on their own interest.

The first principal component does not tell much about the similarities and differences between the five motives. However, by studying the determinants of the second principal component Z_2, we can unveil the profile of those respondents being willing to influence their parents for "altruistic" rather than "self-interested" motives. To that aim, we regress the second principal component Z_2 on a set of covariates selected, as in the previous subsection, from the optimisation of the Akaike Information Criterion (AIC) after checking them under different forms. The results of this linear regression model are displayed in Table 5.7.

Table 5.7 Linear regression on the motivations of being willing to influence

Dependent variable: Second principal component (Z_2)	
(Intercept)	−0.233
	(0.482)
Working status (ref: Active)	
Retired	0.033
	(0.330)
Other (incl. unemployed, homemaker…)	−0.709***
	(0.223)
Housing (ref: Owner)	0.275*
	(0.159)
Parental wealth (ref: Very Low)	
Low	−0.575***
	(0.219)
High	−0.900***
	(0.241)
Very high	−1.506***
	(0.475)
Help company (ref: No)	0.565***
	(0.168)
Cardio (ref: No)	−0.413**
	(0.167)
Neuro (ref: No)	−0.841***
	(0.276)
OOP LTC costs (ref: Nothing or little part)	
Important part or Almost all	−0.472***
	(0.169)
Don't know	−0.046
	(0.249)
Interest in LTCI	0.337***
	(0.108)
Language (ref: German)	−0.311*
	(0.164)
Health (ref: Very bad or bad)	0.535**
	(0.239)
N	239
Adjusted $R^{2\,\dagger}$	23.77%
AIC	758.18
BIC	813.80

Robust standard errors are reported in parentheses.
* significance at 10% level, ** significance at 5% level, *** significance at 1% level. † Mc. Fadden's adjusted pseudo R.

The coefficient corresponding to "Other" in the variable "Working Status", which includes mainly unemployed people and homemakers, is negative which implies that this group of population would be more willing to influence their parents or in-laws to purchase LTC insurance for self-interested motives than those retired or active. Respondents who expect to pay large out-of-pocket LTC costs in case of dependency also seem to agree more with the self-interested motives. In addition, the variable "Housing" (with owner as a reference) has a positive coefficient while the effect of parental wealth is negative. This indicates that

respondents whose parents' or own wealth is large also tend to be more willing to influence their parents' or in-laws' LTC coverage for self-interested reasons.

The effect of the working status is driven by the fact that unemployed and mainly homemakers are those assuming the greatest responsibility if their parent become dependent. This seems confirmed by the fact that, after analysing the distribution of motives within the subsamples of unemployed and homemakers, we see that these groups of respondents strongly agree with the legal responsibility motive. Our results also show that economic factors affect the motives of being willing to influence parental LTC coverage. In particular, the degree of agreement on altruistic versus self-interested motives to influence parental LTC coverage is strongly correlated with the respondent's and parental wealth and expectations of out-of-pocket LTC costs. Whereas respondents from relatively poor families (not owning their main residence or with less wealthy parents) will tend to influence their parents for altruistic reasons, i.e. to avoid their economic ruin, relatively rich individuals report a lower degree of agreement for this group of motives. In particular, the distribution of motives within the subsample of respondents from wealthier families shows that they are much less in agreement with the "Insufficient savings" motive. Finally, respondents expecting large out-of-pocket costs would be more worried for their future bequest, which explains the negative effect of this variable on the principal component.

5.5. Concluding remarks

In this paper, we explore the determinants of adult children's willingness to influence their elderly parents' LTC coverage in Switzerland and their motives using data from a survey carried out in 2019.

Our results show that 27% of respondents are willing to influence their parents to subscribe LTC insurance. We find that reporting self-interest for LTC insurance, living with children under 18 and providing informal care for ADL (personal care) are the strongest determinants of the willingness to influence parents' or in-laws' LTC insurance decisions. Hence, those who are more aware about LTC risks (proxied by self-interest about LTC insurance) are more likely to influence LTC insurance purchase by their parents. But also recognising personally the usefulness of LTC insurance is strongly related to influencing others to purchase it. Having young children is likely to increase the opportunity cost of informal care as people with children might have less time available to take care of their elderlies. Providing informal help with personal care (ADL) is known to be time consuming and to adversely impact the physical and psychological health of children caregivers (Roth et al., 2015, Musich et al., 2007). Hence, having parents purchasing LTC insurance covering the cost of formal care might relieve children for their informal care duties. Actually, our results show that influencing parent LTC insurance purchase would not be necessarily done to substitute informal care by formal care but rather to reduce the burden of intense and painful care provision. Finally, individuals with very high net incomes (i.e. greater than CHF 9'000 per month) also show a significantly higher willingness to influence their parents' LTC insurance coverage. An explanation would be that adult children with large revenues have a high opportunity cost of providing informal care or that they can afford to pay for their parents' LTC insurance premiums.

When it comes to the motives to influence parents' or in-laws' LTC coverage, we find that they can be grouped according to an "altruistic" versus "self-interested" component. Most respondents willing to influence their parents' LTC coverage do it for altruistic reasons, i.e. for which the interest of the elderly prevails over that of the child. Finally, we find that the motives to influence parental LTC coverage have a socio-economic gradient, as individuals from relatively rich families (i.e. self-reporting to have wealthy parents or to own their main residence) are more likely to influence their parents for self-interested motives. This is reflected

by the fact that the coefficient corresponding to the variable "Housing" (with "owner" as reference) has a positive sign in Table 5.7 while the coefficient corresponding to the variable "Parental wealth" has the opposite sign.

Our results offer various insights when it comes to managing LTC risks. A first insight is that LTC insurance is mainly seen as a tool that is beneficial to elderly parents in the face of LTC risks and this is the mean reason why children would influence parents LTC insurance purchase. Second, knowing the profile of those children willing to influence their parents' LTC coverage and their motivations might be useful for the specific design of LTC financing policies. Indeed, our results indicate that one way to increase private LTC insurance amongst elderly parents could be to directly target adult children with the relevant profiles (and whose parents are eligible), and to stress the various benefits for them of having their parents insured for LTC risks. This may also create a spillover effect in which adult children could consider LTC insurance as an option for themselves opening the path to contract LTC insurance at younger ages when the cost is lower and the premiums are more attractive.

There are some limitations to this study that need to be pointed out. First, as in the case of many survey-based studies, our work is observational in nature, meaning that estimates could be driven by omitted variables, although we have done our best to control for most variables. The second limitation is that the survey's respondents expressed above all their willingness to influence insurance purchase which may not necessarily reflect the real decision to influence parent's decision or may not necessarily lead to LTC insurance purchase by the parent. A third limitation is linked to the current conditions in LTC insurance markets, characterized by high loading in premiums, low interest rates and high uncertainty, which clearly create an obstacle to the development of this type of insurance. Finally, respondents are aged between 40 and 65 years old whom parents may be very old or already dependent, and therefore not eligible to LTC insurance or facing very high premiums. While we partially control for this issue, it could create a potential bias in survey's answers should the respondent be aware of such information. However, these limitations should not seriously modify our results which, we hope, contribute to better understand the interest adult children take in how their parents' LTC needs are covered.

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