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ESSAYS ON LONGEVITY, AGEING AND INFORMAL CARE

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Introduction générale

1 La dépendance en Europe

Depuis une cinquantaine d'années, la majorité des pays de l'Union Européenne doit faire face au vieillissement de la population. Les taux de natalité décroissants et l'allongement de la durée de vie réorganisent la pyramide des âges en une structure de la population beaucoup plus vieillissante. Selon Eurostat, au début de l'année 2017, les personnes âgées de 65 ans et plus représentaient 19,4% de la population de l'Union Européenne des 28. Le vieillissement de la population est d'autant plus important que la mortalité de la naissance à la fin de vie active d'un individu est très faible (Meslé et al., 2002) et que les individus de la génération du baby-boom atteignent des âges avancés (Monnier, 2009).

Les enjeux du vieillissement de la population ne se limitent pas à des problématiques démographiques mais également économiques, sanitaires et évidemment sociétales. Par exemple, la prise en charge des personnes âgées en perte d'autonomie relève du domaine de la santé publique et pose la question du rôle des différents acteurs du secteur. En 2018, la Commission Européenne a publié un rapport qui met en évidence les quatre principaux défis du vieillissement démographique auxquels sont confrontés les Etats Membres: l'accès aux soins, la qualité de l'offre de soins, l'emploi des aidants informels et la viabilité financière d'un système d'aide publique pour les soins de longue durée. Ce rapport, en regroupant 35 pays européens autour de ces thématiques, montre que la totalité du vieux continent est concernée par le vieillissement démographique et ses enjeux. Ainsi, les projections européennes pour les décennies à venir semblent confirmer à la fois l'augmentation et le vieillissement de la population (Giannakouris, 2010). La part des 75 ans et plus pourrait représenter plus de 16% de la population de l'Union Européenne en 2050 (Eurostat). Bien que l'on s'accorde sur le vieillissement généralisé des populations en Europe, des disparités persistent au sein même du continent (Rees et al., 2012). Par exemple, la proportion des 65 ans et plus dans la population totale en 2017 est de 22,3% en Italie, qui occupe la première place du classement, contre 13,5% seulement en Irlande (Eurostat). L'évolution de l'âge médian au sein de l'Union Européenne diffère également selon les pays. Le différentiel le plus important a été mesuré en Pologne

où l'âge médian était de 26,4 ans en 1960 et de 51 ans en 2060 (valeur estimée) selon Lanzieri (2011) ; on estime qu'en 2060, la moitié de la population polonaise aura plus de 51 ans. Au contraire, le Royaume-Uni enregistre une faible hausse de l'âge médian de sa population avec une évolution de 6,7 années entre 1960 et 2060, passant de 35,6 ans à 42,3 ans.

Ces disparités concernant le vieillissement démographique peuvent s'expliquer par un certain nombre de facteurs socio-économiques. La grande majorité des études trouve une relation positive entre état de santé et revenu ou éducation (Jusot, 2006; Hupfeld, 2011) suggérant que les personnes aisées ont une espérance de vie plus élevée. Cependant, il n'est pas sûr que ces déterminants du statut économique soient la cause d'une espérance de vie plus ou moins longue. Selon Dwyer and Coward (1991), une mauvaise santé pourrait expliquer un faible revenu, montrant ainsi l'importance de contrôler les différentes sources d'endogénéïté telles que la causalité inverse et les variables omises. Des inégalités en matière d'espérance de vie persistent également selon le genre et la situation matrimoniale. En France, en 2018, les femmes vivent en moyenne 85,3 ans contre 79,4 ans pour les hommes (INSEE). De plus, il y a une surmortalité chez les personnes veuves par rapport aux personnes mariées (Murphy et al., 2007) mais les femmes survivent plus longtemps au veuvage (Gaymu, 2017).

1.1 Qu'est-ce que la dépendance et comment la mesurer ?

L'augmentation de l'espérance de vie ne signifie pas que les individus vivent en bonne santé jusqu'à leur décès. Autrement dit, l'allongement de l'espérance de vie ne se résume pas à des années supplémentaires vécues en parfaite santé. Il faut se tourner vers l'espérance de vie sans incapacité (EVSI), c'est-à-dire au nombre d'années que peut espérer vivre une personne sans être limitée dans ses activités quotidiennes, pour rendre compte de l'état de santé des populations vieillissantes en Europe. Cet indicateur est utilisé par l'OCDE, par l'OMS et par l'Union Européenne depuis 2005. A ce propos, en 1997, le Directeur Général de l'Organisation Mondiale de la Santé (OMS) déclarait que « sans qualité de la vie, une longévité accrue ne présente guère d'intérêt (...), l'espérance de vie en bonne santé est plus importante que l'espérance de vie ». L'EVSI a évolué positivement au cours de ces dernières décennies. Selon Eurostat, elle était de 61,8 ans en 2010 contre 63,5 ans en 2017 pour les hommes dans l'Union Européenne à 28. La progression concernant les femmes est similaire sur cette même période. Malgré une évolution positive de l'EVSI, la part croissante des personnes âgées dans la population totale entraîne une augmentation mécanique

du nombre de personnes âgées en mauvaise santé. Plus précisément, le nombre de personnes âgées en perte d'autonomie tend à augmenter: le vieillissement démographique accru illustre la dépendance. Cette dernière peut être définie comme la perte partielle ou totale d'autonomie des individus et entraîne le besoin d'aide pour accomplir des tâches de la vie quotidienne.

Les soins à la dépendance sont un ensemble de services, médicaux et non médicaux, apportés aux personnes qui rencontrent des difficultés liées à l'âge concernant des Activités de la Vie Quotidienne (AVQ) dites *Activities of Daily Living* (ADL) ou des Activités Instrumentales de la Vie Quotidienne (AIVQ) dites *Instrumental Activities of Daily Living* (IADL). Le premier indicateur fait référence à des tâches basiques du quotidien telles que l'hygiène personnelle (se laver, se coiffer), s'habiller, se nourrir et se mouvoir d'un endroit à un autre. La seconde mesure reflète également l'autonomie d'un individu en incluant des activités faisant appel à des capacités cognitives comme les tâches ménagères de son domicile, gérer ses finances, se préparer à manger ou encore utiliser le téléphone ou d'autres moyens de communication. Katz (1983) propose un index basé sur ces deux catégories d'activités afin de mesurer le degré de dépendance d'un individu. Plus précisément, cet outil prend en compte six éléments : se laver, s'habiller, aller aux toilettes, se déplacer d'un endroit à un autre, être continent et se nourrir. Les individus concernés répondent à ces questions par oui ou par non. Un score égal à six signifie une autonomie complète et un score inférieur ou égal à deux est le signe d'une forte dépendance.

En France, la grille nationale Autonomie, Gérontologie, Groupes Iso-ressources (AGGIR) permet d'évaluer le niveau de dépendance de l'individu. Elle comprend dix éléments (cohérence, orientation, toilette, habillage, alimentation élimination, transfert, déplacement à l'intérieur, déplacement à l'extérieur et communication à distance) et distingue six catégories (GIR 1 à 6, respectivement d'un fort niveau de dépendance à un niveau d'autonomie complète) selon le score des individus. Les GIR 1 et 2 correspondent à une dépendance complète, les GIR 3 et 4 à une dépendance partielle et les GIR 5 et 6 relèvent d'une autonomie quasi-totale. Seuls les GIR 1, 2, 3 et 4 ouvrent les droits à l'Allocation Personnalisée d'Autonomie (APA), aide financière mise en place par les pouvoirs publics français afin de venir en aide aux personnes âgées de plus de 60 ans en perte d'autonomie. A titre d'exemple, parmi les allocataires de l'APA vivant à domicile en 2015, 59% sont classés en GIR 4, 22% en GIR 3 et 18% en GIR 1 ou 2 selon l'INSEE[1].

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[1]Source: Insee (https://www.insee.fr/fr/statistiques/3303484?sommaire=3353488)

1.2   L'offre de soin

La dépendance n'est pas inévitable mais peut représenter un risque important pour les individus. Il existe trois acteurs en mesure de palier ce risque et de répondre à la demande croissante de soin : l'Etat, le marché et la famille. Les deux premiers constituent l'aide formelle et le troisième fait référence à l'aide dite informelle.

L'individu dépendant peut faire appel à l'assistance de l'Etat. En France, l'aide professionnelle aux personnes âgées dépendantes est en partie financée par l'aide publique : les individus de 60 ans et plus peuvent bénéficier de l'APA selon leur degré de dépendance (voir Bozio et al., 2016 pour un état des lieux des politiques publiques relatives à la dépendance en France). Ainsi, au 1er Janvier 2015, une personne âgée pourra bénéficier d'une aide mensuelle plafonnée à 562,57 euros en cas de dépendance légère (GIR 4) et allant jusqu'à 1312,67 euros si elle est en perte d'autonomie totale (Gramain et al., 2015). Cependant, il y a une grande hétérogénéité du fonctionnement et de l'importance du système d'aide pour les personnes dépendantes au sein même du continent européen. Par exemple, alors que les budgets suédois et finlandais dédiés aux soins à la dépendance représentent près de 3% du Produit Intérieur Brut (PIB), la Grèce et la Slovaquie n'y consacrent quasiment aucune ressource (Muir, 2017).

L'aide du marché fait principalement référence à l'achat d'assurances privées. Ce système d'assurance est assez développé au Royaume-Uni, en Suisse, en Allemagne et en Irlande alors que ce n'est pas le cas en Grèce ou en République Tchèque[2]. Plus globalement, et de façon assez surprenante, la souscription de contrats d'assurance pour palier le risque de dépendance reste une solution qui n'est que peu privilégiée alors même que la demande de soins longue durée est en constante augmentation. Ce décalage entre une demande de soins grandissante d'une part et une offre privée peu développée d'autre part constitue ce qu'on appelle communément « l'énigme de l'assurance dépendance » (Kessler, 2007). Plusieurs auteurs ont entrepris d'en trouver les causes. Pestieau and Ponthière (2012) listent et discutent les différentes raisons expliquant ce « puzzle ». Ils mentionnent notamment les coûts dissuasifs des assurances dépendance. Par exemple, Cutler (1993) montre qu'aux Etats-Unis, 91% des individus qui n'ont pas souscrit d'assurance dépendance l'ont fait en raison du prix. La présence d'asymétrie d'information peut rendre le prix d'une assurance encore plus élevé. Il est difficile pour un assureur de connaître réellement l'évolution du niveau de dépendance d'un potentiel client. Dans ce cas, la personne dépendante

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[2]Challenges in long-term care in Europe, a study of national policies (2018). Report of the European Commission.

a plus d'information que l'assureur. Cette situation amène un problème de l'anti-sélection: seuls les individus avec un fort niveau de dépendance vont souscrire une assurance. Mais le coût prohibitif n'est pas la seule explication. Le faible recours aux financements privés peut aussi s'expliquer par un facteur comportemental (Cremer et al., 2012): la myopie. De ce fait, une personne dépendante ne va pas juger nécessaire de souscrire à une assurance aujourd'hui si elle n'en a besoin que demain : elle achète ce qui lui est nécessaire à court terme. De plus, il ne faut pas oublier que les individus ne sont pas toujours bien informés des produits assurantiels mis à leur disposition.

Cependant, les raisons mentionnées ci-dessus n'expliquent pas à elles seules le sous-développement du marché assurantiel concernant la dépendance. Il faut s'intéresser au troisième acteur de l'offre d'aide pour réellement comprendre la complexité des relations entre aide formelle et aide informelle : la famille. Il s'agit de la principale source d'aide pour les personnes âgées dépendantes. Les proches et les membres de la famille fournissent une aide gratuite et non-professionnelle, contrairement à celle proposée et/ou financée par le marché ou par l'Etat. Il peut s'agir d'activités ménagères régulières, de tâches concernant la toilette personnelle de la personne dépendante ou encore de soutien moral. L'accès facile et gratuit à ce type d'aide pourrait être en grande partie à l'origine du faible recours aux assurances privées. Cette problématique a été très largement étudiée dans la littérature afin de comprendre la relation, soit de substitution soit de complémentarité, entre la famille et le marché, et plus largement entre l'aide formelle et l'aide informelle.

La grande majorité des auteurs s'étant intéressée à cette question a mis en avant l'effet d'éviction de la demande d'aide formelle par les solidarités familiales suggérant ainsi une relation de nature substituable (Fontaine, 2017). En effet, il semblerait que l'aide fournie par la famille réduise la probabilité d'intégrer une maison de retraite, ou en tout cas, en retarde l'entrée (Charles and Sevak, 2005; Houtven and Norton, 2004; Bolin et al., 2008). Bonsang (2009) confirme ce résultat mais souligne l'importance du niveau de dépendance, dans la mesure où des non-professionnels de la santé ne peuvent pas remplacer des médecins qualifiés lorsque le patient est très fortement dépendant. Au contraire, Fontaine (2012) a mis en évidence que l'aide professionnelle financée par l'APA se substitue à l'aide professionnelle financée de manière prive et à l'aide informelle. Ses résultats démontrent également l'existence d'une relation de nature substituable entre l'aide informelle et l'aide formelle, mais où l'offre d'aide par l'Etat évince le soutien financier de la famille (voir aussi Arnault, 2015).

Si l'aide informelle semble affaiblir la demande auprès des assurances, on peut supposer que l'Etat exerce la même force sur le marché. Selon Courbage and Roudaut (2011), en France, l'aide publique auprès des faibles revenus semble les dissuader d'avoir recours à des assurances privées. Cet effet d'éviction est d'autant plus important aux Etats-Unis en raison d'un contexte institutionnel particulier. Les prestations des assurances privées sont assimilées à un revenu et entrent en compte dans les critères d'éligibilité à l'aide publique (Medicaid). Il y a donc une relation de substitution entre l'assurance privée et l'aide fournie par l'Etat et finalement, une faible utilité à souscrire une assurance privée aux Etats-Unis (Bien et al., 2011).

2 La prévalence de l'aide informelle

2.1 Qui sont les aidants familiaux et quelles sont leurs motivations ?

L'aide apportée par la famille est la principale source de soutien pour les personnes dépendantes. Selon Bonnet et al. (2011), 80% des personnnes âgées à domicile sont aidées par leurs proches. Dans la majorité des situations, les aidants familiaux sont, en fait, des aidantes (Norton, 2000; Cheneau et al., 2017). Plusieurs raisons expliquent cet effet de genre. Tout d'abord, comme les femmes ont une espérance de vie et une espérance de vie en bonne santé supérieures à celles des hommes, elles ont plus de chances de se retrouver en position d'aidante. D'ailleurs, cette situation met en évidence le statut d'aidant principal de l'épouse quand elle est en bonne santé (Brody et al., 1995. Les enfants de la personne dépendante deviennent les aidants principaux lorsqu'elle celle-ci est veuve (Dwyer and Coward, 1991). Une seconde raison qui explique la prévalence des femmes parmi les aidants est la différence de salaire entre les hommes et les femmes sur le marché du travail conférant un coût d'opportunité plus faible aux femmes actives (Carmichael and Charles, 2003).

La plupart des articles sur le sujet font référence à l'aidant. En réalité, il y a rarement un seul aidant. Tennstedt et al. (1989) ont mis en évidence l'importance des aidants secondaires (voir aussi Stone et al., 1987). Il s'agit de personnes qui fournissent également de l'aide mais qui sont moins investies que l'aidant principal. Ceci peut être le cas lorsque les enfants aident un parent dépendant et qu'ils se partagent les différentes tâches à effectuer. Selon Hiedemann and Stern (1999), cette situation peut donner lieu à des négociations stratégiques entre frères et sœurs afin d'établir la solution optimale de « qui aide et combien » (voir aussi Fontaine

et al., 2009; Roquebert et al., 2018). La multiplication du nombre d'aidants intervient également lorsque la personne dépendante co-réside avec l'aidant. Selon Brody et al. (1995), ce sont principalement les parents dépendants qui se déplacent et emménagent chez leurs enfants, et non l'inverse. Ainsi, non seulement l'enfant du parent dépendant mais également son partenaire et les petits-enfants forment le cercle des aidants.

Que la décision d'offre d'aide informelle soit le fruit d'une réflexion individuelle ou d'un arrangement collectif, elle repose sur trois principales motivations : l'altruisme, l'intérêt et l'obligation. Becker (1976, 1991) a mis en évidence l'importance de l'altruisme dans les interactions sociales, et plus particulièrement au sein la famille (voir aussi Wolff and Laferrere, 2006). L'individu n'est pas intéressé que par son propre bien-être mais également par celui des membres de sa famille. Il est néanmoins très difficile de trouver une mesure adéquate à un concept aussi abstrait que celui de l'altruisme. Dans la littérature, plusieurs stratégies ont été établies pour tenter de prouver l'existence de l'altruisme, dans un cadre restreint, par exemple entre les enfants et leurs parents. Altonji et al. (1997) supposent que des parents altruistes, qui donnent de l'argent à leurs propres enfants, modifient le montant du transfert proportionnellement aux augmentations de salaire dont ils bénéficient. Pour Alessie et al. (2014), l'hypothèse de comportements altruistes entre un parent et son enfant nécessite une relation négative entre d'une part le salaire de l'enfant et d'autre part le transfert financier des parents aux enfants : les parents donnent plus à ceux qui ont moins. Ni Altonji et al. (1997), ni Alessie et al. (2014) ne trouvent des résultats en faveur d'un altruisme dit pur, ébranlant quelque peu l'idée selon laquelle les enfants aident leurs parents de façon totalement gratuite et désintéressée.

Un second facteur prépondérant dans l'explication des incitations des enfants à aider leurs parents est l'intérêt (Wolff and Arrondel, 1998). Plus précisément, cela signifie que les aidants familiaux attendent un retour sur leur investissement régulier. Bernheim et al. (1985) se sont intéressés au rôle de l'héritage (voir aussi Perozek, 1998). En particulier, ces auteurs se demandent si les enfants sont influencés par la présence d'importants legs et prouvent que leurs comportements au quotidien -fréquence des contacts par exemple- sont directement impactés par leur « capacité à hériter » (*bequeathability*).

Les deux motivations de l'offre d'aide informelle abordées jusqu'à présent, l'altruisme et l'échange, résultent d'un choix, d'une volonté, qu'elle soit morale ou non. La

troisième incitation à aider, la norme familiale, est davantage une obligation in-
culquée par les parents à leurs enfants de façon implicite, discrète et quasi-silencieuse.
L'intérêt pour ce facteur est plutôt récent, et reste encore peu abordé en raison de sa
conception à la fois théorique et empirique complexe. Comment définir ce qu'est une
norme ? Cox and Stark (1996) s'intéressent à la transmission de la norme dans une
situation d'offre d'aide intrafamiliale grâce à l'effet de démonstration. Ces auteurs
montrent que les transferts, en temps ou en argent, des parents adultes aux grands-
parents âgés dépendants sont positivement corrélés à la présence de petits-enfants.
Ainsi, les parents adultes souhaitent montrer l'exemple, inculquer les valeurs fa-
miliales à leurs propres enfants afin de les encourager à adopter ces comportements
quand eux-mêmes se trouveront en situation de dépendance. De cette façon, les par-
ents se protègent contre le manque d'altruisme dont pourraient faire preuve certains
de leurs enfants. Forts de cette hypothèse, Canta and Pestieau (2013) distinguent
deux types d'enfants : les traditionnels et les modernes. Les premiers ont un com-
portement similaire à leurs parents alors que les seconds ne sont pas influencés par
la norme familiale, mettant en lumière les limites de l'effet de démonstration. Cela
peut s'expliquer par la montée de l'individualisme qui fait que les familles n'ont plus
l'habitude de vive ensemble et de s'occuper les uns des autres comme cela a pu être
la norme auparavant.

La majorité des études sur le sujet montre que l'altruisme et l'échange sont les
motivations prépondérantes à l'offre d'aide informelle. Cela est peut-être dû à la
difficulté de mesurer la norme familiale et d'en comprendre l'ensemble des tenants
et aboutissants. Que l'aide apportée par la famille résulte d'un choix ou d'une obli-
gation, les aidants familiaux ne généralement, sont ni informés ni préparés à toutes
les implications économiques, sociales, sanitaires ou psychologiques, qu'engendre un
tel statut.

2.2   Les aidants familiaux et l'emploi

Un premier domaine impacté par les activités d'aide effectuées est l'emploi (Fontaine,
2009). La participation au marché du travail des aidants familiaux est plus faible que
celle des non-aidants (Carmichael and Charles, 2003; Bolin et al., 2008). Mais un
certain nombre d'études réfute cette association et explique cela par le faible attache-
ment au marché du travail. Cela signifie que les personnes concernées n'augmenteraient
pas leur participation au marché du travail même sans fournir de l'aide. Il s'agit d'un
problème de sélection soulevé par Dautzenberg et al. (2000). Cependant, Michaud
et al. (2010) ont prouvé que l'emploi actuel réduit la probabilité de devenir un aidant

dans le futur.

Lorsqu'on s'intéresse aux aidants qui sont déjà présents sur le marché du travail, on remarque une réduction du temps de travail en comparaison à des travailleurs qui n'ont pas le statut d'aidant (Lilly et al., 2010; Bolin et al., 2008; Kotsadam, 2011). Par exemple, Meng (2013) démontre qu'une aide fournie à mesure de 10 heures par semaine réduit le temps de travail de 48 minutes pour les hommes. Même lorsque l'on tient compte des problèmes dus à l'endogénéïté, l'impact de l'aide fournie sur les heures travaillées reste négativement fort (Heitmueller, 2007; Coe et al., 2013). De plus, Cheneau (2019) a montré qu'une baisse du temps de travail résulte en une augmentation plus que propotionnelle du temps d'aide. Cela signifie qu'u individu qui réduit son temps de travail va, en contre partie, dédier d'autant plus d'heures à des activités d'aide informelle. Mécaniquement, la réduction du temps de travail entraîne une baisse de salaire. (Carmichael and Charles, 2003; Heitmueller and Inglis, 2007). La qualité du travail des aidants est également remise en cause (Reid et al., 2010). Ils partent plus tôt, arrivent plus tard, ont tendance à être plus souvent absents et peuvent avoir des problèmes de concentration au travail (Fast et al., 1999). De ce fait, ils sont moins souvent éligibles à des promotions et doivent faire face à des salaires horaires moins élevés (Bauer and Sousa-Poza, 2015).

Alors que la réduction de leurs ressources crée déjà une pression financière importante, les aidants font face à des frais supplémentaires en lien direct avec leur statut. Les dépenses les plus communes selon Turcotte (2013) sont les transports (entre le domicile de l'aidé et celui de l'aidant) et l'hébergement. Il n'est pas rare que les adultes aidants participent également aux dépenses pour des services professionnels et non professionnels (infirmières, femmes de ménage, aides à domicile) nécessaires à une fin de vie digne lorsque leurs parents sont maintenus à domicile.

Pourtant, cette pression financière ne disparaît pas au décès de la personne dépendante. Spiess and Schneider (2003) ont montré que la fin de l'épisode d'aide n'entraîne pas de réajustement au niveau de la participation au marché du travail. En d'autres termes, les individus qui ont réduit leur temps de travail en raison de la difficulté à combiner leurs obligations professionnelles et leurs responsabilités d'aidants familiaux n'augmentent pas leur offre de travail quand la période d'aide prend fin. Ces auteurs expliquent cela par le fait que les aidants concernés sont généralement proches de l'âge de la retraite. Ces résultats sont confirmés par Coe et al. (2013) qui ont prouvé que l'offre d'aide informelle augmente la probabilité, chez les aidantes, d'un départ à la retraite (voir aussi Meng, 2013).

2.3 La santé des aidants familiaux

L'offre d'aide informelle combinée à une précarité et à une vulnérabilité économique ont des conséquences néfastes sur la santé des aidants. Pinquart and Sörensen (2003), à l'aide d'une méta-analyse, prouvent l'existence d'une relation négative entre l'aide fournie et des mesures psychologiques comme le bien-être subjectif, le stress perçu ou des symptômes associés à la dépression (voir aussi Savage and Bailey, 2004). Par exemple, le fait d'effectuer un grand nombre de tâches en ayant l'impression de ne pas disposer des ressources suffisantes est une source de stress (Turcotte, 2013). De plus, l'essence même du rôle d'aidant familial est d'aider une personne de sa propre famille, qu'il a probablement côtoyée dans le passé et pour laquelle il a une affection particulière. Etre le témoin quotidien de son déclin est la source d'un bien-être décroissant (Bobinac et al., 2010). Cet impact est d'autant plus fort que l'état de santé de la personne dépendante est mauvais. Selon Cooper et al. (2007), les aidants qui s'occupent de proches atteints de démence sénile présentent des niveaux d'anxiété plus élevés (Schulz et al., 1995).

La santé psychologique est également fortement corrélée à la santé physique. Les aidants qui pâtissent psychologiquement de leurs activités d'aide, en étant plus stressés par exemple, ont tendance à négliger leur hygiène de vie quotidienne (Pinquart and Sörensen, 2007). Cela a un impact sur leur santé physique (dégradation de l'alimentation, baisse des activités sportives) entraînant une fragilité favorisant les blessures ponctuelles dues à la pénibilité et à la répétition des tâches à effectuer (Turcotte, 2013). Plus graves encore, les facteurs psychologiques tels que l'anxiété et le stress favorisent l'apparition de maladies chroniques (arthrite, maladies cardio-vasculaires, certains cancers, sclérose en plaques). Les aidants y sont donc plus exposés selon Pinquart and Sörensen (2007).

La vulnérabilité associée au statut d'aidant familial est accrue par un certain nombre de facteurs socio-économiques. Bédard et al. (2005) mettent en avant l'importance du genre de l'aidant et démontrent que les femmes qui aident des hommes sont plus sujettes à des symptômes psychologiques tels que le stress, le sentiment de fardeau et la colère. Les personnes plus âgées ont tendance à aider davantage (Leontaridi and Bell, 2001), peut-être parce qu'elles ont l'impression que c'est leur devoir d'agir ainsi (Mentzakis et al., 2009) et car elles ont un coût d'opportunité plus faibles que les jeunes adultes (Ettner, 1996).

Au contraire, le statut marital est un modérateur des facteurs psychologiques néfastes car les aidants en couple bénéficient du soutien de leurs partenaires selon

Brody et al. (1995). Plus généralement, avoir une vie sociale plus ou moins développée soulage les charges mentales et physiques qu'implique le rôle d'aidant. D'après Uchino et al. (1992), un contact régulier avec des proches permet de réduire la fréquence cardiaque des aidants d'individus atteints de la maladie d'Alzheimer contrairement à des aidants dont la vie sociale est restreinte au seul cercle des personnes dépendantes. Le conjoint, le cercle familial, les proches mais aussi les pouvoirs publics sont également un facteur modérateur, et son rôle n'est pas à minimiser. Dans les pays où les politiques publiques en terme de dépendance existent et sont assez développées, permettant aux aidants d'être soutenus financièrement et psychologiquement, l'état de santé des aidants est significativement meilleur par rapport aux pays qui n'ont pas mis en place de système de protection les concernant (Dujardin et al., 2011). Ainsi, l'aide formelle reçue à domicile impacte positivement l'état de santé mentale des aidants familiaux selon Juin (2019). Plus précisément, l'auteure a démontré qu'une augmentation de la marge intensive d'aide formelle réduit significativement le risque de troubles du sommeil ou à d'un sentiment dépressif chez les aidants familiaux (voir aussi Juin, 2016).

2.4 Les proches des aidants familiaux

Si les proches permettent de modérer les impacts néfastes de l'offre d'aide, ils n'en subissent pas moins les conséquences. Les implications pour la famille de l'aidant sont nombreuses. Ce dernier fait face à une multiplication des tâches à effectuer : travailler, soigner ses parents, passer du temps avec sa famille. Mécaniquement, une augmentation du nombre d'heures passées à aider des personnes dépendantes réduit le temps passé en famille ou à travailler. Par exemple, la baisse de l'offre de travail de l'aidant peut être compensée par une hausse de celle de son partenaire, modifiant profondément le fonctionnement au quotidien d'une famille. Ce type d'arrangement au sein du foyer peut impacter le bien être à la fois des aidants et de leurs partenaires, qui doivent travailler davantage. Cet effet négatif est d'autant plus fort quand les aidants co-résident avec la personne dépendante. Cette situation impacte non seulement le bien-être de l'aidant mais aussi celui de son partenaire (Amirkhanyan and Wolf, 2006). Evidemment, cette situation est d'autant plus néfaste qu'elle dure longtemps: Bookwala (2009) a montré que les aidants expérimentés sont moins heureux dans leur mariage par rapport à ceux dits récents.

3   Questions de recherche et plan de thèse

De ce contexte de vieillissement démographique, dont sa prévalence et sa généralisation au continent européen le rendent inédit et sans précédent, découle un certain nombre de problématiques. Ainsi, l'augmentation du nombre de personnes âgées, et plus particulièrement, de personnes âgées en situation de dépendance démocratise la question de leur prise en charge et du rôle de chacune des parties prenantes. La famille ayant une place prépondérante dans cette problématique globale de la dépendance, il est plus que probable que chacun d'entre nous soit, un jour, amené à endosser ce rôle si exigeant, chronophage et déconsidéré que celui de l'aidant familial.

De ce fait, j'ai principalement concentré mes recherches sur l'acteur principal de l'offre d'aide : la famille. Plus précisément, le but de cette thèse est de mieux comprendre le fonctionnement de l'aide informelle fournie aux personnes âgées dépendantes et ses implications. Afin de contextualiser ces situations d'aide, je m'intéresse d'abord à l'importance du vieillissement démographique en Europe en étudiant la relation entre mortalité et revenu. Le nombre de personnes âgées dépendantes étant croissant, mon intérêt s'est ensuite porté sur leur prise en charge. Plus précisément, je me suis concentrée sur l'aide informelle en Europe et sur ses déterminants. Quelles sont les motivations d'une telle décision ? Est-ce que l'enfant aide son parent par choix ou est-ce qu'il se sent obligé d'agir ainsi ? Quelles sont les caractéristiques socio-économiques qui entrent en jeu ? Est-ce que les aidants ont des similitudes ? L'idée de cette thèse est également d'accompagner l'aidant tout au long de ce processus d'aide et de comprendre ce qu'il se passe après le début de cet épisode. Une fois que les facteurs de la décision d'aide ont été déterminés, je m'intéresse à ses conséquences. Est-ce que le bien-être de l'aidant est décroissant à mesure que l'aide offerte augmente ? Est-ce que la marge intensive augmente significativement la dépression ? Pour aller plus loin, j'analyse également l'impact de l'aide sur la santé du partenaire. Est-ce que les conséquences néfastes sur la santé psychologique s'étendent à la famille de l'aidant, et plus particulièrement à son conjoint ?

Chapitre 1

Le premier chapitre traite de la relation entre longévité et revenu dans plusieurs pays européens. L'idée est d'estimer le différentiel d'espérance vie selon le revenu en distinguant plusieurs cohortes et en étendant la méthode de Pamuk (1985, 1988) aux données de revenu. Elle consiste à définir les espérances de vie selon le niveau

d'éducation et utilise l'importance des différents niveaux d'éducation dans la distribution des catégories de revenu dans la population. Nous faisons donc l'hypothèse que les niveaux d'éducation sont positivement corrélés au revenu et correspondent à une certaine organisation de la population selon le revenu. Ensuite, à l'aide d'un indice d'inégalité qui prend en compte la part relative de chaque catégorie de revenu dans la population, nous calculons l'ampleur de l'inégalité de longévité afin de comparer les différents pays de notre échantillon. Les données sur les espérances de vie proviennent d'Eurostat (2017) pour un certain nombre de pays européens et de l'INSEE pour la France. Trois niveaux d'éducation sont considérés dans ce chapitre : enseignement primaire et premier cycle du secondaire, enseignement du deuxième cycle du secondaire et enseignement supérieur.

Les résultats, présentés par cohortes et par genre, montrent que le différentiel d'espérance de vie selon le revenu est plus important chez les hommes et qu'il augmente légèrement avec l'âge. C'est en Finlande et en Suède que le différentiel d'espérance de vie selon le revenu est le plus faible pour les hommes. La République Tchèque montre une certaine égalité de longévité chez les femmes, quel que soit l'âge. La diversité de ces résultats peut être partiellement expliquée par l'hétérogénéité des politiques de santé mises en place dans les pays de notre échantillon où les différentes classes de revenu n'ont probablement pas le même accès aux soins.

Chapitre 2

Dans le deuxième chapitre, je m'intéresse aux déterminants de l'offre d'aide informelle. Malgré le rôle grandissant de l'aide formelle, le cercle familial et les proches reste la principale source d'aide. Afin de comprendre quelles sont les motivations des aidants familiaux, je me suis concentrée sur trois déterminants de la décision d'aide : l'altruisme, l'échange et la norme. Le but est de comprendre quel motif prévaut dans la décision d'aide d'un enfant adulte à son parent âgé dépendant. Pour réaliser cette étude, j'utilise des données de l'enquête *Survey of Health, Ageing and Retirement in Europe* (SHARE) et j'observe un certain nombre de pays européens dont la France.

En considérant la marge extensive de l'aide, je trouve que l'altruisme et l'échange sont des facteurs prépondérants. De plus, les résultats empiriques démontrent l'existence d'un gradient Nord-Sud dans la mesure où la prévalence des motivations diffère selon la position géographique. Par exemple, en Grèce, Italie et Espagne, les aidants familiaux semblent être guidés par une forte norme familiale dans leur prise de décision quant à l'aide à fournir à leurs parents, norme complètement absente

dans les pays du centre et du nord de l'Europe. Evidemment, les caractéristiques socio-économiques des aidants sont à prendre en compte pour mieux comprendre leur décision. Ainsi, je trouve que les femmes sont les principales aidantes et qu'un nombre de frères et sœurs important réduit la probabilité d'apporter de l'aide; résultats confirmant ceux de la littérature existante.

Chapitre 3

Le troisième chapitre a pour objectif de déterminer l'impact de l'offre d'aide sur la satisfaction dans la vie des aidants. La littérature empirique et théorique a déjà mis en avant les impacts, souvent néfastes, des activités d'aide sur la santé mentale et physique. Nous nous concentrons sur les Pays-Bas qui ont mis en place une réforme du système de soins longue durée en 2015. Grâce aux données de l'enquête *Longitudinal Internet Studies for the Social Sciences* (LISS), nous avons pu estimer l'impact de l'offre d'aide sur une mesure de la satisfaction dans la vie des aidants entre 2009 et 2017. Nous contrôlons l'endogénéïté, dont les sources sont la causalité inverse et les variables omises, en utilisant des variables instrumentales. Ces dernières sont à la fois des variables macroéconomiques reflétant les situations avant et après la réforme (Eurostat) et les retards des régresseurs endogènes.

Nous trouvons que la marge extensive de l'aide réduit la satisfaction des aidants néerlandais sur cette période. L'ampleur de cet impact néfaste dépend néanmoins de l'intensité, du type d'aide et de la relation avec l'aidé. Nos résultats montrent que fournir de l'aide à un membre habitant dans le même foyer à un impact négatif plus important qu'aider une personne en dehors du ménage, y compris le partenaire. De même, aider un membre de sa famille est beaucoup plus néfaste qu'aider un voisin, un ami ou un collègue.

Chapitre 4

L'idée de ce quatrième chapitre est d'étendre la réflexion du précédent en étudiant si l'offre d'aide informelle n'impacte pas également le partenaire de l'aidant. Cette réflexion, peu abordée dans la littérature, a pour but de démontrer l'existence d'effets, positifs ou négatifs, sur la santé mentale du partenaire de l'aidant. Plus précisément, grâce aux données tirées de l'enquête *Survey of Health, Ageing and Retirement in Europe* (SHARE), j'examine la relation causale entre la marge intensive de l'aide et l'état dépressif du partenaire. Ce dernier est déterminé grâce à douze sous-éléments qui regroupent les caractéristiques d'une personne dépressive. L'étude se concentre donc sur des couples, dont les deux membres habitent ensemble, et qui

aident un parent âgé dépendant dans un certain nombre de pays européens. Pour faire face aux problèmes d'endogénéïté qui seraient susceptibles de biaiser les résultats empiriques, j'utilise un modèle en deux étapes avec des variables instrumentales.

Les résultats sont assez surprenants et démontrent l'effet positif de l'offre d'aide de l'aidant sur l'état dépressif de son partenaire. En d'autres termes, plus l'individu aide, moins son partenaire est dépressif. Afin de comprendre ces résultats, j'explore les différents canaux susceptibles d'expliquer une telle relation. J'ai accordé une attention particulière à l'état de santé du parent dépendant afin de contrôler l' « effet de famille » mis en avant par Bobinac et al. (2010), qui n'est cependant pas à l'origine de l'effet positif de l'offre d'aide dans mon étude. J'ai également contrôlé et éliminé le rôle des externalités positives au sein du couple comme canal explicatif de l'impact bénéfique de la marge intensive.

Chapter 1

La mortalité selon le revenu: estimation à partir de données européennes[1]

Résumé du chapitre

Nous estimons la relation entre mortalité et revenu pour plusieurs pays européens dont la France. A partir d'une méthode de régression pondérée, l'espérance de vie par classe de revenu est dérivée de l'espérance de vie observée pour différents niveaux d'éducation. Nous distinguons plusieurs cohortes selon le sexe. Les résultats montrent que le différentiel de mortalité selon le revenu est plus important chez les hommes que chez les femmes et qu'il tend à augmenter légèrement avec l'âge. De fortes disparités entre pays sont cependant observées avec des inégalités faibles dans les pays nordiques et plus fortes dans les pays de l'Est. La France présente un différentiel de mortalité selon le revenu plutôt faible comparé aux autres pays de l'échantillon.

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1   Introduction

L'espérance de vie à la naissance a fortement augmenté au cours des dernières décennies. En France, elle est, en 2015, de 79,0 ans pour les hommes et 85,1 ans pour les femmes alors qu'elle était de 70,2 ans pour les hommes et 78,4 ans pour les femmes en 2000 (INSEE). De nombreux facteurs ont été mis en avant pour expliquer cette augmentation de la longévité comme la qualité et les conditions de vie ou l'accès et la qualité des soins qui augmentent grâce au progrès technique. Néanmoins, ces bons résultats cachent des disparités parfois importantes au sein de la population. Plusieurs études ont montré qu'il existe une certaine hétérogénéité dans le domaine de la santé selon les catégories de la population considérées et il semble que ces différences se maintiennent malgré le bien-être croissant (voir Cutler et al., 2011, pour un survol des études réalisées sur le sujet).

Plus particulièrement, de nombreux travaux se sont intéressés à la relation entre mortalité et statut socio-économique. Selon les études considérées, le statut social est envisagé du point de vue de l'éducation, du revenu (ou de la richesse) ou de la profession. S'y ajoute parfois le type de ménage ou le patrimoine immobilier mais cette classification apparaît moins précise. Dans la quasi-totalité des cas, une relation positive est observée entre longévité et statut socio-économique, voir par exemple Kitagawa and Hauser (1973), Duleep (1986, 1989), Deaton and Paxson (1998) ou Cristia (2009) pour les Etats-Unis, Jusot (2006) pour la France, Hupfeld (2011) pour l'Allemagne, Kalwij et al. (2013) pour les Pays-Bas ou encore Attanasio and Emmerson (2003) pour le Royaume Uni[2]. Mackenbach et al. (2016, 2008) ont proposé une comparaison entre pays basée sur des données européennes. A partir d'indices d'inégalité du revenu et de données provenant des recensements, et en classant les individus selon leur niveau d'éducation ou leur emploi, ils comparent les causes de décès et l'évaluation de la santé subjective entre les groupes. Ils pointent également une relation positive entre statut socio-économique et état de santé et montrent que les inégalités entre groupes socio-économiques varient entre pays. Alors que les inégalités de santé sont plutôt faibles dans les pays du Sud de l'Europe, elles sont importantes dans les pays Baltes et de l'Est de l'Europe. La question de l'ampleur de cette relation reste néanmoins ouverte et si Preston (1975) montre, à partir de données en séries longues, que le revenu pourrait expliquer 15-20% du différentiel de mortalité, il est parfois difficile de donner un ordre de grandeur exact de l'écart de

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[2]Une exception est donnée par Snyder and Evans (2006), qui montrent au contraire que les groupes de revenus plus élevés font face à une mortalité plus grande que celle rencontrée par les groupes les plus pauvres.

longévité entre différentes catégories de la population.

Plus récemment, la littérature dans ce domaine s'est également attachée à identifier la nature même, causale ou non, de cette relation négative. La question est importante car s'il n'y a pas de doute quant à la corrélation positive entre statut socio-économique et longévité, il n'est pas certain que le niveau d'éducation ou le revenu soit en effet la cause d'une meilleure santé et donc d'une espérance de vie plus longue. Une mauvaise santé pourrait également expliquer un niveau d'éducation et un revenu plus faible (Currie and Madrian, 1999). De nombreux facteurs confondants tels que les capacités intellectuelles ou les préférences temporelles peuvent également être la cause à la fois d'une plus forte mortalité et du statut socio-économique. Cette question donne lieu à d'intenses débats techniques et scientifiques sur l'identification de la source de la causalité (Lleras-Muney, 2002; Lindahl, 2005; Balia and Jones, 2008 ; Van Kippersluis et al., 2011[3]), le problème étant de mesurer correctement la mortalité et de trouver une stratégie empirique qui isole l'effet du statut de la personne (son revenu, son niveau d'éducation ou sa richesse) des autres effets favorables à la longévité.

Bien que la question de recherche principale se concentre sur l'identification des canaux par lesquels la situation socio-économique affecte la santé et la mortalité, il n'en reste pas moins que l'existence d'une relation inverse entre mortalité et statut socio-économique, ainsi que les inégalités de mortalité qui en découlent, peuvent jouer un rôle prépondérant quant aux questions de politiques publiques. Lorsqu'une politique de soins est mise en place, il est important d'identifier quel groupe de la population est plus ou moins dans le besoin. Si les plus pauvres ont une espérance de vie réduite par rapport aux plus riches, le taux de rendement interne d'un système d'assurance retraite qui ne différencierait pas entre les individus est en moyenne plus faible pour les pauvres. En matière de redistribution, il est également important de pouvoir quantifier l'étendue du paradoxe de la mortalité (Lefebvre et al., 2013, 2014). En effet, si la mortalité varie selon le revenu, tel que les personnes aux revenus plus élevés vivent plus longtemps que celles ayant des revenus plus faibles, les taux de pauvreté calculés dépendent non seulement de « la vraie pauvreté » mais aussi de la sélection induite par la mortalité différentielle selon le revenu. Si la mortalité était la même pour tous les niveaux de revenu, il y aurait proportionnellement moins de riches et plus de pauvres en comparaison avec la situation actuelle où les espérances de vie varient selon le revenu. De telles différences de mortalité doivent pouvoir être prises en compte puisqu'il est communément admis que les différentiels de santé

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[3]Certains pointent plutôt un effet de la santé sur le statut socio-économique, voir Currie and Madrian (1999) et García-Gómez et al. (2013)

et/ou d'espérance de vie dans la population doivent être gommés afin de réduire les inégalités économiques et sociales (Belloni et al., 2013).

Dans cet article, nous nous intéressons à la relation entre longévité et revenu et poursuivons trois buts. Premièrement, nous estimons le différentiel d'espérance de vie selon le revenu dans une série de pays européens en étendant la méthode proposée par Pamuk (1985, 1988) aux données de revenu. Cette méthode utilise les espérances de vie selon le niveau d'éducation et les tailles relatives de ces catégories d'éducation dans la population couplées à la distribution des catégories de revenu dans la population. Ces résultats sont essentiellement descriptifs et nous ne prétendons pas identifier une quelconque relation causale. Sur base de ces estimations, nous évaluons ensuite l'ampleur de l'inégalité de longévité. A l'aide d'un indice d'inégalité qui prend en compte la taille relative de chaque classe de revenu dans la population, nous comparons les pays de notre échantillon en différenciant les hommes des femmes ainsi que les groupes d'âge. Enfin, l'ensemble de ces résultats nous permettent de dresser un bilan de la situation des pays étudiés; pays aux trajectoires et aux systèmes de protection sociale très différents.

Tout au long de cet article, nous nous concentrons sur l'espérance de vie plutôt que sur les taux de mortalité[4]. L'espérance de vie mesure la dimension temporelle de la mortalité et a l'avantage d'être directement et facilement interprétable. Les données utilisées pour cette étude sont disponibles pour une série de pays européens; ce qui permet de réaliser des comparaisons entre différentes populations.

Dans la suite, nous présentons d'abord la méthode utilisée pour obtenir les espérances de vie selon la classe de revenu. Nous mettons en évidence les hypothèses faites ainsi que les données utilisées pour estimer la longévité. Nous présentons ensuite les résultats ainsi que différentes analyses de l'inégalité de la distribution des espérances de vie. Enfin, dans une dernière section, nous donnons quelques conclusions.

2   Estimer les espérances de vie selon le revenu

La position dans la hiérarchie sociale est principalement déterminée par la profession, l'éducation ou le revenu. Bien que ces dimensions aient probablement leur effet spécifique sur la santé, elles sont fortement liées les unes aux autres. Le niveau d'éducation est particulièrement intéressant car il est un déterminant important des

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[4]Nous pourrions également utiliser les rapports de cote (odds ratio). Ces derniers sont plus simples à utiliser mais ils ont tendance à refléter l'intensité de la mortalité et nous apprennent finalement peu de chose sur les morts prématurées.

revenus. Il a également les avantages d'être disponible pour la plupart des individus observés et de rester assez stable lorsque l'on considère la population adulte. Partant de ce constat, la méthode utilisée dans cet article propose de lier les distributions de la population selon ces deux dimensions, éducation et revenu, pour obtenir les espérances de vie selon le revenu.

Le point de départ est constitué par les tables de mortalité et les espérances de vie par niveau d'éducation. Nous utilisons deux sources de données: les espérances de vie publiées par Eurostat pour une série de pays européens (Eurostat 2017) et les données publiées pour la France par l'Insee à partir de l'échantillon démographique permanent (Insee 2017)[5]. Ces données, bien que provenant de sources différentes, ont l'avantage d'être directement comparables et présentent les statistiques de mortalité et d'espérance de vie selon le niveau d'éducation. Trois niveaux d'éducation sont ici envisagés : enseignement primaire et premier cycle du secondaire, enseignement du deuxième cycle du secondaire et enseignement supérieur. Les pays disponibles pour l'étude sont la Bulgarie, le Tchéquie, le Danemark, l'Estonie, la Finlande, la France, la Hongrie, l'Italie, la Norvège, la Pologne, le Portugal, la Roumanie et la Suède.

Grâce à ces données, nous disposons des espérances de vie par niveau d'éducation à chaque âge entre 30 et 65 ans. L'espérance de vie des femmes est plus longue que celle des hommes, et ce quel que soit le niveau d'éducation, l'âge et le pays considérés, et ce pour les deux âges de référence, 30 ans et 60 ans. On observe également, dans tous les pays, une relation croissante entre longévité et niveau d'éducation (cf. Tableau 1.1).

En faisant l'hypothèse que les niveaux croissants d'éducation reflètent bien une certaine hiérarchisation de la société selon le revenu, on peut estimer des tables de mortalité selon le revenu à partir de régressions par la méthode des moindres carrés ordinaires pondérés (Pamuk, 1985, 1988)[6]. Cette technique, largement utilisée par les épidémiologistes et les démographes pour estimer les espérances de vie en bonne santé (voir Bossuyt et al., 2004; Oyen et al., 2005), a l'avantage de prendre en compte la taille relative de chaque catégorie de population considérée (ici selon le niveau d'éducation). Elle permet de facilement prédire les espérances de vie selon le revenu à partir de la relation entre revenu et éducation.

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[5]Les données françaises ne sont pas disponibles pour une année précise mais correspondent à la moyenne obtenue sur une période de 5 ans. Pour les chiffres présentés dans cet article, il s'agit de la période 2009-2013. Ceci permet d'avoir accès à un plus grand nombre d'observations et donc d'obtenir des mesures plus exactes.

[6]Voir en annexe un détail de la méthode des moindres carrés pondérés.

Table 1.1: Espérance de vie à 30 ans et 60 ans selon le niveau d'éducation, 2014

	Hommes			Femmes		
	Primaire et 1er cycle secondaire	2eme cycle secondaire	Supérieur	Primaire et 1er cycle secondaire	2eme cycle secondaire	supérieur
	30 ans					
Bulgarie	36,3	44,7	47,2	45,4	50,6	51,9
Tchéquie	35,7	46,6	48,3	49,8	52	52,4
Danemark	45,9	49,2	51,6	50,8	53,3	54,3
Estonie	34,9	44,6	48,5	45,9	51,7	54,5
Finlande	46,1	48,7	51,5	52,4	54,6	55,8
France	46,8	51,2	53,1	54,1	56,7	57,1
Hongrie	36,4	44,7	48,1	46,6	51,1	51,9
Italie	49,0	53,6	53,5	54,4	57,2	57,2
Norvège	47,7	50,7	52,4	52,1	54,5	55,7
Pologne	37,9	44,2	49,9	49,1	51,8	54,2
Portugal	47,5	50,8	52,6	54,1	54,9	56,4
Roumanie	38,1	45	46,3	48,1	51	51,2
Suède	48,5	51,2	52,8	52	54,7	55,5
Moyenne	42,4	48,1	50,4	50,4	53,4	54,5
	60 ans					
Bulgarie	14,8	18,3	19,5	20,0	22,1	22,9
Tchéquie	14,2	19,2	21,6	23,2	23,2	24,8
Danemark	20,1	21,2	22,4	23,4	24,5	25,1
Estonie	13,6	18,2	20,2	21,9	23,6	25,3
Finlande	20,7	21,4	22,9	25,5	26,0	26,6
France	21,2	23,9	25,1	26,4	28,2	28,4
Hongrie	13,8	19,1	19,8	21,0	23,2	23,2
Italie	21,9	24,3	24,2	26,4	27,6	27,5
Norvège	20,9	22,4	23,5	24,6	25,8	26,5
Pologne	17,2	18,5	21,4	23,4	23,8	25,2
Portugal	21,4	22,6	23,7	25,9	26,3	27,1
Roumanie	16,3	18,9	18,7	21,5	22,7	22,5
Suède	21,9	22,6	23,6	24,9	25,6	26,3
Moyenne	18,5	21,0	22,2	23,8	25,0	25,6

Source: Eurostat (2017) et Insee (2017).
Note: Les chiffres pour la France sont une estimation moyenne pour la période 2009-2013.

Tout d'abord, les niveaux absolus d'éducation sont transformés en niveaux re-
latifs. En effet, la seule observation des diplômes obtenus par la population ne tient
pas compte de la taille relative des groupes par niveau d'éducation et pourrait avoir
des conséquences sur le statut relatif du diplôme. Entre les cohortes successives,
la taille des groupes d'éducation a changé. Aujourd'hui, les jeunes étudient plus
longtemps que les cohortes précédentes, ce qui fait que le statut socio-économique
obtenu suite à un certain diplôme a changé. De plus le secteur de l'éducation
et l'organisation de l'enseignement varient d'un pays à l'autre : l'utilisation d'un
concept relatif permet la comparaison. On utilise donc une méthode qui permet

l'application d'une régression linéaire sur la taille relative de chaque catégorie dans
la population d'un certain âge. Concrètement, le niveau d'éducation est approché
par une échelle continue de 0 à 100% dans laquelle chaque catégorie de diplôme est
représentée par sa taille relative dans la population. Cela permet de comparer à la
fois les extrêmes et l'ensemble de la distribution. La Figure 1.1 illustre la méthode
avec un exemple fictif. L'axe horizontal représente une distribution hypothétique
de la population selon le niveau d'éducation. La bande inférieure sous l'axe des
abscisses montre la part, dans la population, des personnes ayant un certain niveau
d'éducation. Dans notre exemple, 18% de la population (le premier groupe) a au
plus un diplôme de l'enseignement primaire. Le second groupe correspond à ceux
qui ont au plus un diplôme de l'enseignement secondaire et représente 54% de la
population, le troisième représente quant à lui 28%. Chaque niveau d'éducation est
donc représenté selon son poids dans la population.

Figure 1.1: Point milieu par catégorie d'éducation
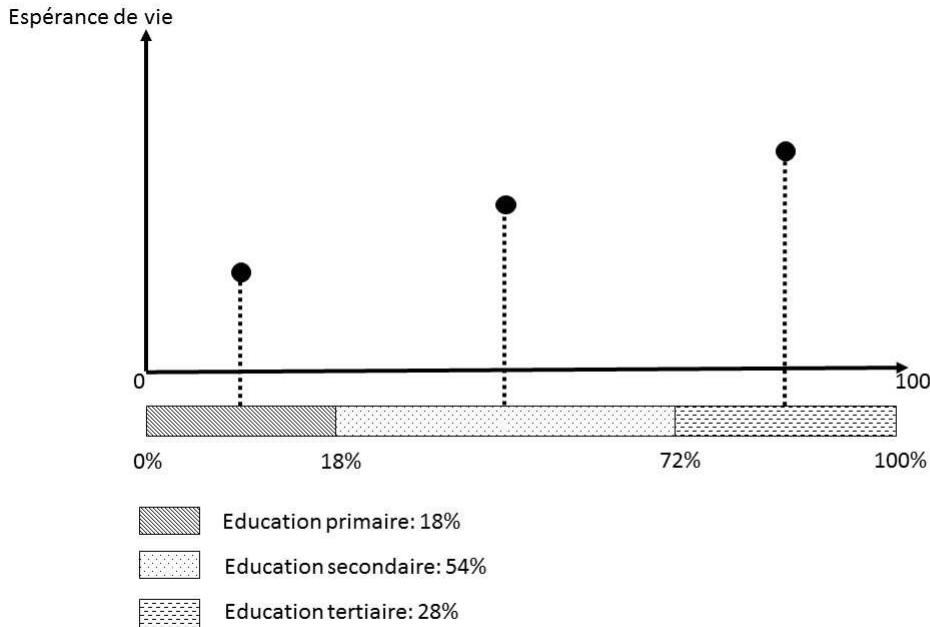
Cette échelle peut être considérée comme le reflet d'une répartition socio-économique
de la population. Au sein de cette distribution, nous faisons l'hypothèse que la
référence d'un niveau d'éducation est déterminée par sa position relative, définie
comme le point milieu (mid-point) de la proportion de la catégorie d'éducation dans
l'échelle ordonnée (Pamuk, 1985, 1988). Par exemple, si la première catégorie est

donnée par ceux qui ont au plus un diplôme de l'enseignement primaire et qu'ils représentent 18% de la cohorte, le point milieu sera 9%. Si ceux qui ont au plus un diplôme de l'enseignement secondaire représentent 54% de la population, les bornes de la catégorie considérée sur l'échelle ordonnée sont 18% et 72% et le point milieu est 45%.

A partir des données de l'enquête européenne sur les revenus et les conditions de vie (EU-SILC)[7], nous pouvons facilement calculer la distribution des niveaux d'éducation à chaque âge et obtenir pour chaque pays et chaque âge le point milieu correspondant. Pour plus de représentativité de nos échantillons par âge dans l'enquête EU-SILC, nous utilisons des groupes d'âge de 5 ans. Dans la suite, l'ensemble de nos estimations est donc réalisé par groupe d'âge. A titre d'exemple, le Tableau 1.2 donne la distribution des niveaux d'éducation pour le groupe d'âge 60-64 et pour l'année 2014.

Table 1.2: Distribution des niveaux d'éducation (%) par sexe en 2014 - âge 60-64

	Hommes			Femmes		
	Primaire et 1er cycle secondaire	2eme cycle secondaire	Supérieur	Primaire et 1er cycle secondaire	2eme cycle secondaire	supérieur
Bulgarie	30,2	52,8	17,0	29,0	48,8	22,2
Tchéquie	12,6	76,7	10,7	19,0	72,2	8,8
Danemark	17,4	51,2	31,4	24,8	40,1	35,1
Estonie	16,9	61,9	21,2	11,3	56,1	32,6
Finlande	28,1	39,1	32,8	24,0	42,4	33,6
France	28,5	50,9	20,6	42,6	39,3	18,1
Hongrie	15,3	67,7	17,0	28,7	54,7	16,6
Italie	50,3	38,1	11,6	58,6	31,3	10,1
Norvège	11,2	50,5	38,3	16,3	48,7	35,0
Pologne	20,1	69,2	10,7	24,8	63,7	11,5
Portugal	75,4	13,5	11,1	74,2	16,3	9,5
Roumanie	29,6	60,2	10,2	47,9	41,9	10,2
Suède	18,8	51,5	29,7	16,3	49,0	34,7

Source: estimations à partir de l'enquête EU-SILC.

Une fois la position de chaque catégorie d'éducation sur l'échelle déterminée, l'espérance de vie de chaque catégorie est associée à ce point milieu. Nous pouvons alors estimer une régression pondérée de l'espérance de vie selon le niveau d'éducation sur les points milieux de chaque catégorie d'éducation en tenant compte de la taille relative de la catégorie dans la population (sa prévalence). La pente de

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[7]L'enquête européenne sur les revenus et les conditions de vie (EU-SILC: European Union survey on income and living conditions) collecte à la fois des données transversales et longitudinales en vue d'établir des statistiques comparatives sur la répartition des revenus et l'inclusion sociale dans l'Union Européenne.

la droite de régression représente la différence de mortalité entre le bas et le sommet de l'échelle d'éducation. Le Tableau 1.3 donne les résultats de ces estimations par pays et par sexe pour la population âgée de 60 à 64 ans. Les mêmes estimations sont réalisées pour l'ensemble des groupes d'âge de notre échantillon[8]. Dans la majorité des pays, on obtient une relation significative entre éducation et longévité.

Les coefficients obtenus offrent alors la possibilité d'estimer l'espérance de vie pour chaque position sur l'échelle ordonnée de l'éducation. Ils peuvent également être utilisés pour estimer l'espérance de vie selon le revenu en faisant l'hypothèse que la hiérarchie sociale donnée par le revenu est similaire à celle obtenue par l'éducation. Pour ce faire, nous répartissons la population de la cohorte considérée en classes de revenu que nous ordonnons et faisons correspondre aux catégories d'éducation. En faisant l'hypothèse que le revenu et l'éducation donnent le même classement socio-économique[9], nous pouvons appliquer les coefficients obtenus pour l'éducation aux classes de revenu correspondantes dans l'échelle. L'espérance de vie selon le revenu est obtenue en appliquant les coefficients aux points milieu de chaque classe de revenu et en pondérant par la taille relative de la classe.

3   Résultats

Dans la suite, nous avons distingué 100 classes de revenu de montant équivalent (excepté la classe de revenu la plus élevée qui consiste en une classe résiduelle). Le but est d'avoir assez de classes pour identifier les éventuelles non-linéarités. Ces catégories changent d'un pays à l'autre afin de refléter les niveaux et la distribution des revenus observés[10]. A partir des coefficients de régression obtenus dans la section précédente, nous avons pu estimer l'espérance de vie pour chaque classe de revenu.

Nous avons réalisé les estimations pour plusieurs groupes d'âge et nous nous sommes limités à une fenêtre allant de 30 ans à 70 ans. La borne inférieure de 30 ans nous permet d'avoir des personnes, qui pour une majeure partie, ont terminé

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[8]Tous les résultats détaillés par groupe d'âge ainsi que les statistiques descriptives sont disponibles sur simple demande auprès des auteurs.

[9]Voir Psacharopoulos (1993) et Walker and Zhu (2001) pour un survol des études ayant démontré une corrélation positive entre niveau d'éducation et revenu.

[10]Dans la suite, nous considérons 99 classes de 100 Euros en Bulgarie, Pologne et Roumanie. En Hongrie, nous avons divisé la population en classes de 150 Euros et en Tchéquie, en classes de 200 Euros. Au Portugal, nous prenons des classes de 400 Euros et au Danemark, Finlande, France, Italie et Suède, nous utilisons des classes de 500 Euros. Les classes retenues pour la Norvège sont de 800 Euros.

Table 1.3: Régression pondérée de l'espérance de vie par niveau d'éducation - âge 60-64

	Bulgarie	Tchéquie	Danemark	Estonie	Finlande	France	Hongrie	Italie	Norvège	Pologne	Portugal	Roumanie	Suède
						Hommes							
Constante	13,510	17,178	20,117	14,490	20,456	20,961	15,355	20,418	20,911	15,924	19,009	16,626	21,832
	(1,764)	(2,068)	(0,856)	(2,181)	(0,003)	(0,058)	(2,260)	(0,043)	(0,647)	(1,590)	(0,010)	(1,752)	(0,091)
Point-milieu	0,081	0,042	0,029	0,083	0,031	0,045	0,064	0,054	0,035	0,058	0,059	0,039	0,023
	(0,026)	(0.014)	(0,002)	(0,033)	(0,000)	(0,002)	(0,037)	(0,002)	(0,009)	(0,057)	(0,000)	(0,039)	(0,002)
R2	0,870	0,583	0,995	0,766	0,839	0,952	0,747	0,867	0,981	0,795	0,821	0,572	0,934
						Femmes							
Constante	20,368	23,027	23,592	22,691	25,372	25,808	20,966	26,039	24,425	23,057	24,876	21,292	25,013
	(0,543)	(0,263)	(0,232)	(0,709)	(0,014)	(0,319)	(0,756)	(0,148)	(0,397)	(0,494)	(0,364)	(0,138)	(0,658)
Point-milieu	0,038	0,011	0,023	0,038	0,018	0,032	0,033	0,021	0,028	0,018	0,024	0,021	0,019
	(0,007)	(0,006)	(0,004)	(0,010)	(0,000)	(0,009)	(0,033)	(0,004)	(0,006)	(0,010)	(0,009)	(0,004)	(0,010)
R2	0,924	0,816	0,962	0,918	0,995	0,921	0,807	0,959	0,944	0,753	0,875	0,958	0,749

Note: les écarts-types sont présentés entre parenthèses.

leurs études. La borne supérieure est dictée par des raisons de disponibilité de données et de représentativité de l'échantillon. Toutes les estimations ont été réalisées pour des groupes d'âge de 5 ans et nous ne présentons ici qu'une sélection des résultats[11].

Le Tableau 1.4 présente les espérances de vie moyenne par sexe pour quatre groupes d'âge. A l'âge de 30-34, les hommes de notre échantillon ont en moyenne une espérance de vie de 47 ans. Ce chiffre cache cependant des réalités différentes selon les pays avec une espérance moyenne de 39 ans en Estonie et de presque 53 ans en Italie. La France est plutôt dans le haut du classement avec une espérance de vie à 30-34 ans de 50 ans chez les hommes.

L'espérance de vie chez les femmes, au même âge est de 53 ans avec un âge minimum de presque 51 ans observé en Hongrie et un âge maximum de 57 ans en France et en Italie. Dans les autres groupes d'âge, l'espérance de vie diminue évidemment mais on retrouve plus ou moins le même classement de pays avec la France et l'Italie où la longévité est la plus longue et l'Estonie, la Hongrie et la Bulgarie où elle est la plus courte. On retrouve le gradient est-ouest en Europe déjà identifié à partir des espérances de vie à la naissance (Avdeev et al., 2011).

L'espérance de vie des femmes est toujours plus grande que celle des hommes mais la différence varie d'un pays à l'autre. Cette différence tend à diminuer avec l'âge en terme absolu alors qu'elle augmente en terme relatif. En moyenne les femmes ont une espérance de vie supérieure de 13% à celle des hommes dans la catégorie d'âge 30-34 et de 21% chez les 60-64 ans.

Les Figures 1.2 et 1.3 montrent l'évolution de l'espérance de vie en fonction de la classe de revenu pour les quatre groupes d'âge du Tableau 1.4 en distinguant les hommes des femmes. Quel que soit le sexe ou l'âge, on observe une relation croissante entre le revenu et la longévité. Cette relation est non linéaire et concave. L'espérance de vie ne commence à augmenter qu'au-delà d'une certaine classe de revenu et montre des rendements décroissants; c'est-à-dire que l'augmentation de la longévité associée à une augmentation du revenu est de moins en moins importante. Parmi les plus riches, le gain d'espérance de vie est plus faible que parmi les plus pauvres. Ces résultats sont similaires à ceux déjà identifiés précédemment par Mackenbach et al. (2005), Dowd et al. (2011) et Blanpain (2018). Ces courbes sont également comparables aux résultats obtenus à un niveau macroéconomique par Preston (1975). En étudiant la relation entre revenu moyen et espérance de vie à la naissance par pays, Preston (1975) identifie également une relation croissante,

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[11]Les résultats détaillés des espérances de vie par pays, par sexe et par âge sont disponibles sur demande auprès des auteurs.

Table 1.4: Espérance de vie moyenne par groupe d'âge et sexe, 2014

	Hommes			
	30-34	40-44	50-54	60-64
Bulgarie	44,1	35,6	25,7	18,9
Tchéquie	46,7	37,0	27,9	19,5
Danemark	48,4	39,4	30,3	21,4
Estonie	39,1	32,8	23,9	17,1
Finlande	49,2	38,8	29,7	22,1
France	50,8	41,9	31,6	23,5
Hongrie	43,8	34,6	25,1	17,7
Italie	52,6	42,2	33,1	23,5
Norvège	49,5	40,5	31,1	22,5
Pologne	43,1	35,0	25,1	18,5
Portugal	51,5	40,5	32,1	23,0
Roumanie	46,2	35,4	27,1	18,6
Suède	51,4	40,9	31,4	22,8
Moyenne	47,1	37,7	28,5	20,5
	Femmes			
	30-34	40-44	50-54	60-64
Bulgarie	51,1	41,5	32,1	22,9
Tchéquie	52,1	42,3	32,7	23,7
Danemark	53,4	43,6	33,8	24,6
Estonie	51,2	42,2	32,8	24,1
Finlande	55,2	45,4	35,7	26,3
France	56,8	46,8	36,9	27,5
Hongrie	50,7	40,7	31,4	22,6
Italie	57,1	47,0	37,1	27,4
Norvège	54,5	44,7	34,7	25,7
Pologne	52,5	42,2	32,5	23,9
Portugal	56,0	45,9	36,0	26,7
Roumanie	51,4	41,7	32,0	22,9
Suède	54,9	45,0	35,3	25,8
Moyenne	53,4	43,5	33,9	24,7

concave et non linéaire entre l'espérance de vie et le revenu national par individu. Ces résultats permettent de mettre en évidence l'importance de la distribution des revenus dans l'explication de la relation entre revenu et longévité.

On observe des différences importantes entre sexe et entre pays. La sensibilité de l'espérance de vie au revenu n'est donc pas uniforme selon les classes de revenu considérées. Chez les hommes, le différentiel de longévité selon les revenus est plus important dans les anciens pays de l'Est de notre échantillon, particulièrement en Estonie, Pologne ou Roumanie bien que cela dépende également du groupe d'âge considéré. Par exemple, en Estonie, l'espérance de vie des hommes dans la première classe de revenu est de 33 ans chez les 30-34 ans et de 15 ans chez les 60-64 ans.

Figure 1.2: Espérance de vie par classe de revenu en 2014 - Hommes
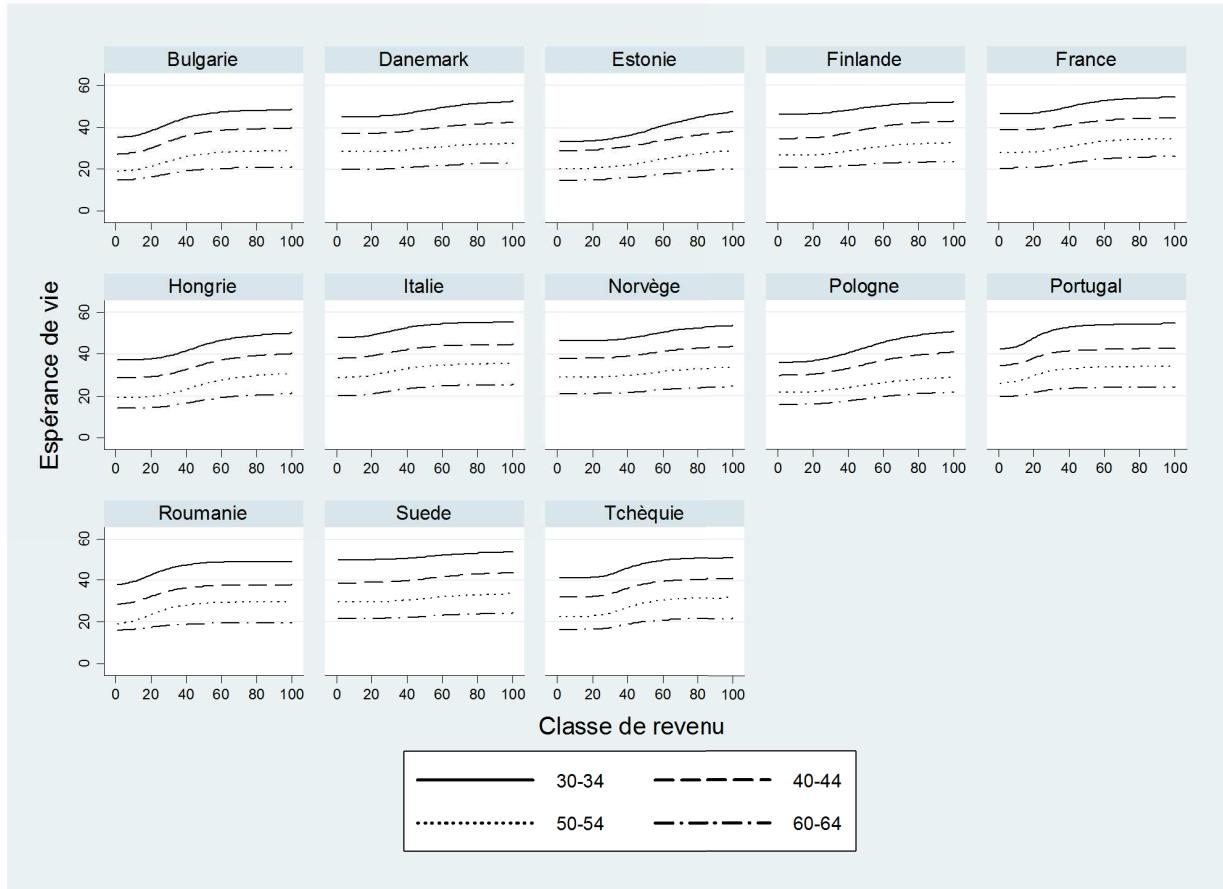
C'est le niveau le plus bas de l'échantillon et le différentiel par rapport aux plus riches est de 14 ans et 5 ans pour les groupes d'âge 30-34 et 60-64 respectivement. Le Portugal et l'Italie présentent un différentiel important dans la catégorie d'âge 60-64 avec un écart de 5 ans. Dans l'ensemble, ce sont les pays nordiques qui présentent le différentiel selon le revenu le plus faible à tous les âges. Alors qu'en Suède, l'espérance de vie à 60-64 ans est de 21,6 années pour les hommes et de 25 années pour les femmes, le gain pour les plus riches n'est que de 2,6 ans et 1,8 ans pour les hommes et les femmes respectivement. La France présente également un différentiel plutôt faible en comparaison avec les autres pays de l'échantillon.

De manière générale, le revenu semble avoir un rôle plus important chez les hommes que chez les femmes même si nous ne pouvons conclure à une quelconque causalité dans le cadre de ces estimations. Les différentiels selon le revenu y sont plus faibles à la fois en termes absolu et relatif pour tous les groupes d'âge considérés. En comparant les pays, on retrouve plus ou moins les mêmes évidences chez les femmes

Figure 1.3: Espérance de vie par classe de revenu en 2014 - Femmes
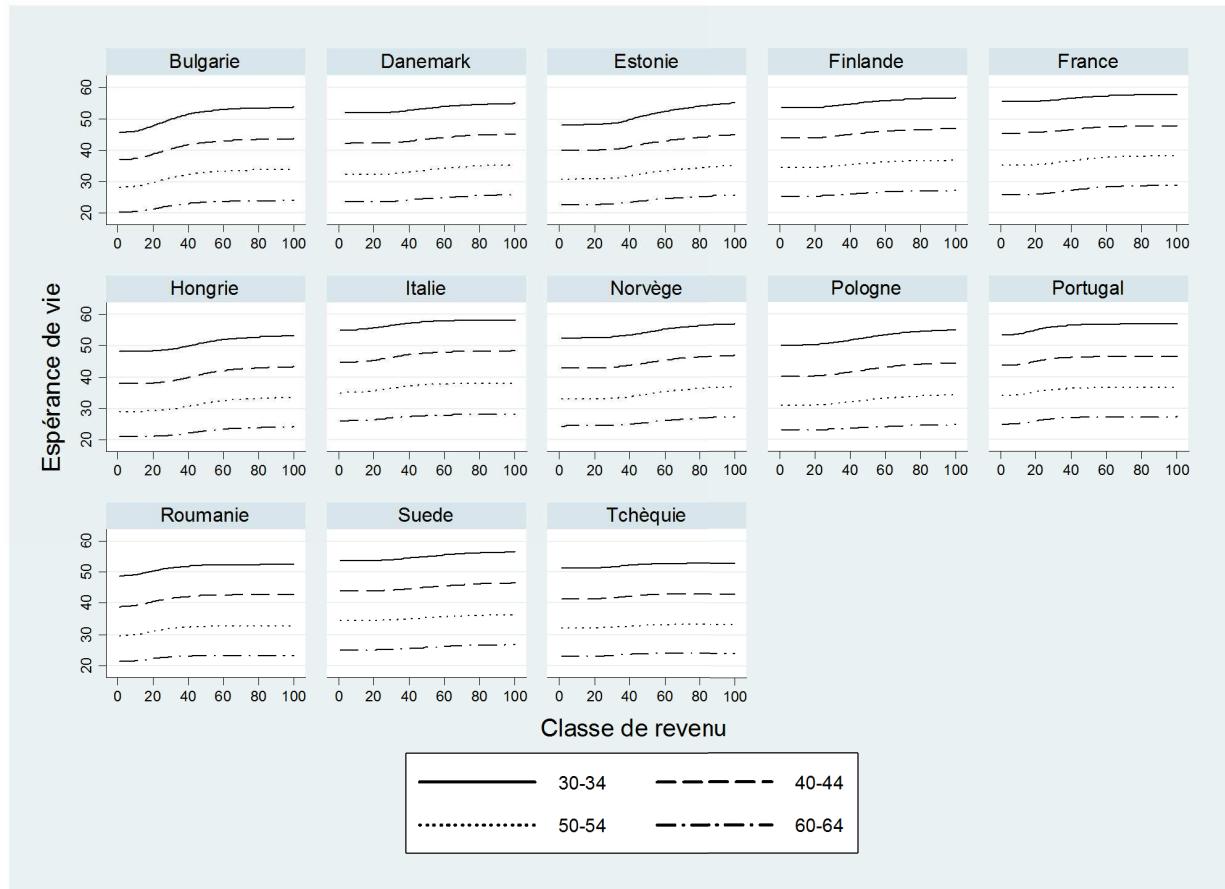
et chez les hommes, excepté les très bons résultats de la Tchéquie qui présente le différentiel d'espérance de vie le plus faible de l'échantillon pour les femmes: 1 année de différence entre les plus aisés et les moins aisés. Les résultats concernant la Tchéquie en termes de redistribution et d'inégalité sont similaires à ceux trouvés par Lefebvre and Pestieau (2012).

Ces résultats hétérogènes quant à la relation entre revenu et longévité peuvent également être contrastés avec les estimations antérieures réalisées pour d'autres pays développés. Kagamimori et al. (2009) montrent à partir d'un survol des études japonaises sur la relation entre santé et statut socioéconomique que la mortalité est significativement plus élevée pour les personnes provenant de municipalités où le revenu par habitant est plus faible. Aux Etats-Unis, Chetty et al. (2016) montrent également qu'un revenu plus élevé est associé à une plus grande longévité. L'écart entre les 1% les plus pauvres et les 1% les plus riches est 14,6 années pour les hommes et 10,1 années pour les femmes.

Afin d'évaluer les inégalités de longévité entre les différentes classes dans chaque pays, nous utilisons un indice basé sur les espérances de vie qui tient également compte de la distribution de la population selon le revenu. La proportion de chaque classe de revenu dans la population peut énormément varier selon les pays et les groupes d'âge et il peut être important d'en tenir compte afin d'obtenir un indice global de l'inégalité de longévité dans la population. A partir de l'indice de perte de vie (PALL pour Population Attributable Life Loss) développé par Shkolnikov et al. (2001), Deboosere et al. (2009) proposent un indice pondéré par la taille de la population présente dans chaque sous-catégorie. Pour un pays j, avec i classes de revenu, de population p^i, l'indice d'inégalité L_j s'écrit :

$$L_j = \sum_i (e_j^{max} - e_j^i) p_j^i$$

où e est l'espérance de vie.

En terme absolu, la somme des différences entre e_j^{max} et e_j^i représente l'augmentation totale de l'espérance de vie qu'on obtiendrait si toutes les classes de revenu avaient l'espérance de vie la plus longue. L_j capture à la fois l'effet de l'inégalité des espérances de vie et l'impact de la distribution des classes de revenu dans la population. Les résultats présentés dans le Tableau 1.5 confirment les analyses faites sur bases des différences absolues d'espérance de vie. On observe, une plus grande inégalité de longévité en Bulgarie, Hongrie, Pologne, Portugal et Roumanie et une plus grande égalité en Suède. Chez les femmes, la Norvège montre une inégalité de longévité assez forte à tous les âges alors que la Tchéquie obtient un indice en dessous de 1. On observe également que les indices d'inégalité diminuent avec l'âge. Deux effets peuvent expliquer cela. D'un côté, en terme relatif, le différentiel de longévité est plus faible chez les personnes âgées, ce qui peut être dû à un effet de sélection lié à la mortalité différentielle. Les plus pauvres ayant une espérance de vie plus courte disparaissent au fur et à mesure des âges et sont moins représentés dans ces catégories d'âge. Mais cette diminution peut être également liée au fait que la distribution des revenus à des âges élevés est de moins en moins inégalitaire et que les personnes plus âgées sont concentrées dans des classes de revenus moins « étalées » que les plus jeunes.

Table 1.5: Indice d'inégalité, L, de l'espérance de vie par groupe d'âge

	Hommes			
	30-34	40-44	50-54	60-64
	30-34	40-44	50-54	60-64
Bulgarie	6,59	6,19	4,95	3,01
Tchéquie	4,96	4,51	4,61	2,67
Danemark	3,63	2,64	1,95	1,49
Estonie	5,15	3,26	3,07	1,89
Finlande	2,86	4,05	2,98	1,44
France	3,66	2,67	3,15	2,56
Hongrie	6,38	5,73	5,70	3,43
Italie	3,77	3,20	3,30	2,65
Norvège	3,50	2,68	2,16	1,61
Pologne	6,44	4,86	3,14	2,56
Portugal	6,11	4,01	3,98	2,39
Roumanie	5,54	4,64	5,26	1,71
Suède	1,88	2,40	1,97	1,29
	Femmes			
	30-34	40-44	50-54	60-64
	30-34	40-44	50-54	60-64
Bulgarie	4,01	3,27	2,83	1,84
Tchéquie	0,84	0,89	0,58	0,54
Danemark	1,49	1,48	1,53	1,09
Estonie	2,71	1,92	1,62	1,15
Finlande	1,49	1,41	1,11	0,87
France	1,04	1,12	1,46	1,44
Hongrie	2,48	2,70	2,22	1,58
Italie	1,60	1,86	1,55	1,03
Norvège	2,12	1,95	1,88	1,36
Pologne	2,17	1,97	1,47	0,72
Portugal	1,78	1,51	1,33	1,20
Roumanie	1,82	1,93	1,65	1,05
Suède	1,38	1,25	0,95	0,87

4   Conclusion

Dans ce papier, nous estimons la relation entre espérance de vie et revenu afin
d'évaluer les inégalités de longévité entre les différentes classes de revenu pour treize
pays européens dont la France. En faisant l'hypothèse que la hiérarchisation de la
société selon le niveau d'éducation est la même que celle faite selon les classes de
revenu, nous utilisons les niveaux d'éducation et leur prévalence au sein de la pop-
ulation pour déterminer les niveaux et la distribution de l'espérance de vie selon les
revenus. Nos résultats montrent que longévité et revenu sont positivement corrélés,

quel que soit l'âge ou le sexe et que le différentiel de longévité selon le revenu est plus important chez les hommes que chez les femmes. En moyenne, chez les 30-34 ans, ce différentiel est de 10 ans chez les hommes et 4 ans chez les femmes. A 60-64 ans, il est plus faible et est de 4,6 ans chez les hommes et 2,3 ans chez les femmes. Géographiquement, la Finlande et la Suède ont le différentiel de longévité selon le revenu le plus faible pour les hommes et la Tchéquie montre une certaine égalité de longévité chez les femmes, quel que soit l'âge.

La méthode utilisée a cependant ses limites. Le différentiel d'espérance de vie selon le revenu a été estimé en étendant la méthode proposée par Pamuk (1985, 1988). Le calcul des données de revenu est donc basé sur celui des niveaux d'éducation, permis par l'hypothèse que nous faisons sur la hiérarchisation de la société. Les données concernant les classes de revenu sont mécaniquement liées à celles des niveaux d'éducation. Nous ne nous intéressons pas non plus à la possibilité d'une relation causale entre revenu et longévité et nos résultats sont donc descriptifs.

5 Annexes

5.1 Moindres carrés pondérés

La méthode des moindres carrés suppose que l'écart-type du terme d'erreur est le même pour toutes les variables explicatives. Cette hypothèse est difficile à tenir dans beaucoup de situation et il peut être utile d'appliquer des pondérations différentielles aux observations de la régression. La méthode des moindres carrés pondérés permet d'appliquer des pondérations différentielles et de ne pas traiter chaque observation de façon identique. Elle est donc particulièrement utile lorsque l'on suppose que les variances des résidus ne sont pas constantes (hétéroscédasticité) pour l'ensemble des variables indépendantes.

Plus concrètement, la méthode permet de donner à chaque observation sa propre influence sur l'estimation des paramètres du modèle et donc d'obtenir des estimations plus efficientes.

Si l'on tente d'estimer le modèle suivant:

$$y_i = \beta x_i + \varepsilon_i$$

Plutôt que de minimiser la sommes des carrés des résidus RSS tel que:

$$RSS = \sum_{i=1}^{n} (\varepsilon_i)^2$$

La méthode des moindres carrés pondérés minimise WS:

$$WSS = \sum_{i=1}^{n} w_i(\varepsilon_i)^2$$

Où w est le poids spécifique donné à chaque observation. Si ces poids sont tous égaux à l'unité, on retrouve la méthode des moindres carrés traditionnelle. En théorie, les poids sont l'inverse des valeurs des variances des résidus mais, en pratique, ces variances sont souvent inconnues. Comme elles sont souvent proportionnelles aux valeurs de la ou des variables indépendantes, on calcule les pondérations à partir de la distribution des observations.

Chapter 2

The informal care provision: What are the genuine incentives of children ?[1]

Summary of the chapter

Current population ageing in European countries is likely to result in an increasing number of people requiring long-term care (LTC). Despite the growing role of formal care -the market and the state-, close relatives remain the main caregivers. Using panel data from *Survey of Health, Ageing and Retirement in Europe* (SHARE), we examine the effects of (1) altruism, (2) the exchange motive, and (3) family norms on the informal care decision in an ascendant family model. These estimates suggest that altruism and the exchange motive are the drivers of the caregiver's decision. Furthermore, the empirical results are in favour of a North-South gradient since the motives driving the decision to care differ from one country to another. Finally, the results confirm well-known findings: women are the main caregivers but having siblings relieves them of the care burden.

1   Introduction

Most European countries are facing demographic ageing. This trend has strong implications for social security systems and raises the question of supporting people who need long-term care (LTC). LTC concerns disabled persons who are not able to get by with activities of daily while living alone, owing to old-age, such as bathing, dressing, feeding, toileting, transferring or walking. While the demand for care is increasing due to the ageing population, LTC supply seems limited. The occurence of the formal care is still marginal and studies have shown that older persons rely mainly on informal care.

Using panel data from the Survey of Health, Ageing and Retirement in Europe (SHARE), this paper analyzes the incentives of informal care provided by adult children to their old-age parents. We thereby focus on three determinants motivating children to transfer either income or time to their care-needing parents: (1) altruism, (2) exchange and (3) family norms.

Previous works have found both theoretical and empirical evidence supporting the validity of these determinants. Altruism and exchange are often put forward as being significant motives for transferring either money or time to another family member and many studies try to discriminate between both motives, leaving aside the role of norms (Alessie et al., 2014; Angelini, 2009; Cox and Rank, 1992). Other authors have focused on family norms using cultural transmission (Jellal and Wolff, 2002) or the demonstration effect (Cox and Stark, 1996). Both studies find empirical results in favor of family norms, suggesting that parents instill behavioral preferences in their children.

However, one of these motivations alone cannot entirely predict complex individuals' behaviors. To the best of our knowledge, the only paper that tests these three motives considering informal care supply in the same framework is Klimaviciute et al. (2017). Using cross-sectional data from SHARE, they find empirical evidence supporting the model of altruism and rejecting the exchange motive. They identify each of these determinants by looking at the relationship between informal care provided by adult children and downward transfers from parents to adult children. The analysis of these causal relationship permits them to conclude whether children's and parents' behaviors are driven by one of these three motives. However, they acknowledge that the theoretical predictions might be ambiguous since identifying which motive prevails is not always feasible.

Unlike Klimaviciute et al. (2017), we use panel data, which allows us to control for unobserved heterogeneity. Our goal is to identify how to measure altruism, exchange

and family norms. Based on the existing literature, we select three variables: charity activities measuring altruism, the role of bequests to define exchange, and mutual informal care provision measuring family norms. This original approach to define the main variables constitutes the major contribution of the present work.

The results suggest that altruism and the exchange motive are the main drivers of the caregiver's decision. Furthermore, the empirical results reveal a clear North-South gradient: LTC decision is mainly driven by the family norms for southern European countries, while altruism and exchange motives prevail for both northern and central European countries. Finally, our findings confirm well-known results: women are the main caregivers, and having siblings relieves the care burden. Robustness tests confirm our main results.

The rest of the paper is organized as follows. Section 2 describes the existing literature. Section 3 presents the data used in the analysis and discusses the empirical approach. The main results are reported in Section 4. Robustness tests with regard to the econometric strategy, as well as the endogeneity issue are presented in Section 5. Section 6 concludes.

2 Related literature

Becker (1976) stresses the importance of altruism in social interactions, in particular within the family. Hence, a person does not only want to maximize his own income, but also the income of his entire family. For example, since a parent is concerned about the well-being of his child, his utility function positively depends on both his consumption level and his child's well-being Becker (1991). This hypothesis is the starting point of inter-vivos transfers (e.g. money transfers) in a descendant altruistic model (i.e. transfers from parents to children). This model uses exogenous altruism, in the sense that parents cannot directly influence the likelihood of their children to be altruistic. It states that if family relationships would only be driven by altruistic thought, given changes in the children's and parents' wages will affect subsequent transfers in the same proportion.

Some authors have questioned the hypothesis of altruism defined with descendant inter-vivos transfers. For example, Hochguertel and Ohlsson (2007) ask whether parental transfers are compensatory by analysing whether parents give more to their poorest child. In other words, is the aim of the transfer to balance their children's financial resources? They find empirical evidence supporting that parents "gifts" can be considered as being compensatory since poorer children receive more than

their richer siblings. Yet, parents' transfers do not entirely balance the resources between siblings, suggesting the existence of the exchange model. Altonji et al. (1997) analyse an implication of the altruism model for parents who transfer money to their children. This model suggests that a one-dollar rise in the parents' wage and, at the same time, a one-dollar decrease in the children's wage leads to a one-dollar increase in the parents' transfer. Thus, altruism would imply a one-dollar increase in the transfer. However, their results show that the rise in the parents' transfer is smaller than the rise in the parents' wage. This result rejects the hypothesis of pure altruism (when there is no warm-glow motives).

Cox and Rank (1992) also try to discriminate between the altruism and the exchange motives when considering inter-vivos transfers. For the altruism model, they predicted that an increase in the child's wage would lead to a decrease in the probability of money transfers as well as in the amount given. On the contrary, for the exchange model, they predicted that an increase in the child's wage would imply a decrease in the probability of transferring but a rise in the amount given. Empirically, they validate the prediction of their exchange model. Furthermore, they find a positive relationship between the support provided by children to parents and transfers made by parents to their children. This tends to strengthen the significance of the exchange motive in a two-way transfer model. Based on the model of Cox (1987), Alessie et al. (2014) consider time transfers from children to parents in addition to money transfers from parents to children. Contrary to the altruism prediction, they find that, even though poorer children help they parents more than their richer siblings, parents do not give more to their poorer children.

Inter-vivos transfers are not the only way to transfer money or time: parents can also transfer money through bequests. Based on the pure altruism theory, parents give inheritance to their children regardless of any help. In the exchange mechanism, the child helps his parents for an implicit subsequent compensation. Some studies try to arbitrate between the altruism hypothesis or the exchange motive when considering bequests. They thus examine whether inheritance can impact caregivers' behavior. Bernheim et al. (1985) study whether parents use bequests to strategically influence the behavior of their children. They predict that children may be influenced by future bequests such that parents may drive their offspring's behaviors when they have siblings (i.e.: threat of disinheritance). They suggest that contacts between parents and children are more important when children are bequeathable, which confirms the bequest motive as part of a strategic behavior. Perozek (1998) reassesses the strength of the analysis of Bernheim et al. (1985). She wonders

whether parents can sway potential behavior through a bequest and finds that attention is not only affected by "bequeathability", but also by the size of the family: many siblings leads to less attention paid by each one to their parents. Her results turn weaker than those of Bernheim et al. (1985) but remain in the same line, supporting the bequest motive as a part of a strategic behavior. Thereupon, Angelini (2009) analyses whether attention from adult children to their parents (mainly via phone calls) is driven by pure altruism or by a strategic bequest motive. She studies whether parents use the threat of disinheritance to sway their child's "kindness". Her findings support the bequest motive in case of more than one beneficiary. Angelini (2009) furthermore distinguishes between two types of wealth: financial and real. The results show that children are more influenced by real wealth since they are not aware of the liquidities their parents hold. Indeed, it is easier to hide assets than houses.

Very few papers consider transfer motives from children to parents when the latters are dependent. Yet, using game theory, Hiedemann and Stern (1999) analyse chilren's and parents' characteristics and find that gender, number of siblings or distance between the children's and the parents' house, impact caregiving decisions. Engers and Stern (2002) confirm Hiedemann and Stern (1999)'s results that gender and distance are put forward as important explanatory variables in the caregiving decisions withtin the family.

Apart from exogenous altruism and exchange, family norms are also stressed as an important determinant for transfers from children to parents. Unlike altruism, which may be exogenously determined, family norms may be influenced by someone's behavior. Older people face both the risk of being dependent and the uncertainty of obtaining help. In order to reduce the uncertainty of receiving care, parents may influence their children's behavior by investing in their daily education and instilling in them specific family values. Indeed, some authors concede that individual preferences are part of a cultural transmission inside the family. Cavalli-Sforza and Feldman (1981) distinguish the "vertical transmission" (i.e.: offsprings see their parents as a cultural model) from the "oblique transmission" (i.e.: all the members' parental generation provide a set of cultural traits to the children). Their empirical findings support the "vertical transmission" and bear out the role of close relatives as the roots of children's behavior traits. Likewise, Bisin and Verdier (2001) study inter-generational cultural transmission of one's preference traits, based on his parents' socialization actions. In their paper, parents are imperfectly altruistic and decide whether to transmit cultural traits to their offspring or not. Ponthière (2013)

explains that parents who are sure to become dependent in one may can decide to incite their children to become more altruistic through a socialization process. This decision is, however, a arbitration between the high socialization cost and the potential benefit the parent will receive at old age. Jellal and Wolff (2002) study the cultural transmission of preferences. They point out two types of individuals: altruistic or selfish. Indeed, the probability of a child to become altruistic positively depends on the care her parents provided to their own old-age parents. They find empirical results in favour of cultural transmission, in that altruistic preferences survive over time.

Related, Cox and Stark (1996) study family norms by using the demonstration effect throughout three generations. The authors question whether the presence of a child increases the quantity of services provided by adult children to their elder parents when parents took care of their own parents in order to show their children the behaviour they would like them to adopt. The authors find evidence supporting the demonstration effect, since the presence of children positively impacts the transfers in time (e.g.: calls and visits) from adult children to their elder parents. Accordingly, parents may instill behavior preferences in their children in order to better face the uncertainty of being helped later. Cox and Stark (1996) conclude that family norms are intentionally shaped by the parents. According Canta and Pestieau (2013), children decide whether to care for their old-age parents or not, based on a norm conveyed in the family through the demonstration effect of Cox and Stark (1996). Supporting her parents represents a risky investment insofar as children have to this decision before knowing the degree of disability of their parents. If the parents do well in later life, children's investment turns out unfruitful. At the same time, the authors distinguish between two types of children: "traditional" (i.e.: the child follows the family norms) and "modern" (i.e.: the child does not follow the family norms). By investing in the demonstration effect, parents will be helped by their children, if "traditional", provided that they turn dependent. Otherwise, if their children are "modern", the efforts put in the demonstration process represent a sunk cost. Hence, the parents face the uncertainty of getting help, since children do not always follow a steady traditional behavior.

To summarize, while some studies analyse the determinants of inter-generational transfers, using either inter-vivos transfers or the bequest motive, in order to discriminate between altruism and exchange incentives, others focus on the significance of family norms whose transmission is still slightly black-boxed.

3 Data and empirical strategy

Let us now present the methodology used in this paper, as well as our data.

3.1 Model specification

The informal care decision (Y_{it}) is a function of altruism (A_{it}), exchange (E_{it}), norms (N_{it}) and a vector of socio-demographic controls *(z_{it})*. The following care decision equation is estimated for each individual i *(i=1,...,n)* in year t *(t=1,2)* using a binary response probit model :

$$P_{it} = Prob[Y_{it} = 1 \mid A_{it}, E_{it}, N_{it}, \mathbf{z_{it}}] = \Phi(\beta_1 A_{it} + \beta_2 E_{it} + \beta_3 N_{it} + \boldsymbol{\beta_4}(\mathbf{z_{it}}))$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution function.

3.2 Variables and descriptive statistics

We use data from the first two waves -2004 and 2006- of the Survey on Health, Ageing and Retirement in Europe (SHARE). SHARE is a cross-sectional and multi-disciplinary database that gathers representative samples from eleven participating countries: Austria, Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden and Switzerland. It comprises micro data on health, socio-economic status and personal characteristics of individuals aged 50 and over and their partners, irrespective of age.

In order to study the supply of informal care, the respondents are the adult children who decide whether to care for their old-age parents or not. Respondents younger than 50 are excluded to be sure that parents are over 65 since the likelihood to be dependent after this age is higher.

The dependent variable represents the children's decision to care for their parents. It is a dummy variable equal to one if respondents have helped their parents in the last year and zero otherwise. Based on the questionnaire, three types of help are considered: personal care, housework and administrative work. We focus on respondents who have helped their parents in the last twelve months prior the interview, regardless of the type of help provided and the frequency. In the rest of the paper, the sample is subdivided in two parts: the adult children whose both parents are alive and those who only one parent is still alive. This distinction is interesting insofar as the family structure impacts the decision to care. If both parents are alive,

it is more likely that the spouse of the dependent parent is the primary caregiver, so that their children are less likely to help them (Tennstedt et al., 1989, Allen et al., 1999). On the contrary, if the dependent parent lives alone, children become the primary caregivers.

Altruism, exchange and family norms are the main hypothetical explaining variables. As mentioned above, some authors have largely used the neutrality rule in order to discriminate between altruism and the exchange motive when inter-vivos transfers enter in consideration. They observed the child behavior given his and his parents' wages. We cannot apply this method since variables on the parents' income are not available in SHARE. Also, it is very difficult to define the meaning of altruism in an objective way insofar as common language biases it. In the literature, a purely altruistic person is often defined as someone whose welfare depends positively on others' (Becker, 1991). Smith (1981) defines altruism "*as an aspect of human motivation that is present to the degree that the individual derives intrinsic satisfaction or psychic rewards from attempting to optimize the intrinsic satisfaction of one or more other persons without the conscious expectation or participating in an exchange relationship whereby those others would be obligated to make similar/related satisfaction optimization efforts in return*".

In this paper, altruism is proxied by respondents who took part into voluntary activities outside the household during the last month. There exists a prolific literature dealing with the relationship between altruism and volunteering. While most of the authors acknowledge that altruism is a determinant explaining the participation in charity work, some of them recognize that altruism is only a minor reason out of many others. The literature distinguishes between "pure altruism" and "impure altruism". Andreoni (1990) explores a model of impure altruism, where people are assumed to get a "warm glow" from giving. Indeed, Smith (1981) shows that there is no "absolute form of human altruism". He cites several "egoistic" reasons explaining the decision to do volunteerism, such as psychic rewards, positive image in the community and ego enhancement. These reasons are almost impossible to observe in the data if the questionnaire has not been constructed for this purpose. Given our data restrictions, we measure (impure) altruism in this paper with the respondents' action to having taken part into voluntary activties outside the household in the last month, since part of the literature defines it as a determinant of the volunteerism decision.

Furthermore, we distinguish between intra-family altruism and extra-family altruism. Assuming the former, altruism would positively impact the informal care decision: the more the adult children took part into charity activities, the more

altruistic they are and the more they may help their disabled elders. Assuming
the latter, altruism would negatively impact the informal care decision: the more
the adult children took part into charity work, the less time they have to care
for their own parents. Thus, there may be a substitution between intra-family and
extra-family altruism. In this paper, the hypothesis of intra-family altruism is made.

Previous literature has proved that transfers do not only depend on altruism but
also on exchange considerations. According to Smith (1981), *"where one tries to
please another to a significant degree because one expects reciprocity, the degree of
selfishness is higher and the altruism lower than where no such exchange relationship
is contemplated"*. Bequests are a type of transfer which can appear under exchange.
Parents can use bequests both as a threat and a reward in order to shape their
children's attention. In the case of LTC, children care for their old-age parents,
but they could expect reciprocity through bequests. The aim of this paper is to
analyse whether being bequeathable impacts the supply care decision. More pre-
cisely, respondents are asked whether "they have chances to inherit money, including
property, in the next years". Obviously, if the parent is very ill, children will expect
to inherit soon, but the real question is whether the inheritance is worth to make
efforts to care old-age parents (see Vitaliano et al., 2003 ; Coe and Van Houtven,
2009; Schmitz and Westphal, 2015) for the literature on the impact of care provision
on caregivers' health and employment).

The third motive of caring considered is family norms. We wonder whether re-
spondents are induced to reproduce what they have observed and received inside the
family (Cavalli-Sforza and Feldman, 1981; Cox and Stark, 1996). In the survey, they
are asked whether "they have ever received any kind of help from family members
outside the household except the parents". We argue that if potential caregivers
have already been helped by family members in the past, they are more likely to
provide care to their own parents. Furthermore, family norms could either positively
or negatively impact the outcome. Indeed, either children have been helped by rel-
atives in the past and thus reproduce what they received and observed (positive
impact, idea of mimetism), or children have been helped by close relatives because
they were in a difficult situation and are not able to care for their parents (negative
impact). In the paper, we made the hypothesis of a positive impact of family norms
on children's decision to care.

Explanatory variables include gender, wealth, education, number of siblings, number of children and grandchildren, distance between the parents' and the respondents' households, marital status, occupation status and countries of residence. Given missing values and restrictions, our entire panel comprises 4890 observations. For 3697 of them, only one parent is alive and for 1193, both are parents are alive.

Table 2.1: Sample variable definitions and descriptive statistics

Variables	Definitions	%
Help	= 1 if respondent has helped a parent living outside the household in the last twelve months	29.3
Altruism	= 1 if respondent has done voluntary or charity work in the last month	15.4
Exchange	Likelihood respondent will receive an inheritance, including property and other valuables in the next ten years	39.1
Norms	= 1 if respondent has ever received any kind of help from a family member outside the household except the parents	8.7
Age	Age at interview	55.7
Gender	= 1 if respondent is female	52
Married	= 1 if respondent is married and living with spouse/husband	76.5
Sisters	Number of sisters	1.33
Brothers	Number of brothers	1.39
Grandchildren	Number of grandchildren	1.30
Children	Number of children	2.32
Education	Education level	2.99
Job	Current job situation of the respondent	
	Retired	18.81
	Employed or self-employed	58.40
	Unemployed	5.60
	Permanently sick or disabled	4.23
	Homemaker	12.94
Distance	Distance in km between parents' house and respondent's one	131.04
Wealth	Respondent's household net worth in Euro (100k)	9.4
Country	Country identifier	-

Table 2.1 reports the definitions of all the variables used in the model. The education level variable has been created based on the ISCED code[2]. The sample comprises 52 % of women and the mean age of the respondents is 55.7. Moreover, around 30 % of the respondents has provided care to their old-age parents in the last twelve months[3].

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[2]International Standard Classification of Education (ISCED) developed by UNESCO. The answer of 2.99 represents between 8 and 12 years of education depending on country-specific codes.

[3]Correlation between variables is controlled and correlation matrix is available upon request. Almost all coefficients are close to zero. This means that the level of correlation between variables is relatively low.

Figure 2.1: Informal care provision in Europe
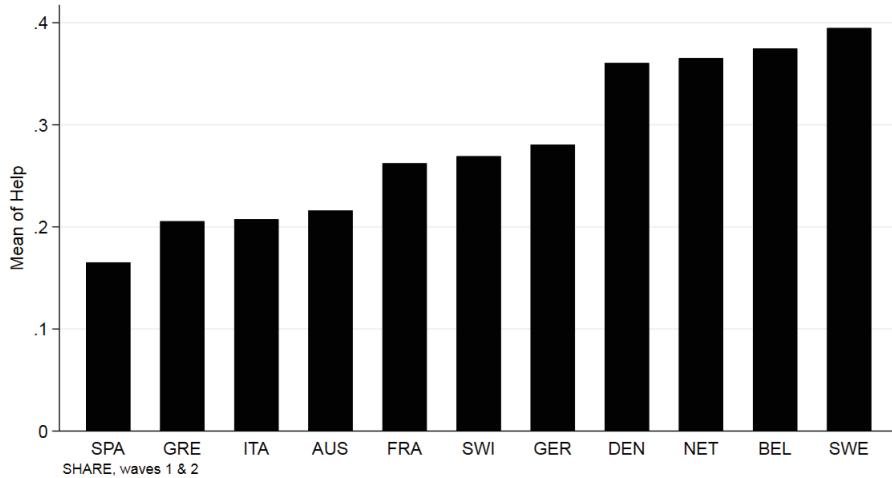
Figure 2.1[4] provides further descriptive statistics summarizing informal care provision. Country specific patterns are noteworthy: less than 25% of the respondents in Austria, Greece, Italy and Spain have helped their parents in the last twelve months. In contrast, on average, 35% of respondents in the Netherlands, Belgium, Denmark and Sweden have helped their parents. Based on these statistics, three country groups can be distinguished: northern European countries, exhibiting an above average level of informal care provision (Belgium, Denmark, Netherlands, Sweden), central European countries (France, Germany, Switzerland) and southern European countries (Austria[5], Greece, Italy and Spain).

4 Estimation results

4.1 Main results

The sample is divided in two parts: one part where adult children have only one parent alive and one part where they have both parents adult children still alive. As mentioned ealier, in the former, adult children are more likely to be the primary caregiver while in the latter, spouses are more likely to be the primary caregiver. The marginal effect probit estimates are presented in Table 2.2. In the first specification, altruism is significant and positively correlated with the care decision: the more

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[4]Following abbreviations refer, respectively, to: "SPA" Spain, "GRE" Greece, "ITA", Italy, "AUS" Austria, "FRA" France, "SWI" Switzerland, "GER" Germany, "DEN" Denmark, "NET" The Netherlands, "BEL" Belgium, "SWE" Sweden.

[5]Even though Austria is not located in the south of Europe, it has similar descriptive statistics than Greece, Italy and Spain. Kalmijn and Saraceno (2008) have found similar patterns.

altruistic the child, the more likely she decides to help her parents. The exchange variable is significant at the 0.01 level and has a positive effect on the care decision in both specifications. This means that a higher probability to inherit (inheritance from a parent to his child) leads to a higher probability to care for his parents. This highlights the role of exchange in the care decision and excludes altruism as being the only explanation of it. Family norms seem to have an effect on the care decision when one parent is alive while it has no impact when both are alive.

Considering other explicative variables, some results are in line with those presented in the literature. The number of sisters is negatively correlated with the dependent variable. This means that the more siblings a potential caregiver has, the less likely it is that she decides to help his parents. She may rely on her siblings to care for their parents. In other words, having sisters reduces the workload. The coefficient of education level is highly significant and positive. Respondents with a high level of education tend to help their own parents more. Additionally, distance between the children's and parents' households has a strong negative effect on the informal care decision: if the child lives far away from her parents' house, she is less able to take care of them. Neither wealth nor being married have an effect on the decision to care.

4.2 Results by country groups

Results using country groups are presented in Table 2.3. We aim at capturing differences between countries in terms of transfer motivations. Based on the descriptive statistics, three groups are considered: northern European countries (Belgium, Denmark, the Netherlands, Sweden), central European countries (France, Germany, Switzerland) and southern European countries (Austria, Greece, Italy and Spain). The first two coefficients - altruism, exchange - are significant and positively correlated with the care decision when one parent is alive, except in southern European countries. These results are similar to those found in the main regression. Another result supports the presence of a North-South gradient: while the family norms variable is weakly significant in the main regression presented in Table 2.2, the coefficient is significant ($p<0.001$) when one parent is alive for southern European countries only. An intuitive explanation would be the strong family ties. Kalmijn and Saraceno (2008) analyse whether Southern European countries are more "familialistic in their culture" than Western and Northern European countries. They establish a ranking of the most familialistic countries in Europe; the first four are

Table 2.2: Effects of altruism, exchange and norms on care decision using probit marginal effects

Marginal effects: care decision	One parent is alive	Both parents are alive
Altruism	0.066***	0.010
	(0.02)	(0.04)
Exchange	0.001***	0.001***
	(0.00)	(0.00)
Norms	0.049*	-0.019
	(0.03)	(0.06)
Female	0.094***	0.114***
	(0.02)	(0.03)
Married	0.017	0.016
	(0.02)	(0.04)
Sisters	-0.028***	-0.032**
	(0.01)	(0.01)
Brothers	-0.008	0.004
	(0.01)	(0.01)
Grandchildren	-0.006	-0.003
	(0.00)	(0.01)
Children	-0.013	-0.033*
	(0.01)	(0.02)
Education	0.025***	0.031***
	(0.01)	(0.01)
Current job situation		
Retired	Ref	Ref
Employed or self-employed	0.018	-0.117**
	(0.02)	(0.05)
Unemployed	0.014	-0.144*
	(0.04)	(0.09)
Permanently sick or disabled	-0.082*	-0.067
	(0.05)	(0.09)
Homemaker	0.024	-0.131**
	(0.03)	(0.07)
Wealth	-0.000	-0.000
	(0.00)	(0.00)
Distance	-0.072***	-0.047***
	(0.01)	(0.01)
Countries	Included	Included
Observations	3692	1191

Standard errors are in parentheses.
* p<0.10, ** p<0.05, *** p<0.010

Greece, Spain, Italy and Austria. Their results are in line with those presented in Table 2.2[6].

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[6]We re-estimate the model presented in Table 2.2 using these six specifications and excluding respondents living in co-residency with their own parents. Results are similar to the baseline ones and are available upon request.

Table 2.3: Effects of altruism, exchange and norms on care decision by European country groups using Probit marginal effects.

Marginal effects: care decision	One parent is alive			Both parents are alive		
	North	Central	South	North	Central	South
Altruism	0.075*	0.069*	0.067	-0.088	0.046	0.050
	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.09)
Exchange	0.001***	0.001**	0.001**	0.003***	-0.000	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Norms	-0.008	0.060	0.127***	0.027	-0.115	0.096
	(0.05)	(0.05)	(0.04)	(0.07)	(0.10)	(0.10)
Female	0.149***	0.024	0.094***	0.129**	0.053	0.086*
	(0.04)	(0.02)	(0.03)	(0.06)	(0.04)	(0.05)
Married	0.070*	-0.016	-0.032	0.004	0.005	0.042
	(0.04)	(0.03)	(0.03)	(0.05)	(0.03)	(0.06)
Sisters	-0.043***	-0.011	-0.027***	-0.028	-0.024	-0.006
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Brothers	-0.006	-0.025**	0.005	0.032*	-0.009	-0.014
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Grandchildren	-0.004	-0.002	-0.014	0.001	-0.003	-0.028
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.03)
Children	-0.020	0.002	-0.014	-0.035	-0.007	-0.061**
	(0.02)	(0.01)	(0.01)	(0.03)	(0.02)	(0.03)
Education	0.016	0.017*	0.036***	0.010	0.026	0.026
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Current job situation						
Retired	Ref	Ref	Ref	Ref	Ref	Ref
Employed or self-employed	0.068	-0.002	-0.026	-0.168*	-0.050	-0.056
	(0.05)	(0.03)	(0.03)	(0.09)	(0.06)	(0.06)
Unemployed	-0.023	0.047	-0.014	-0.212	-0.054	-0.101
	(0.07)	(0.05)	(0.06)	(0.14)	(0.07)	(0.16)
Permanenlty sick or disabled	-0.135*	-0.065	0.034	-0.046	-0.052	0.000
	(0.08)	(0.06)	(0.10)	(0.12)	(0.11)	(.)
Homemaker	0.006	-0.009	0.012	-0.097	-0.015	-0.098
	(0.07)	(0.05)	(0.04)	(0.13)	(0.07)	(0.08)
Wealth	0.000	-0.001	-0.002	-0.001	0.000	0.007
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Distance	-0.111***	-0.040***	-0.042***	-0.062***	-0.021	-0.045***
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Countries	Included	Included	Included	Included	Included	Included
Observations	1621	911	1160	492	375	321

Standard errors are in parentheses.
* p<0.10, ** p<0.05, *** p<0.010

Looking at the last three columns - both parents are alive - the effect of altruism has disappeared while exchange effect remains stable in northen European countries. Another interesting result is the gender of caregivers: in northern and southern European countries, being a woman increases the probability to supply care while

gender has no effect in the central European countries. This means that the result about caregiver's gender is not confirmed in the central European countries.

5 Robustness tests

We perform three different robustness tests in order to confirm the validity of our results. First, we check whether findings remain constant when using different estimators. Second, we run the same regressions as those presented before after having redefined the dependent variable and and the notion of altruism in this paper. Finally, we discuss the problem of endogeneity, especially due to potential simultaneity between the variable of exchange and the informal care decision.

5.1 Alternative econometric specifications

Table 2.4 shows the clustered probit and logit estimates of our three variables of interest[7]. As we suspect the care decision to be correlated among the people living in a same country, the standard errors are clustered at the country level in Probit regressions. The efficiency of the formal care in each country may indeed impact the informal care decision, and act as a substitute. Thus, data might be correlated within countries through a common unobserved specific pattern (Cameron and Trivedi, 2005: the formal care.

We notice that the significance level as well as the sign of the correlation of our main variables of interest (altruism, exchange, norms) remain unaltered in comparison to the specifications presented in Table 2.2. Furthermore, the magnitude of the marginal effects is similar between clustered probit and logit. These findings permit us to conclude that our results are not driven by the use of estimators.

5.2 New definitions for both the dependent variable and altruism

Let us now redefine the notions of informal care and altruism used in this paper. An altruistic caregiver has been defined as someone who took part voluntarily in charity activities in the last month. However, "charity activities" have not been precisely defined in the questionnaire. In order to strenghen our definition of altruism, we add a condition of frequency: henceforth, we use a categorical variable indicating

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[7]Detailed results are in Appendix, Table 2.7.

Table 2.4: Effects of altruism, exchange and norms on care decision using Probit clustered and Logit specifications.

	Marginal effects: care decision			
	Probit clustered		Logit	
	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive
Altruism	0.059***	0.014	0.066***	0.003
	(0.01)	(0.04)	(0.02)	(0.03)
Exchange	0.001***	0.001***	0.001***	0.001***
	(0.00)	(0.00)	(0.00)	(0.00)
Norms	0.044*	-0.023	0.048*	-0.007
	(0.02)	(0.06)	(0.03)	(0.04)
Countries	Included	Included	Included	Included
Controls	Included	Included	Included	Included
Observations	3692	1191	3692	1191

Standard errors are in parentheses.
In the two first columns, standard errors are clustered at the country level.
* p<0.10 , ** p<0.05 , *** p<0.01

the time spent taking part in charity activities. The definition of the remaining variables stay unchanged. Table 2.5[8] presents the probit regressions using this new definition. We observe that taking part in charity activities almost daily increases the probability of giving help compared with no charity activity involvment. Assuming that charity activities reflects one's altruism, the hypothesis of intra-familial altruism is held: the more the adult children took part into charity activities, the more altruistic they are and the more they may help their parents.

The definition of the care decision may also be challenged. It considers respondents living outside their parents' house and declaring having helped them in the last twelve months. This definition may however be strenghen by adding a condition on the frequency of helping actions from the adult children. Thus, we now use a discrete variable that represents the frequency of help scored from 0 (no help provided) to 3 (help provided almost weekly or daily). We estimate a standard linear regression. Results are in the last two columns of Table 2.5. While the effect of altruism becomes weaker compared with our main specification, the impact of the exchange variable remains highly significant, meaning that being bequeathable increases the frequency of care.

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[8]Detailed results are in Appendix, see Table 2.8.

Table 2.5: Effects of altruism, exchange and norms on care decision using Probit marginal effects - new definitions for both altruism and the dependent variable.

	Probit: Marginal effects		OLS	
	Help decision		Help (bis) decision	
	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive
Altruism (bis)				
No charity activity	Ref	Ref	-	-
Charity activities less often	0.068*	-0.051	-	-
	(0.04)	(0.03)		
Charity activities almost weekly or daily	0.065**	0.038	-	-
	(0.03)	(0.03)		
Altruism	-	-	0.094*	0.024
			(0.05)	(0.08)
Exchange	0.001***	0.001**	0.002***	0.002***
	(0.00)	(0.00)	(0.00)	(0.00)
Norms	0.049*	-0.004	0.068	-0.111
	(0.03)	(0.02)	(0.06)	(0.11)
Countries	Included	Included	Included	Included
Controls	Included	Included	Included	Included
Observations	3692	1191	3692	1191

Standard errors are in parentheses.
* $p<0.10$, ** $p<0.05$, *** $p<0.010$

Now, the informal care decision may also depend on the type of help procured by the adult children to their parents: administrative work, housework and personal care. Table 2.6[9] shows the estimation results of our three variables of interest, depending on the type of help, by estimating Probit marginal effects. We observe that altruism and exchange are still significant when one parent is alive which confirms the results of the initial regression. However, the coefficient of norms is now only significant when one parent is alive and in need of personal care.

[9]Detailed results are in Appendix, see Table 2.9.

Table 2.6: Effects of altruism, exchange and norms on care decision considering three types of help -housework, administrative chores and personal care - using Probit marginal effects.

	Marginal effects: care decision					
	Housework		Administrative		Personal care	
	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive
Altruism	0.053***	-0.003	0.047***	0.002	0.040***	0.009
	(0.02)	(0.03)	(0.02)	(0.00)	(0.01)	(0.01)
Exchange	0.001***	0.001***	0.001***	0.000	0.000***	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Norms	0.032	-0.007	-0.007	-0.008	0.034**	-0.005
	(0.02)	(0.05)	(0.02)	(0.01)	(0.02)	(0.01)
Countries	Included	Included	Included	Included	Included	Included
Controls	Included	Included	Included	Included	Included	Included
Observations	3692	1191	3692	1191	3692	1142

Standard errors are in parentheses.
* $p<0.10$, ** $p<0.05$, *** $p<0.010$

5.3 Endogeneity issues

We now finish by discussing the presence of potential endogeneity bias. Endogeneity has to be controlled in order to correct for a potential bias which would underestimate or overestimate the impact of our variables of interest on the informal care supply. More precisely, it would be interesting to control for the simultaneity of the exchange variable, which could be the source an endogeneity bias: does the child decide to help his parents in order to increase his chances to inherit in the future, or does he believe to increase his chances to inherit because of helping his parents ? The previous estimations suggest that the care decision is explained by the bequeathability of a potential caregiver. Yet, the chances to inherit may be determined by the care decision of the child. In order to tackle this issue, the use of instrumental variables would be suitable. Since the variable of exchange might be endogenous, its lagged variables could be used as an instrument. The advantage of a lagged variable is that it is directly correlated with the endogenous regressor and indirectly linked to the outcome. Furthermore, it is available in the questionnaire. Unfortunately, the sample is observed through two waves only, and the level of attrition is too high to use a lagged variable as an instrument. This prevents us from controlling for the potential endogeneity sources that might bias our results.

6 Conclusion

This paper analyses the informal care decision motives, that is, the decision of adult children to care for their parents by helping them with various tasks that have become too difficult to execute. Based on previous literature, we have identified three main motives explaining the care supply: altruism, the exchange motive and family norms. Using a European panel database, we estimate the significance of the three main determinants mentioned above and a set of control variables.

The empirical results are in line with those found in the literature. We indeed find a positive relationship between the care decision and altruism. Furthermore, the exchange variable impacts the informal care decision positively. These results exclude the model of pure altruism, saying that there is no warm-glow motives. Nevertheless, results concerning family norms are not stable, so that we cannot conclude that it plays a significant role in the care decision process. This may be explained by the definition of norms we used in this paper.

These results have, however, to be interpreted cautiously. First, if we assume that informal and formal care supply are substitutes, one has to take into account the social security system features of each country. In a given country, children may not help their parents as much as in another country because its social security system is very effective and might act as a substitute for informal care. These differences have to be taken into consideration; for instance, by modelling the formal care implication degree of the social security system for each country. Nevertheless, understanding motivations of the children's informal care decision remains important to allow policy-makers to complement each country's formal care offer by implementing appropriate policies.

Second, our analysis focus on the decision to care decision. We do not study the determinants of the time or money amount provided to help. In fact, children may not be able to help their parents because they do not have enough time to do it. Likewise, they may pay (or they contribute to pay) private services, such as employing a cleaner or a home helper.

Third, we work with a panel database composed of two waves. However, it is plausible that family norms evolve over time. It would thus be interesting to conduct this analysis using more waves in order to detect changes in family behaviors and confirm the results of our paper. Using more waves would also have allowed us to deal with endogeneity issues using lagged variables as instruments.

7 Appendices

7.1 Detailed results

Table 2.7: Effects of altruism, exchange and norms on care decision using clustered Probit and Logit specifications

	Marginal effects: care decision			
	Probit clustered		Logit	
	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive
Altruism	0.059***	0.014	0.066***	0.003
	(0.01)	(0.04)	(0.02)	(0.03)
Exchange	0.001***	0.001***	0.001***	0.001***
	(0.00)	(0.00)	(0.00)	(0.00)
Norms	0.044*	-0.023	0.048*	-0.007
	(0.02)	(0.06)	(0.03)	(0.04)
Female	0.083***	0.096***	0.096***	0.084***
	(0.02)	(0.02)	(0.02)	(0.03)
Married	0.015	0.014	0.019	0.014
	(0.02)	(0.03)	(0.02)	(0.03)
Sisters	-0.025***	-0.025***	-0.028***	-0.024**
	(0.00)	(0.01)	(0.01)	(0.01)
Brothers	-0.007	0.003	-0.009	0.003
	(0.01)	(0.01)	(0.01)	(0.01)
Grandchildren	-0.005	-0.003	-0.006	-0.002
	(0.01)	(0.01)	(0.00)	(0.01)
Children	-0.012	-0.028*	-0.013	-0.025*
	(0.01)	(0.01)	(0.01)	(0.01)
Education	0.022***	0.025***	0.025***	0.024**
	(0.01)	(0.01)	(0.01)	(0.01)
Current job situation				
Retired	-	-	-	-
Employed or self-employed	0.016	-0.102***	0.018	-0.126*
	(0.03)	(0.03)	(0.02)	(0.08)
Unemployed	0.012	-0.123**	0.016	-0.141*
	(0.04)	(0.06)	(0.04)	(0.08)
Permanently sick or disabled	-0.067***	-0.059	-0.073*	-0.084
	(0.02)	(0.06)	(0.04)	(0.11)
Homemaker	0.021	-0.116**	0.024	-0.135*
	(0.04)	(0.05)	(0.03)	(0.08)
Wealth	-0.000	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Distance	-0.063***	-0.039***	-0.073***	-0.035***
	(0.01)	(0.01)	(0.01)	(0.01)
Countries	Included	Included	Included	Included
Observations	3692	1191	3692	1191

Standard errors are in parentheses.
In the two first columns, standard errors are clustered at the country level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.7 reports detailed results of estimations using clustered Probit and Logit specifications. It refers to Table 2.4 of Section 2.

Table 2.8: Effects of altruism, exchange and norms on care decision using Probit marginal effects - new definitions for both altruism and the dependent variable.

	Probit: Marginal effects		OLS	
	Help decision		Help (bis) decision	
	One parent is alive	Both parent are alive	One parent is alive	Both parents are alive
Altruism (bis)				
No charity activity	Ref	Ref	-	-
Charity activities less often	0.068*	-0.051	-	-
	(0.04)	(0.03)		
Charity activities almost weekly or daily	0.065**	0.038	-	-
	(0.03)	(0.03)		
Altruism	-	-	0.094*	0.024
			(0.05)	(0.08)
Exchange	0.001***	0.001**	0.002***	0.002***
	(0.00)	(0.00)	(0.00)	(0.00)
Norms	0.049*	-0.004	0.068	-0.111
	(0.03)	(0.02)	(0.06)	(0.11)
Female	0.094***	0.053**	0.223***	0.317***
	(0.02)	(0.02)	(0.04)	(0.06)
Married	0.017	0.010	0.043	0.088
	(0.02)	(0.02)	(0.04)	(0.07)
Sisters	-0.028***	-0.015*	-0.053***	-0.015
	(0.01)	(0.01)	(0.01)	(0.02)
Brothers	-0.008	0.002	-0.011	0.009
	(0.01)	(0.01)	(0.01)	(0.02)
Grandchildren	-0.006	-0.002	-0.010	0.002
	(0.00)	(0.00)	(0.01)	(0.02)
Children	-0.013	-0.017*	-0.021	-0.060**
	(0.01)	(0.01)	(0.02)	(0.03)
Education	0.025***	0.015*	0.033**	0.045**
	(0.01)	(0.01)	(0.01)	(0.02)
Current job situation				
Retired	Ref	Ref	Ref	Ref
Employed or self-employed	0.018	-0.057*	-0.034	-0.359***
	(0.02)	(0.03)	(0.05)	(0.10)
Unemployed	0.014	-0.067	0.018	-0.351**
	(0.04)	(0.05)	(0.08)	(0.15)
Permanently sick or disabled	-0.082*	-0.033	-0.174*	-0.274*
	(0.05)	(0.04)	(0.09)	(0.16)
Homemaker	0.024	-0.064*	0.011	-0.377***
	(0.03)	(0.04)	(0.07)	(0.12)
Wealth	-0.000	-0.000	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Distance	-0.072***	-0.023**	-0.158***	-0.089***
	(0.01)	(0.01)	(0.01)	(0.02)
Constant	-	-	1.182***	0.918***
			(0.12)	(0.22)
Countries	Included	Included	Included	Included
Observations	3692	1191	3692	1191

Standard errors are in parentheses.
* $p<0.10$, ** $p<0.05$, *** $p<0.010$

Table 2.8 reports detailed results of estimations using alternative definitions for both altruism and the dependent variable. It refers to Table 2.5 of Section 2.

Table 2.9: Effects of altruism, exchange and norms on care decision considering three types of help -housework, administrative chores and personal care - using Probit marginal effects.

	Marginal effects: care decision					
	Housework		Administrative		Personal care	
	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive	One parent is alive	Both parents are alive
Altruism	0.053***	-0.003	0.047***	0.002	0.040***	0.009
	(0.02)	(0.03)	(0.02)	(0.00)	(0.01)	(0.01)
Exchange	0.001***	0.001***	0.001***	0.000	0.000***	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Norms	0.032	-0.007	-0.007	-0.008	0.034**	-0.005
	(0.02)	(0.05)	(0.02)	(0.01)	(0.02)	(0.01)
Female	0.075***	0.088***	0.026**	0.005	0.079***	0.015
	(0.02)	(0.03)	(0.01)	(0.00)	(0.02)	(0.01)
Married	0.016	0.002	0.007	0.002	-0.004	0.002
	(0.02)	(0.03)	(0.01)	(0.00)	(0.01)	(0.00)
Sisters	-0.022***	-0.017	-0.020***	-0.003	-0.009**	-0.001
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Brothers	-0.007	0.005	-0.006	-0.002	0.003	-0.000
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Grandchildren	-0.004	-0.002	-0.003	0.000	-0.001	0.001
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Children	-0.014*	-0.023	-0.010	-0.002	-0.006	-0.004
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)
Education	0.012**	0.020*	0.020***	0.004	0.010***	0.001
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Current job situation						
Retired	Ref	Ref	Ref	Ref	Ref	Ref
Employed or self-employed	0.023	-0.133**	0.001	-0.004	-0.019	-0.007
	(0.02)	(0.06)	(0.02)	(0.01)	(0.01)	(0.01)
Unemployed	0.037	-0.131	-0.003	-0.006	-0.003	-0.004
	(0.04)	(0.08)	(0.03)	(0.01)	(0.02)	(0.02)
Permanenlty sick or disabled	-0.066**	-0.137*	-0.040	0.024	-0.018	-
	(0.03)	(0.08)	(0.03)	(0.04)	(0.02)	
Homemaker	0.047	-0.114	0.004	-0.007	0.009	-0.012
	(0.03)	(0.07)	(0.02)	(0.01)	(0.02)	(0.01)
Wealth	-0.000	-0.000	-0.000	-0.000	-0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Distance	-0.059***	-0.038***	-0.034***	-0.003	-0.017***	-0.003
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Countries	Included	Included	Included	Included	Included	Included
Observations	3692	1191	3692	1191	3692	1142

Standard errors are in parentheses.
* p<0.10, ** p<0.05, *** p<0.010

Table 2.9 reports detailed results of estimations considering three types of help. It refers to Table 2.6 of Section 2.

Chapter 3

Informal caregivers and life satisfaction: Empirical Evidence From the Netherlands[1]

Summary of the chapter

The impact of informal care provision on life satisfaction remains an unsolved puzzle. Because of reverse causality and time varying unobserved variable biases, simple cross-sectional estimations or fixed effect models may provide unclear causal relationships of the informal care supply on life satisfaction.

Using panel data from *Longitudinal Internet Studies for the Social Sciences* (LISS) for The Netherlands over the period 2009-2018, we first estimate a simple Ordinary-Least-Square (OLS) with fixed effect model analysing the impact of informal care on caregivers' life satisfaction. To address endogeneity issues, we then apply a panel based GMM methodology to estimate a dynamic model of life satisfaction. We find that taking into account endogeneity biaises slightly increases the negative impact of providing informal care on life satisfaction compared with an OLS with fixed effect approach. Further, we show that after 5 years of regular support, careers adapt to their role. The specificity of care also matters. Among caregivers, providing support to someone living in the same household or being a family caregiver has a stronger negative impact on life satisfaction. Additionally, the detrimental effect of providing care is larger for women, individuals being in co-habitation with children and employed or self-employed individuals.

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1 Introduction

An important share of individuals are brought to provide informal care to older people, working age adults, young people and children with disability as well as to people living with mental health problems. Estimates indicate that on average 34,4% of the European population provides informal care Verbakel et al. (2017). This trend is likely to speed up against the background of ageing population and growing needs for long term care. For policy makers informal care is seen as a cost-effective solution of preventing institutionalization and enabling care recipient to remain at home. These advantages, however, may be offset by indirect costs such as, reduced employment, possible loss in human capital and higher health care expenditures for caregivers. Additionally, informal care provision generates psychological and physical costs as it is mentally stressful, time-consuming and physically exhausting, that might in turn affect caregivers' life satisfaction Bauer and Sousa-Poza (2015).

The main objective of this paper is to estimate the causal impact of informal care provision on caregivers' life satisfaction. We examine how caregivers' life satisfaction may vary depending on both the intensity as well as the type of care provided and the relationship with the care recipient.

Providing informal care is mentally stressful, physically exhausting, time-consuming and may have negative spillover effects on work, family life and especially, on health outcomes (Bauer and Sousa-Poza, 2015). Brouwer et al. (2005) in a meta-analysis, highlight evidences of a negative impact of caregiving on mental and physical health of informal caregivers. Informal care and psychological health are linked, not only because caregiving implies perceived overload due to difficulties to combine leisure time, family duties, work demand and care tasks, but also because health status of the care recipient affects one's emotions negatively. In this regard, Schulz et al. (1990) indicate that caregivers tend to show an above-average level of psychiatric symptoms. Additionally, a review of the literature from Bom et al. (2018) find that caregiving results in higher prevalence of depressive feelings and lower mental health scores. Estimates of the physical health effect of informal care are more ambiguous. Caregiving requires physically demanding duties over a long duration, thus it might lead to unhealthy life style, stress and lowers psychological health that induce hypertension and cardiovascular diseases. Pinquart and Sörensen (2007) point out that the most severe physical impairments are more likely to occur for older men caregivers in charge of dementia patients, while women bear higher psychological cost due to a more important perceived care burden.

Informal caregivers are not all equal when it comes to health issues. An extended literature highlights how the impact of caregiving on physical and mental health varies depending on specific socio-demographic characteristics. For instance, providing informal care to close family members involves a relatively larger negative subjective burden than providing care to non-family members (García-Castro et al., 2019; Kramer, 1997). Furthermore, dealing with several duties on top of caregiving increases the perceived feeling of caregiving burden. Thus, negative health effect of caregiving is larger for married individuals (Bom et al., 2018) and working female caregivers (Kenny et al., 2014). According to Llacer et al. (2002) spouses caregivers have lower socioeconomic status, poorer health and lower level of well-being than children caregivers, however, children caregivers were significantly more burdened. The intensity of care also matters. Pinquart and Sörensen (2007) find evidences that both care recipients' behavioral problems (e.g., disruptive and aggressive behavior) as well as the time spent on caregiving, place a burden on the caregiver and increase symptoms of depression, with behavioral problems being particularly important when caring for demented care recipients.

The adverse impact of caregiving, however, is softened by psychological resources such as mastery, copying strategies, social support, and financial resources. Jansson et al. (1997) demonstrate that informal caregivers meeting other caregivers in the same situation increase their spirit of community, their knowledge of caregiving and their ability to handle the situation. Lin et al. (2013) provide evidence that the relationship between caregivers' duties and the caregivers' level of depression was weaker when participants have high feedback from others or have a good parent-child relationship. In another study, García-Castro et al. (2019) indicate that caregivers experiencing the greatest burden are those who perceive a decreasing leisure time and a high financial stress. Besides, they find that personality traits such as hope, zest, social intelligence and love mediate the relationship between perceived stress and care burden.

To sum up, the process of caring may generate negative feelings like stress, because it is physically and mentally demanding. This process create a perceived burden that varies depending on other duties that caregivers have to bear with, and on psychological, financial and external resources they dispose.

Few studies have analyzed the effect of providing informal care on life satisfaction. Borg and Hallberg (2006), collecting data on informal caregivers in Sweden, determine that a high frequency of caregiving decreases life satisfaction, while no

significant difference exists between less frequent caregivers and non caregivers. Using panel data from *Household, Income and Labour Dynamics in Australia survey* (HILDA), Leigh (2010) studies the effect of informal care for an elderly or disabled person on labor market outcomes, including life satisfaction. He finds that informal carers have a lower level of life satisfaction than non-carers while this effect becomes insignificant when individual fixed-effects are taken into account. In contrast, Bookwala (2009), based on U.S sample of adult daughters and sons, finds that female caregivers' life satisfaction increases over time, and that women caregivers report significantly higher level of life satisfaction than men caregivers do. Finally, a study of Van Den Berg and Ferrer-i Carbonell (2007) assess the compensating variation necessary to maintain the same level of well-being among Dutch informal caregivers. They estimate that an extra hour of informal care is worth about 9 or 10 Euros. This equals to 8 or 9 Euros if the care recipient is a family member and about 7 or 9 Euros if not.

The majority of these studies are subject to methodological shortcomings, they use cross-sectional databases (Borg and Hallberg, 2006; Raschick and Ingersoll-Dayton, 2004; Van Den Berg and Ferrer-i Carbonell, 2007) and do not deal with endogeneity biais (Leigh, 2010). The effect of caregiving on life satisfaction may, however, suffer from an upward bias induced by the failure to control for the so-called *family effect* (Bobinac et al., 2010): the health status of the care recipient directly affects her relatives' life satisfaction. The relation may also be downward biased by the simultaneity between life satisfaction evaluation and the choice to provide informal care : individuals being more satisfied tend to provide care more often.

In this paper, we attempt to fill this gap by estimating the causal effect of providing care on Dutch caregivers' life satisfaction, while controlling for several sources of endogeneity. The Netherlands is an interesting study case, because between 2007 and 2015, the Dutch government undertook a normative reorientation towards greater individual responsibility in LTC. As a consequence in 2007, domiciliary care (e.g. housekeeping, services, transport services, meal services and house adjustments), was excluded from coverage of public LTC insurance and transferred to the responsibility of the municipalities under the new social support act (Wet maatschappelijke ondersteuning, abbreviated Wmo). Besides, in 2015, the Dutch government went a step further by restricting admission criteria to institutional care. Those reforms have been implemented to shift the responsibility of care towards family or local community. According to Maarse and Jeurissen (2016) the potential of unexplored

informal caregivers is overestimated and the negative externalities for informal carers are underestimated. Indeed, the new arrangement may make informal care an obligation, while limited work hours arrangements are offered to caregivers[2]. Additionally, Oudijk et al. (2011) show that the main incentives of providing care in The Netherlands are feelings of being needed and obligation while deriving pleasure from an activity reduces it. Middle aged and older Dutch carers stand out when it comes to make a useful contribution; they cite this motive more often than older persons in other countries, and thus appear to regard care activities as a special form of active citizenship. Thus, Dutch caregivers may perceived a higher burden of caring because they feel obligated to do so, but, at the same time, they may be more satisfied in their life because caring is meaningful.

Using data from Longitudinal Internet Studies for the Social Sciences (LISS), we analysed whether respondents' life satisfaction is explained by the informal care provision over the period from 2008 to 2018. The dependent variable is scored from 0 (completely dissatisfied) to 10 (completely satisfied) and the main variable of interest is a dummy variable that indicates whether respondents have helped someone in the last twelve months. We first estimate the relationship using Ordinary-Least-Squares (OLS) with fixed effect model. Secondely, As we suspect the decision to care not to be taken exogenously, we then estimate a dynamic model using two-step system Generalized Method of Moments (GMM) estimator that allows us to control for several sources of endogeneity, namely simultaneity, unobserved heterogeneity and dynamic endogeneity.

Our research contributes to the literature in many regards. Our main contribution is the identification of the causal impact of the informal care provision on caregivers' life satisfaction. As mentioned above, many papers dealing with this topic fail to control for endogeneity problems, meaning that the causal mechanism was unclear. Another contribution of this paper is the study case of The Netherlands with panel data. To the best of our knowledge, only Van Den Berg and Ferrer-i Carbonell (2007) focus on Dutch caregivers analysing the monetary value of providing informal by means of a well-being valuation method but they use cross-sectional data, and so, do not deal with endogeneity biaises. Additionally, we go one step further by highlighting how heterogeneous is the effect of informal care provision

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[2]According to the Dutch government website, employees are legally entitled to take short-term care leave to look after a sick relative such as child, partner or parent. In 2015, care leave was expanded to also include time off to look after extended family members (such as siblings or grandparents) and acquaintances (such as housemate, neighbor or friend). This type of leave is available on the condition that the sick person requires care and is not in the hospital. Within a 12 month period, employees are entitled to take short-term care leave equal to twice their weekly working hours. During this time, the employer must pay at least 70 percent of their salary.

regarding various socio-demographic characteristics and informal care specificities.

Our main finding is that providing informal care reduces caregivers' life satisfaction on average by 0.09 percentage-point. This effect is persistent until caregiving episodes of five years. While the short-run effects (until 5 periods of help) are large and negative, there are no negative long-run effects. In other words, negative impact largely dissipates after five years. One explanation to this difference might be the adaptation of caregivers to their role. As another result, current life satisfaction depends on its past realization positively, meaning that today respondents' life satisfaction relies on how they were satisfied in the past.

The remainder of this paper is organized as follows. We explain our data and some descriptive statistics in Section 2. Section 3 describes our empirical strategy, both the OLS with fixed effect specification as well as the two-step system GMM model. In section 4, we present our empirical results including estimations from our baseline specification, those about the intensity and the duration of the caregiving episode and an exploration of the potential sources of heterogeneity that may occur in the relationship between informal care and life satisfaction. Robustness tests are reported in Section 5. Section 6 concludes.

2   Empirical strategy

Our aim was to estimate the impact of the informal care provision on the life satisfaction of caregivers. Using standard linear fixed effects[3] estimation, our model is specified such that:

$$LS_{it} = \beta_0 + \beta_1 C_{it} + \beta_2 X_{it} + \alpha_i + \epsilon_{it} \tag{3.1}$$

LS_{it} is the life satisfaction of individual i at time t, C_{it} represents the decision to care and X_{it} is a vector of socio-economic controls. α_i, λ_t and ϵ_{it} represent, respectively, individual specific time-invariant effects, time fixed-effects and the error term.

We used a linear fixed-effects estimation to control for fixed unobserved heterogeneity under the assumption of strict exogeneity of covariates. This analytic approach is commonly used in economic analyses of the correlates of well-being using panel data (Ferrer-i Carbonell and Frijters, 2004). It allows to control for unobserved characteristics that do not change over time, as personality traits, that

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[3]The results of the Hausman test points us to the use of fixed effets, see Table 3.11

are likely to affect both one's life satisfaction as well as socio-economic variables.

However, we suspected other sources of endogeneity to bias our estimation. Indeed, we faced a problem of simultaneity between the decision to care and life satisfaction. More particularly, the care variable is likely to be taken in a function of life satisfaction and its lags, since satisfied people tend to help more their relatives than dissatisfied individuals. We perform several regressions using life satisfaction and its lags as explanatory variables of the decision to care. The high level of significance of life satisfaction past realizations lead us to the rejection of the strict exogeneity of the decision to care[4].

Another source of endogeneity that may interfere in our results is the omitted variable bias. More precisely, we analysed the causal relationship between the decision to care and the caregiver's life satisfaction but we do not observed the health status of the care recipient . Howewer, Bobinac et *al.* (2010) highlight the importance of the so-called *family effect*. The latter, to be disentangled from the care effect, refers to the fact that individuals' well-being is directly influenced by their close relatives' health, whether or not they provide care. Providing help to close family members or relatives, may produce negative feelings since caregivers witness both their physical and mental impairments. These authors show that not accounting for the family effect overestimates the care effect by 30%. Following Bobinac et al. (2010), we suspect that missing information on the health of the care recipient is likely to skew our results as the health status of the recipient might affect both the decision to care as well as the life satisfaction of potential caregivers. In order to identify whether our model suffers from omitted variable bias related to the care provision, we perform a Durbin-Wu-Hausman test[5]. Unlike simple OLS with fixed effects model that fails to control for varying omitted variables, the Durbin-Wu-Hausman test determines whether varying information contained in the residuals is correlated with individual regressors. A significant *t*-test of the Durbin-Wu-Hausman test leads to the rejection of the null hypothesis of exogeneity and allows us to conclude that OLS estimator is inconsistent[6].

Panel based GMM methodology can be used to estimate a dynamic model of life satisfaction and overcome endogeneity issues (Powdthavee, 2009). Thus, we

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[4]Results are in Appendix, see Table 3.12

[5]This method, consisting in the inclusion of the residuals of the endogenous variable as a function of exogenous variable in our main specification. For more details, see Davidson and Mackinnon (1992); Ullah et al. (2018).

[6]See the results in Appendix, Table 3.13

performed a two-step system[7] GMM developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). More specifically, the use of GMM model allows us to control for three sources of endogeneity: simultaneity, unobserved heterogeneity and dynamic endogeneity[8]. Our two-step system GMM model is presented in the following equation:

$$LS_{it} = \beta_1 LS_{it-1} + \beta_2 C_{it} + \beta_3 X_{it} + \lambda_t + \epsilon_{it} \tag{3.2}$$

Where LS_{it-1} denotes the first lag of the dependent variable. The rest of the variables is as mentionned above. As suggested by Roodman (2009) we included time fixed effects (λ_t) in order to avoid cross-individual correlation.

3 Data and summary statistics

In this section, we present our data extracted from the Dutch *Longitudinal Internet Studies for the Social Sciences* (LISS) and provide descriptive statistics.

3.1 Data

The present investigation uses data from the Dutch *Longitudinal Internet Studies for the Social Science*s (LISS) panel administered by CentERdata[9] (see for details: www.lissdata.nl). The panel is based on a true probability sample of households drawn from the population registered by Statistics Netherlands consisting of more than 4500 households over 7000 individuals and 137 monthly waves from November 2007 to March 2019. In the LISS survey, individuals report several aspects of their life, including their satisfaction with life, providing informal care and background

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[7]According to Arellano and Bover (1995) the two-step GMM model provides more efficient and consistent estimates in the case of panel data than the first-step GMM model. In order to determine whether we had to perfom either a difference-GMM or a system-GMM model, we follow the second rule-of-thumb suggested by Blundell et al. (2001). Following these authors, the autoregressive model should be initially estimated by pooled OLS and a fixed effects approach. The pooled OLS estimate for the parameter of the lag of the dependent variable should be considered as an upper-bound estimate while the one of the fixed effects estimate is the lower-bound estimate. A difference-GMM estimate close or below the fixed effects estimate suggests a downward biais and points us to the use of a system-GMM estimator. Results are detailed in Appendix, see Table 3.14

[8]Dynamic endogeneity biais arised due to the inclusion of the past realisation of the depedent variable.

[9] Tilburg University, The Netherlands

informations[10]. Our common sample is unbalanced and include 9,180 observations
and 1,188 individuals observed over the period 2009-2018.

Our dependent variable is an indicator of life satisfaction based on the question
"How satisfied are you with the life you lead at the moment?". The respondent
was asked to use an ordinal scale from zero (not all satisfied) to ten (completely
satisfied). This single-item scale life satisfaction question is a widely used measure
of subjective well-being. It has the advantage of asking the respondent to focus on
an overall evaluation of their life rather than on current feelings or specific psycho-
somatic symptoms. Veenhoven (2000) and Frey and Stutzer (2002) have shown that
life satisfaction is closely related to a number of other potentially more objective
measures of happiness.

The variable of interest is whether or not the respondent has provided any kind
of help in the last twelve months. Informal care may be provided to partner, family
member, young people, acquaintance, friend, colleague or neighbor. Three types
of help are considered: housekeeping help (e.g. cleaning, laundry, grocery shop-
ping), personal care (e.g. bathing, showering, dressing) and personal support (e.g.
arranging affairs, offering solace, listening). We do not restrict our analysis to a
specific relationship between the caregiver and the care recipient because of too few
observations in each category. Instead, we include partners, children[11], parents[12],
siblings, grandparents, other family member, friend, colleague from work or neighbor
(non-family). Since receiving informal care implies being in poor health, it directly
impacts one's life evaluation. Thus, we restrict our sample to respondents who do
not themselves receive any kind of informal care.

Explanatory variables include age category, health, marital status, educational
level, occupational status, children, working hours, log of standardized net house-
hold income, living environment and year dummies[13].

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[10] The panel was extracted from the LISS database and uses information from 5 panels of the
core study: "Personality Questionnaire, LISS Core Study", "Family and Household Questionnaire,
LISS Core Study", "Health Questionnaire, LISS Core Study", "Work and Schooling Questionnaire,
LISS Core Study", "Social Integration and Leisure, LISS Core Study". For more details on our
merge, see Appendix, Table 3.8

[11] Including children adopted, step and foster.

[12] Including step parents, parents in-law and foster parents.

[13] The definitions and descriptive statistics of the relevant variables are provided in Table 3.9
and Table 3.10

3.2 Descriptive statistics

The distribution of life satisfaction by informal care provision is illustrated in Figure 3.1. For both informal caregivers as well as non caregivers, the grade attributed to satisfaction with life follows a normal distribution centered around eight, which is standard in the literature. Non caregivers prevail in the higher score group, from seven to ten, while a wider share of careers scored six out of ten.

Figure 3.1: Distribution of life satisfaction by informal care provision
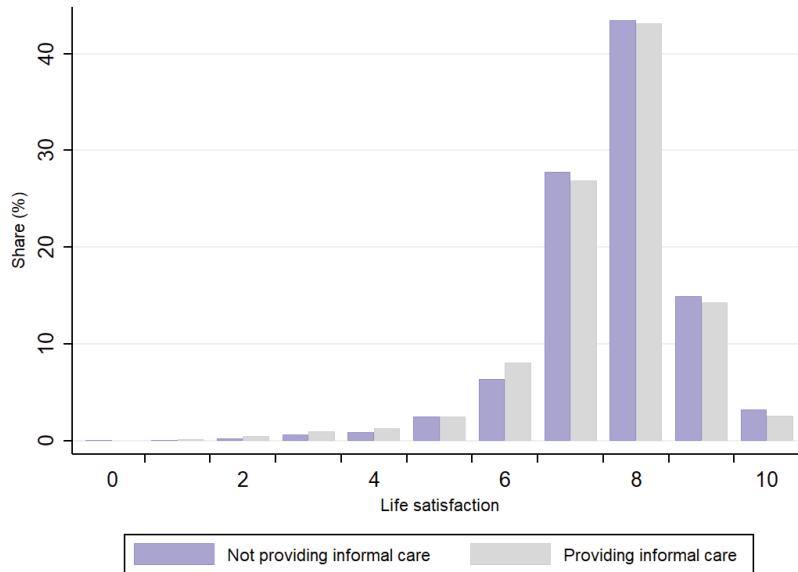
Descriptive statistics are base on our common sample from LISS panel data (2009-2018)

The average life satisfaction of informal caregivers depending on the intensive margin and on gender is reported in Figure 3.2. We observe that average life satisfaction of men caregivers is constantly reducing with an increasing number of weekly informal care hours. Women's average life satisfaction follows a different pattern. Between zero and four hours of informal care per week, their life satisfaction steadily decreases from 7.8 to 7.4 out of ten, while it goes slightly up to 7.6 when women provide between ten and twenty hours of informal care per week. Overall, helping others more than twenty hours a week decreases the average life satisfaction of both men and women around seven out of ten.

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Figure 3.2: Averages life satisfaction and frequency of care provision by gender
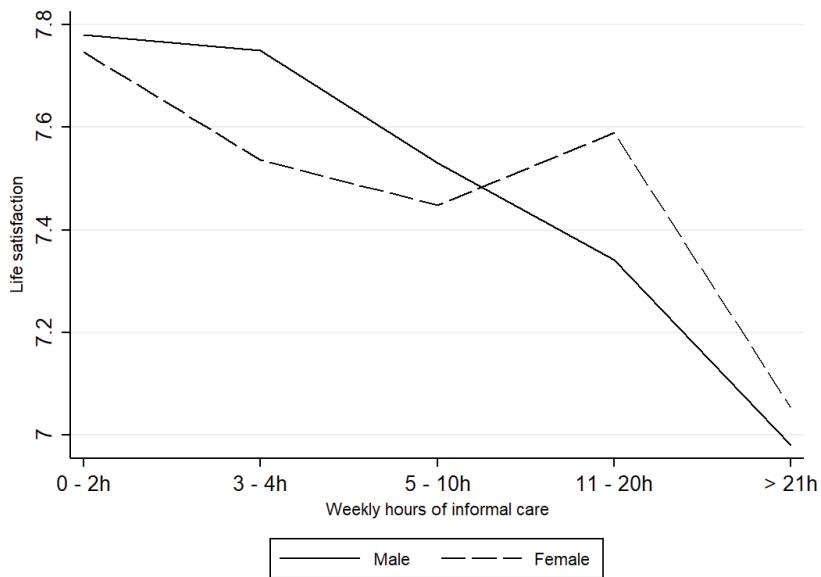
Descriptive statistics are base on our common sample from LISS panel data (2009-2018)

An overview of respondent socio-demographic characteristics is given in Table 3.1. In our common sample, there are 2,253 observations of individuals providing care and 6,927 observations of individuals not providing care. The first column of Table 1 indicates that, in our common sample, 58% of individuals providing informal care are women, 73 % are aged over 55 years, 56 % are in co-habitation without children and 58 % work between zero and eleven hours per week. In addition, non caregivers have similar socio-demographic characteristics, except with regard to gender, age categories, occupational status and weekly working hours. Comparing them with caregivers, they are respectively, 57% against 42% of men, 23% against 6% aged under 44 years, 53% being employed or self-employed against 39% and 34% working more than 34 hours per week against 18%.

The characteristics of the informal care provided is presented in Table 3.2. We observe that respondents provide care mainly at a low frequency; 54% of caregivers helps someone less than four hours per week. The type of informal help supplied is mostly housekeeping and personal support ; only 20% of caregivers provides personal care (e.g. bathing, showering, dressing). Finally, care recipients are most often friends, colleagues or neighbors that do not live in the same household than caregivers.

Table 3.1: Descriptive statistics of respondent socio-demographic characteristics

	Providing(%) Informal care	Not providing (%) Informal care
Sex		
Men	42	57
Women	58	43
Age		
15 - 24 years	1	3
25 - 34 years	1	6
35 - 44 years	4	14
45 - 54 years	21	20
55 - 64 years	33	25
65 years and older	40	32
Health		
Disease	37	30
No disease	63	70
Domestic Situation		
Single	13	17
(Un)married co-habitation without children	56	48
(Un)married co-habitation with children	25	30
Single with children	4	4
Other	2	1
Standardized net monthly household income		
0€ - 1,350€	23	22
1,351€ - 1,800€	25	29
1,801€ - 2,300€	24	24
2,300€ and more	28	26
Occupation		
Employed or self-employed	39	53
Unemployed	2	2
Out of the Labour Force	59	45
Education level		
Primary school	4	4
Intermediate Secondary Education	30	27
Higher Secondary Education	9	9
Intermediate Vocational Education	22	26
Higher Vocational Education	23	25
University	8	7
Other	4	2
Weekly Working hours		
0 - 11 Hours	58	42
12 - 21 Hours	9	8
22 - 33 Hours	15	15
34 - 39 Hours	11	17
More than 40 Hours	7	17
living environment		
Rural	45	35
Moderately Urban	20	24
Urban	35	41
Number of young children at home		
None	72	66
One child	10	11
Two children	12	17
Three children	5	5
Four children and more	1	1
Observations	2,253	6,927

Descriptive statistics are based on our common sample from LISS panel data (2009-2018)

Table 3.2: Descriptive statistics of respondents providing informal care

	Providing (%) Informal care	**Observations**
Weekly Hours of Informal Care		
Less than 2 hours	31	711
2 - 4 hours	23	512
5 - 10 hours	26	583
11 - 20 hours	11	248
More than 20 hours	9	199
Kind of help provided		
Housekeeping	60	1,347
Personal care	20	450
Personal support	85	1,907
Relation with the care recipient		
Living at home	21	474
Not-living at home	79	1,779
Partner	17	377
Family	25	557
Friends or colleagues	58	1,319

Descriptive statistics are based on our common sample from LISS panel data (2009-2018)

4 Empirical Results

4.1 Baseline estimates

Table 3.3 reports results for both the OLS with fixed effect approach and the GMM-sytem estimator. The dependent variable is the respondent's life satisfaction measured on a scale rated from 0 to 10. For a matter of comparison, we also show results from OLS estimator with pooled data and clustered standard errors at the individual level in order to account for the dependency of the observations.

The two first columns of Table 3.3 present the OLS results[14]. We do not include the past realizations of the dependent variable in these specifications to avoid dynamic endogeneity biais . As anticipated, the informal care decision is correlated to the respondent's life satisfaction negatively, meaning that being a caregiver leads to lower satisfaction (Model 2 of Table 3.3). In other terms, providing care reduces the life satisfaction by 0.07 percentage-point on a scale scored from 0 to 10. It is worth noting that the magnitude of the informal care coefficient changes when using pooled data (Model 1 of Table 3.3) compared with the fixed effect specification (0.116 > 0.07). This difference might be explained by the fixed unobserved heterogeneity correlated with both the dependent variable and, at least, one individual regressor. The impact of the informal care on life satisfaction decreases by 0.046

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[14]Full estimates are in Appendix, see Table 3.15.

percentage-point when we account for constant unobserved characteritics such as respondents' personality traits.

To treat endogeneity of the informal care decision, we applied panel based GMM-system estimator. Models (3) and (4) introduce the lag one of the life satisfaction as a right-hand side variable. In Model (3), we use the most recent lags of the dependent variable as instruments to control for dynamic endogeneity due to the inclusion of the past realisation of life satisfaction. All other endogenous regressors[15] are instrumentalized by their first and second lags. The estimated coefficient of the lagged life satisfaction is positive and highly significant, which is in line with the hedonic capital theory, i.e. Happiness today relies on past happiness. The GMM estimator generates coefficients on informal care provision that are slightly larger than the one estimated with OLS fixed-effects.

Two problems arise when using GMM estimator. The first one is the proliferation of instruments that may overfit endogenous variables (Roodman, 2009). However, there is no clear consensus on "how many is too many" instruments (see Ruud et al., 2000; Windmeijer, 2005; Roodman, 2009). We follow the arbitrary rule-of-thumb mentioned by Roodman (2009) in that instruments should not outnumber individual units[16]. Model (3) respects this rule as the number of instruments does not exceed the number of individuals (474 < 1188). Our results also pass the Hansen test of overidentifying restrictions in Model (3) with a high p-value of 0.792, well above the significance level of 0.1.

The second matter of concern is the serial autocorrelation, meaning that error terms might be correlated. In order to overcome this issue, we perfom a first-order and a second-order serial correlation tests to examine whether the differenced error term is first or second order serially correlated. Specification of Model (3) is rejected by the test of serial correlation. While the significant first-order serial correlation is to be anticipated, the second-order correlation is a a matter of concern since it detects autocorrelation in levels and might signal that instruments are misspecified.

To tackle this issue, we exclude the most recent lags of life satisfaction and instead we use the third and fourth lag of the dependent variable in Model (4) of Table 3.3. Other endogenous regressors are still instrumentalized with their first and second lags. This new specification is now supported by the second-order serial correlation that turns insignificant. Changing the list of instruments has not really altered the results of both the informal care provision as well as the lag of the de-

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[15]All explanatory regressors, except time dummies, gender and age categories, are treated as endogenous.

[16]We address the sensitivity of our results to the number of instruments in Section 4.

pendent variable, whose coefficient magnitude has slightly decreased from 0.088 to 0.066. In next sections, we consider Model (4) to be our main specification.

Table 3.3: OLS and two-step system GMM estimates of life satisfaction

| | Pooled OLS | OLS with fixed effects | Two-step system GMM (instrument from second to third lag dependent variable) | Two-step GMM (instrument from third to fourth lag dependent variable) |
	Model (1)	Model (2)	Model (3)	Model (4)
l.Life satisfaction	-	-	0.088***	0.066***
			(0.01)	(0.01)
Informal	-0.121***	-0.070**	-0.087***	-0.086***
	(0.05)	(0.03)	(0.02)	(0.02)
Constant	5.425***	7.485***	7.309***	7.484***
	(0.44)	(0.46)	(0.23)	(0.20)
Number of observations	9180	9180	9180	9180
Number of groups	1188	1188	1188	1188
Time fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.10	0.02		
Number of instruments			474	470
AR(1)			0.000	0.000
AR(2)			0.067	0.131
Hansen test			0.777	0.508

Standard errors in parenthesis, clustered at the individual level in the Model (1). * p<0.10, ** p<0.05, *** p<0.010
All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.
We instrument the lag of the life satisfaction with its first and second lags in Model (3)
We instrument the lag of the life satisfaction with its second and third lags in Model (4).
We instrument other endogenous regressors with their first and second lags

4.2 Intensity and duration of the caregiving episode

Up to this point, we concentrated our analysis on the causal relationship between the informal care decision and caregivers' life satisfaction. The literature has shown, however, that the adverse impact of the informal care varies with both its intensity and its duration. In order to explore the first issue, we replace the binary response on informal care by the intensive margin of care. Respondents are asked how many weekly hours of care they provide on average. As previously, we use the first and second lags of endogenous regressors, and the third and fourth lags of the lagged life satisfaction as instruments[17]. A higher number of care hours leads to a lower level of life satisfaction, as shown in Model (1) of Table 3.4. More precisely, one more hour of care decreases the life satisfaction by 0.006 percentage-point on average. However, the significance of the second-order correlation test reject our model specification. Dropping the most recent lag of all other endogenous regressors including

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[17]Full estimates are in Appendix, see Table 3.16.

the intensive margin resolves this issue, as shown in Model 2 of Table 3.4. In the latter, the coefficient magnitude has slightly increased up to 0.018.

We are also interested in the duration of the caregiving episode. We supposed that beginner caregivers' life satisfaction is not impacted in the same way than experienced caregivers'. To address this point, we control for the number of periods respondents have helped consecutively. For instance, if one provides care in 2009 and 2010, then stopped between 2011 and 2015, and start again providing care in 2017, we consider that he had helped 2 years in 2010 and one year in 2015. In other words, the duration is a categorical variable ranging from 0 - respondent has never helped - to 7 and more - respondent has helped at least 7 periods of time consecutively. Results are reported in the third column of Table 3.4 (Model 3). The overall negative relationship is not affected by the use of another care measure. As in Model (1), the second-order correlation test rejects the null hypothesis of no serial correlation. In order to tackle this issue, we adopt the same strategy as before by dropping the most recent lag of other endogenous regressors including the duration of the caregiving episode, as shown in Model (4) of Table 3.4. Looking at the latter, some disparities arise. Helping during two years has roughly the same impact than helping during five years, while the negative impact largely dissipates after five years. While the short-run effects, until 5 periods of help, are large and negative, there are no negative long-run effects. This result is in line with adaptation-level theory (Brickman and Campbell, 1971) stipulating that one's emotion system react to one's life events but through time adapt back to baseline levels of subjective well-being.

Table 3.4: Intensity and duration of caregiving

	Two-step system GMM estimates on life satisfaction			
	Model (1)	Model (2)	Model (3)	Model (4)
L.life satisfaction	0.086***	0.031***	0.106***	0.003
	(0.01)	(0.01)	(0.01)	(0.01)
Frequency	-0.006***	-0.018***	-	-
	(0.00)	(0.00)		
Duration of caregiving episodes				
0 year	-	-	Ref	Ref
1 year	-	-	-0.100***	-0.158***
			(0.02)	(0.05)
2 years	-	-	-0.059**	-0.206***
			(0.03)	(0.05)
3 years	-	-	-0.139***	-0.251***
			(0.03)	(0.05)
4 years	-	-	-0.127***	-0.161***
			(0.04)	(0.05)
5 years	-	-	-0.156***	-0.203***
			(0.04)	(0.05)
6 years	-	-	0.020	-0.066
			(0.05)	(0.06)
7 years and over	-	-	-0.063	-0.109
			(0.06)	(0.07)
Constant	7.451***	6.754***	7.265***	6.519***
	(0.19)	(0.32)	(0.18)	(0.28)
Number of observations	9180	9180	9180	9180
Number of groups	1188	1188	1188	1188
Time fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Number of instruments	470	408	544	460
AR(1)	0.000	0.000	0.000	0.000
AR(2)	0.075	0.196	0.051	0.513
Hansen test	0.603	0.279	0.512	0.192

Standard errors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010
All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous
In all models, we instrument the lag of the life satisfaction with its second and third lags.
Other endogenous regressors are instrumented with their first and second lags (Models (1) and (3)).
Other endogenous regressors are instrumented with their second and third lags (Models (2) and (4)).

4.3 Moderators of the relationship between informal care provision and life satisfaction

In this section, we explore how the impact of informal care provision on life satisfaction may vary depending on care specificities. Firstly, we estimate how the frequency of informal care provided, the kind of help and the relationship with the care recipient may mitigate the effect of informal care provision on caregivers' life

satisfaction. Secondly, we examine whether the impact of the informal care provision differs using various subsamples.

4.3.1 Specificity of care provided

All models presented in this subsection focus on individuals that have provided care at least once; non caregivers are excluded. Our estimations are based on a restricted sample of 638 individuals and 2,253 observations. Model (1) of Table 3.5 shows the estimated coefficient of our two-step system GMM model looking at the residence of the care recipient. We split our common sample of informal caregivers into three categories. Namely, caregivers of someone living in the same household, caregivers of someone living outside and being caregivers for partner. We choose to create this specific category since the literature on informal care highlights that spouses caregivers have to endorse a higher care burden than children caregivers (Llacer et al., 2002). Taking care of someone living in the same household reduces, on average, life satisfaction by 0.23 percentage-points compared with caring for someone not living at home. We do not find significant difference between caring for someone not living at home and caring for partners. This result is in line with those from Kramer (1997) and García-Castro et al. (2019).

Additionally, in Model (2) of Table 3.5, we split the common sample of informal caregivers into three categories depending on their relationship with the care recipient. We find that taking care of a family member or of a partner has a significant negative impact on life satisfaction compared with caring for a friend, a neighbor or our partner. Such as, on average, family caregivers grade their life satisfaction 0.14 percentage-point lower than those taking care of a friend, colleague or neighbor.

We then look at the kind of help that caregivers provide (i.e: housekeeping, personal care and personal support) as shown in Models (3), (4) and (5) of Table 3.5. Overall, we find that all these types of help have a negative impact on life satisfaction. However, the magnitude of the estimated coefficient is higher when providing housekeeping and personal care than for personal support. Helping someone for house chores and personal care respectively reduce life satisfaction by 0.22 percentage-point and by 0.26 percentage-point while providing personal support only decreases life satisfaction by 0.13 percentage-point. Intuitively, this result is expected since housekeeping and personal care may be considered as more burdensome and physically demanding than personal support.

Estimated effects of informal care weekly hours on life satisfaction are presented in Model (6) of Table 3.5. The higher the weekly hours of care, the lower respondents grade their satisfaction with life. In this estimation, the reference category is

"providing informal care between 5 and 10 hours a week". We observe that providing informal care less than 4 hours a week has a positive impact on life satisfaction compared with the reference category. At the opposite, helping more than 11 hours a week has a negative impact on life evaluation in comparison with lower care intensity. The difference is particularly pronounced for careers helping more than 20 hours a week. On average, they grade their life satisfaction 0.22 percentage-points lower than those who help between 5 and 10 hours a week. Similar results are found in the literature on informal care and health (Pinquart and Sörensen, 2007).

Overall, it is worth noting that, for all of these six specifications, both the Hansen test as well as the second-order serial correlation test do not reject the null hypothesis of exogeneity. Moreover, the number of instruments never exceeds the number of individual units.

4.3.2 Socio-demographic characteristics

Table 3.6 displays our results focusing on respondent socio-demographic characteristics, disregarding whether they provide care or not. In Model (1), we look at gender separately. We observe that both men's and women's life satisfaction are impacted by the informal care provision negatively, however the estimated coefficient is significantly higher for women. On average, women caregivers grade their satisfaction with life 0.14 percentage-points lower than their non caregiver counterparts. This result is in line with the literature on informal care and health (Kenny et al., 2014).

Estimates of Models (3), (4) and (5) shown in Table 3.6 report the effect of providing informal care on life satisfaction by marital status. Overall, being a caregiver has a negative impact on life satisfaction, except for single respondents with children. However, the coefficient magnitude is relatively small for respondents who are single or (un)married in cohabitation without children. The negative effect of providing informal care on life satisfaction is the larger for respondents in co-habitation with children. On average, individuals in co-habitation with children grade their life satisfaction 0.24 percentage-point lower when they are informal caregivers. Parents have to care for their children besides their involvement as informal caregivers. Thus, their time constraints is higher compared with individuals without children. This result is consistent with findings of Bom et al. (2018) showing that negative health effect of caregiving is larger for married individuals with children. It is worth noting that the regression was not produced for two categories - i.e. single individuals with children and other - because of too few observations.

Table 3.5: Heterogeneity analysis - Parameter estimates effects of informal care specificity on Life satisfaction

	Two-step system GMM estimates on life satisfaction					
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Residence of the care recipient						
Ref: Not living in the caregiver's home						
Living at home	-0.23 (0.02)***	-	-	-	-	-
Partner	0.00 (0.03)	-	-	-	-	-
Relationship with care recipient						
Ref: The care recipient is a friend, colleague or neighbor						
Family member	-	-0.14 (0.02) **	-	-	-	-
Partner	-	-0.07 (0.03)**	-	-	-	-
Kind of help provided						
Housekeeping	-	-	-0.22 (0.01) ***	-	-	-
Personal care	-	-	-	-0.26 (0.02) ***	-	-
Personal support	-	-	-	-	-0.13 (0.03) ***	-
Weekly hours of care						
Ref: Betw. 5-10 hours per week						
Less than 2 hours	-	-	-	-	-	0.09 (0.01)***
2-4 hours	-	-	-	-	-	0.09 (0.01) ***
11-20 hours	-	-	-	-	-	-0.03 (0.01) **
More than 20 hours	-	-	-	-	-	-0.22 (0.02) ***
Number of observations	2,253	2,253	2,253	2,253	2,253	2,253
Number of groups	638	638	638	638	638	638
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of instruments	383	383	362	362	362	425
AR(1)	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)	0.39	0.57	0.70	0.65	0.59	0.45
Hansen test	0.87	0.85	0.90	0.99	0.92	0.91

Standard errors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010

All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.

In all models, we instrument the lag of the life satisfaction with its second and third lags.

In all models, we instrument other endogenous regressors with their first and second lags.

Models (6) and (7) of Table 3.6 present the estimated effect of providing informal care on life satisfaction by occupational status. Providing informal care has a negative impact on life satisfaction, for both employed or self employed respondents with a lower life satisfaction, about 0.21 percentage-points less, when they provide informal care. Caregiving may imply opportunity costs related to the time spent in paid employment and may have adverse effects on wage and career (Bauer and Sousa-Poza, 2015). Thus, providing care while being employed or self-employed is more costly in terms of life satisfaction than being a caregiver out of the labour force. As in previous models, regression gathering unemployed individuals was not produced because of too few observations.

However, some of these models are misspecified due to both a too high number of instruments or remaining serial correlation in levels. More precisely, Model (3) suffer from the proliferation of instruments (a Hansen p-value of 1.00 is a sign of trouble) and Model (1) and Model (5) are biased due the correlation between the standard errors.

Table 3.6: Heterogeneity analysis - Informal care provision and socio-demographic characteristics

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Two-step system GMM estimates on life satisfaction							
Gender							
Men	-0.04 (0.02)*	-	-	-	-	-	-
Women	-	-0.14 (0.02)***	-	-	-	-	-
Marital status							
Single	-	-	-0.10 (0.02)*	-	-	-	-
(Un)married co-habitation, without children	-	-	-	-0.07 (0.02)***	-	-	-
(Un)married co-habitation, with children	-	-	-	-	-0.27 (0.03)***	-	-
Single with children							
Other							
Occupational status							
Employed or self-employed	-	-	-	-	-	-0.21 (0.03)***	-
Out of the labour force	-	-	-	-	-	-	-0.05 (0.02)**
Unemployed							
Number of observations	4,916	4,264	1,469	4,620	2,606	4,555	4,448
Number of groups	622	566	240	686	418	709	695
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of instruments	445	439	325	339	311	404	374
AR(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)	0.06	0.83	0.25	0.55	0.09	0.27	0.82
Hansen test	0.94	0.90	1.00	0.65	0.63	0.80	0.92

Standard errors are in parenthesis. * $p<0.10$, ** $p<0.05$, *** $p<0.010$

All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.

As in the main specification, we instrument the lag of the life satisfaction with its second and third lags in all these models.

As in the main specification, we instrument other endogenous regressors with their first and second lags in all these models.

5 Robustness Tests

In order to test the reliability of our results, we perform a series of robustness tests using alternative specifications. Firstly, we analyse the sensitivity of our results to the number of lags, and consequently to the number of instruments. Then, we check whether choosing a different definition of the dependent variable is likely to affect our results. Finally, as GMM estimators do allow the use of external instruments, we include macroeconomic instruments.

5.1 Alternative definitions and specifications

Results of previous highlight the importance of the number of lags as instruments and how they might be sensitive to it. We initially use instruments from the second to the third lag of the lagged dependent variable and instruments from first-lag to second-lag for other endogenous regressors. We now implement instruments from second to third lag (Model 2 of Table 3.7), and from third to fourth lag (Model 3 of Table 3.7)[18] for other endogenous regressors. There are two reasons for choosing these lags. First, dropping the most recent lags might avoid serial correlation to remain (as seen in the main specifcation, Table 3.3). Secondly, limiting the number of lags allows us to respect the rule-of-thumb mentioned by Roodman (2009) in that instruments should not outnumber the number of individuals units (as it is the case in Table 3.6). In these two models, the number of instruments is well under the number of individuals. The overall negative relationship between the care provided and life satisfaction levels remains quite stable. Moreover, the second-order correlation test as well as the Hansen test of overidentification are well above the upper significance level of 0.1, meaning that our estimates are correctly specified. We find that the negative and significant relationship between providing informal care and life satisfaction holds regardless of the number of lags used. Please noticed, that the size of the estimated negative coefficient is slightly higher, about -0.15, when we use the second and third lags of endogenous regressors.

Another robustness test that we perform is whether our results are sensitive to the definition of subjective well-being. Initially, we have analysed the causal relationship between life satisfaction and the informal care provision. We now use the happiness level as the dependent variable. More precisely, respondents answer the following question "On the whole, how happy would you say you are ?". The rating scale is from 0 - totally unhappy - to 10 - totally happy. Results are displayed

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[18]Full estimates are in Appendix, see Table 3.17.

in Model (1) of Table 3.7[19]. The informal care provision leads to lower happiness levels, reducing it by 0.12 percentage-point. Even though the overall negative result has not changed, the coefficient magnitude has increased from 0.096 percentage-point using life satisfaction to 0.12 percentage-point with the happiness score. A first difference between the life satisfaction question and the happiness question is the time period evaluated. The former question refers to evaluation of the current life the individual is leading, while the latter ask to evaluate the globality of one's life. Additionally, the question on life satisfaction involves cognitive appraisals, based on aspirations, expectations and values, while the question on happiness is more reliable on the sensory system (Veenhoven, 2000).

Table 3.7: Alternative specifications

	Two-step system GMM estimates on life satisfaction			
	Model (1)	Model (2)	Model (3)	Model (4)
l.Happiness	0.032***	-	-	-
	(0.01)			
l.Life satisfaction	-	-0.003	-0.065***	0.011
		(0.01)	(0.01)	(0.01)
Informal	-0.117***	-0.152***	-0.070***	-0.081***
	(0.02)	(0.05)	(0.02)	(0.03)
Constant	7.798***	6.768***	7.028***	8.274***
	(0.19)	(0.31)	(0.24)	(0.27)
Number of observations	9013	9180	9180	8184
Number of groups	1188	1188	1188	1185
Time fixed effects	Yes	Yes	Yes	No
Controls	Yes	Yes	Yes	Yes
Number of instruments	469	408	506	420
AR(1)	0.000	0.000	0.000	0.000
AR(2)	0.208	0.535	0.638	0.388
Hansen test	0.304	0.125	0.554	0.290

Standard errors are in parenthesis. * $p<0.10$, ** $p<0.05$, *** $p<0.010$
All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.
In all models, we instrument the lag of the life satisfaction with its second and third lags.
We instrument other endogenous regressors with their first and second lags in Model (1) and Model (4)
We instrument other endogenous regressors with their second and third lags in Model (2)
We instrument other endogenous regressors with their third and fourth lags in Model (3).

5.2 Long-term care reform in The Netherlands (2015)

Throughout this paper, we have analysed the causal relationship between the informal care provision and caregivers' life satisfaction using internal instruments only. As mentioned previously the Dutch governments has undertake major reformed of the long-term care system in 2007 and 2015. The major one underwent in 2015.

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[19]Full estimates are in Appendix, see Table 3.17.

This reform has three main goals: saving costs, keep people self-sufficient for as long as possible and improve quality and coordination of care by a client-tailored approach (Maarse and Jeurissen, 2016). A key element of the reform is that social care (e.g home help, transport facilities and home adjustments) is decentralized to municipalities under the Social Support Act (Wet Maatschappelijke Ondersteuning, WMO). The Social Support Act was revised to strengthen the role of people's social network in providing care. Each municipality is free to organize non-residential care and its need assessment procedure. The government had the will to encourage family members and local community networks (i.e neighborhood networks) to provide various social care (e.g home help). All in all, successive reforms have been implemented by the Dutch government to shift the responsibility of care towards family or local community, increasing probably the share of informal care.

As GMM-estimators do allow the use of external instruments, we are interested in macroeconomic variables that are supposed to reflect the evolution of the LTC system following the reforms in The Netherlands. We use data from the OECD database from 2009 to 2017 (information for 2018 are not yet available). More precisely, we focus on the number of LTC workers at home and the LTC spendings as a share of the Gross Domestic Product (GDP). As these two external instruments do not vary neither between nor withtin individuals, they are extremely collinear with the time dummies, that we have finally excluded, as shown in Model (4) of Table 3.7[20].

Overall, using external instruments do not change the negative impact the informal care provision has on caregivers' life satisfaction. Both second-order serially correlation as well as the Hansen test do not reject this specification. Moreover, the Difference-in-Hansen test for this subset of instruments do not reject the null hypothesis of exogeneity. However, the effect of these two external instruments might not be causal as we have excluded the time dummies and are likely to pick up other effects of different variables that are constant accross individuals.

6 Conclusion

Using panel data from the LISS survey, this paper studies the causal effect of the informal help provision on caregivers' life satisfaction. Its main objective is to determine whether caregivers might suffer from assuming this role regarding mental health outcomes such as life satisfaction.

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[20]Full estimates are in Appendix, see Table 3.17.

We first estimate a simple OLS with fixed effect approach that reveals a negative and statistically significant causal effect of help supply on caregivers' health. However, this specification may be biased due to several endogeneity sources that we attempt to tackle by using the GMM-system estimator. Controlling for unobserved heterogenity, simultaneity and dynamic endogeneity does not altered the overall negative impact of the care provision. More precisely, we find that taking into account endogeneity biaises slightly increases the negative impact of providing informal care on life satisfaction compared with an OLS with fixed effect approach. Further, we show that after 5 years of regular support, careers adapt to their role. The specificity of care also matters. Among caregivers, providing support to someone living in the same household or being a family caregiver has a stronger negative impact on life satisfaction. Additionally, the detrimental effect of providing care is larger for women, individuals being in co-habitation with children and employed or self-employed individuals.

We attempt to go further by analysing to what extent our results are sensitive to both the number as well as to the type of instruments. Overall, changing the number of lags and using either internal or external do not altered neither the size nor the statistical significance of our results.

This steady negative impact of the help supply on caregivers' life satisfaction throughout our analysis reveals how important is it to account for indirect costs borne by the caregivers. Even though the informal care provision is apparently cheaper and easier to access than formal care, it affects vehemently careers' health. Moving to policies substituting institutional residential care towards more home and community based care, as it has been the case in The Netherlands, should include some compensating mechanisms that are supposed to relieve caregivers of their responsabilities.

7 Appendices

7.1 Details on our merge

To run our analysis we had to combine different module from the LISS panel data. The personality questionnaire from LISS Core study contains informations on subjective well-being, the questionnaire background incorporates socio-demographic informations, the questionnaire social integration and leisure includes informations on informal care provisions, the questionnaire work and schooling embodies informations on working time, and the questionnaire health comprehendes informations on objective health. In order to ensure consistency in our merge we made sure that for each year the selected questionnaire was conducted before and the closest of the month on which the questionnaire personality was administered. We made this choice because life satisfaction is our main dependent variable. Informations on respondents background are asked almost every months. Thus, we selected background informations that correspond to the month where the personality questionnaire was administred. Concerning the questionnaire social integration and leisure we choosed to use the questionnaire administred in October and November 2016 for year 2017, because the question on life satisfaction was asked in May and June 2017. Thus, questions on informal care are asked before the question on life satisfaction and with the same month gap than if we choosed to take year 2017. We did the same choice to define year 2018. The maximum month gap between the personality questionaire and the social integration and leisure questionaire is in 2017 and 2018, it is about 6 months. This month gap is about 8 months between the questionaire on personality and the questionaire on work and schooling for year 2014 and 2015. For the questionnaire health the maximum month gap is one year in 2014. Indeed, any health questionaire was administred in 2014, thus we decided to take health informations from November and December 2013 for year 2014. Regarding the other years the health questionaire is always asked in November and December, thus for every years we toke the lag of the health questionaire. For instance, in year 2009 we used informations from the health questionaire conducted in November and December 2008. The personality questionaire is not available for year 2016. As a consequence we miss year 2016 in our sample. At the end of our merge procedure we end up with a balanced panel data including 1,307 individuals observed over ten years. When we run our last model specification with two-step GMM we end up with an unbalanced panel data comprising 9,180 observations, thus we lost 3,890 observations.

Table 3.8: Merge procedure

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Personality	05-08/2008	05-06/2009	05-06/2010	05-06/2011	05-06/2012	05-06/2013	11-12/2014	11-12/2015	-	05-06/2017	05-06/2018
Background	07/2008	05/2009	05/2010	05/2011	05/2012	05/2013	12/2014	12/2015	-	05/2017	05/2018
Social integration and leisure	02-05/2008	02-03/2009	02-03/2010	02-03/2011	02-03/2012	02-03/2013	02-03/2014	10-11/2015	-	10-11/2016	10-11/2017
Work and schooling	04-05/2008	04-05/2009	04-05/2010	04-05/2011	04-05/2012	04-05/2013	04-05/2014	04-05/2015	-	05-06/2017	05-06/2018
Health	11/2007 and 02/2008	11-12/2008	11-12/2009	11-12/2010	11-12/2011	11-12/2012	11-12/2013	07-08/2015	-	11-12/2016	11-12/2017

7.2 Definition and descriptive statistics of variables

Table 3.9: Definitions of variables

Variable	Definition
Life satisfaction	Score on question "How satisfied are you with the life you lead at the moment?" (zero to ten)
Happiness	Score on question "On the whole how happy would you say you are?" (zero to ten)
Informal care	Dummy variable if the individual regularly help someone requiring help due to a disease or other affliction over the past 12 months.
Informal care frequency	Average number of informal care hours provided per week.
Housekeeping help	Dummy variable if the caregiver helped the care recipient with cleaning, laundry, grocery shopping.
Personal care	Dummy variable if the caregiver helped the care recipient with bathing, showering, dressing.
Personal support	Dummy variable if the caregiver helped the care recipient with arranging affairs, offering solace, listening.
Care recipient living at home	0 "The care recipient is not living in the same household"
	1 "The care recipient is living in the same household"
	2 "The care recipient is our partner".
Care recipient relationship	0 "The care recipient is a family member"
	1 "The care recipient is a friend or colleague or neighbor"
	2 "The care recipient is our partner".
Age category	0 "15-24 years"
	1 "25-34 years"
	2 "35-44 years"
	3 "45-54 years"
	4 "55-64 years"
	5 "65 years and older".
Health	Dummy variable if suffer from any kind of long-standing disease
Marital status	0 "Single"
	1 "(Un)married co-habitation, without child
	2 "(Un)married co-habitation, with child(ren)"
	3 "Single, with child(ren)".
Education level	Highest level of education with diploma.
Occupational status	0 "Employed or self-employed"
	1 "Unemployed"
	2"Out of the labor force"
Child(ren)	Number of living-at-home children in the household
Work hours	Weekly working hours according to employment contract.
Log of standardized net household income	Log of the net household income divided by the square root of household members
Living environment	Urban character of place of residence (one to five)
Year	Year dummies (2009-2018), reference year is 2009

Table 3.10: Descriptive Statistics

Variables	Mean	Std dev.	Min	Max	Observations
Life satisfaction	7.6	1.2	0	10	9,180
Happiness	7.7	1.1	1	10	9,092
Informal care	0.2	0.4	0	1	9,180
Informal care frequency	9.2	16.8	0	168	2,253
Housekeeping help	0.6	0.5	0	1	2,253
Personal care	0.2	0.4	0	1	2,253
Personal support	0.8	0.4	0	1	2,253
Care recipient living at home	0.4	0.7	0	2	2,253
Care recipient relationship	0.9	0.6	0	2	2,253
Age	57.1	13.7	17	96	9,180
Health	1.7	0.5	1	2	9,180
Marital status	2.2	0.8	1	5	9,180
Education level	3.7	1.5	1	9	9,180
Occupational status	1.0	1.0	0	2	9,180
Child(ren)	0.6	1.0	0	6	9,180
Work hours	17.6	17.1	0	68	9,180
Log of standardized net household income	7.5	0.7	0	12	9,180
Living environment	3.1	1.2	1	5	9,180

Descriptive statistics based on our common sample.

It includes 9,180 observations and 1,188 individuals.

7.3 Fixed effects vs Random effects

Table 3.11: Hausman test

	OLS estimates	
	Fixed effects	Random effects
Informal	-0.070***	-0.082***
	(0.03)	(0.03)
Age categories. Ref: 15-24		
25-34	0.234**	0.254***
	(0.10)	(0.09)
35-44	0.270**	0.197*
	(0.13)	(0.11)
45-54	0.232	0.175
	(0.15)	(0.11)
55-64	0.237	0.222**
	(0.16)	(0.11)
65 and over	0.137	0.136
	(0.17)	(0.12)
Gender	-	-0.014
		(0.06)
Objective health	0.121***	0.220***
	(0.04)	(0.03)
Marital status. Ref: Single		
Married without children	-0.035	0.309***
	(0.08)	(0.06)
Married with children	0.016	0.162**
	(0.10)	(0.08)
Single with children	0.052	-0.090
	(0.12)	(0.10)
Other	-0.277**	-0.023
	(0.13)	(0.11)

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	OLS estimates	
	Fixed effects	Random effects
Educational status: Ref: Primary school		
Intermediate secondary education	-0.491***	-0.110
	(0.18)	(0.11)
Higher secondary education	-0.490**	-0.254**
	(0.20)	(0.12)
Intermediate vocational education	-0.567***	-0.203*
	(0.19)	(0.11)
Higher vocational education	-0.322	-0.026
	(0.21)	(0.12)
University	-0.389*	-0.052
	(0.23)	(0.13)
Others	-0.593***	-0.257*
	(0.21)	(0.15)
Not yet completed any education	-0.376	-0.100
	(0.28)	(0.25)
Not yet started any education	-1.356*	-0.853
	(0.81)	(0.80)
Occupational status. Ref : Employed or self-employed		
Unemployed	-0.276***	-0.306***
	(0.07)	(0.07)
Out of the labor force	0.203***	0.209***
	(0.05)	(0.04)
Children	-0.151***	-0.042
	(0.04)	(0.03)
Working hours	-0.002*	-0.002
	(0.00)	(0.00)
Household income	0.019	0.057***
	(0.02)	(0.02)
Living environment. Ref: Extremely urban		
Very urban	-0.198	-0.120
	(0.14)	(0.08)
Moderately urban	0.187	0.066
	(0.16)	(0.09)
Slightly urban	0.128	0.081
	(0.16)	(0.09)
Not urban	-0.019	0.108
	(0.18)	(0.09)
Constant	7.485***	-
	(0.33)	
Observations	9180	9180
Time fixed effects	Yes	Yes
Hausman test Prob > chi2 = 0.000		

Standard errors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010.
The sample includes 1188 individuals.

Table 3.11 reports the results for both the fixed effects and rendom effects regression as well as the Hausman test. Its low *p*-value points us to the use of fixed effects.

7.4 Endogeneity issues

7.4.1 Controlling for the simultaneity between life satisfaction and the decision to care

Table 3.12: The impact of life satisfaction on the decision to care

	OLS estimates	
	Full	Full
Lifesat	-0.013**	-0.012**
	(0.01)	(0.01)
l.Life satisfaction	-	-0.011**
		(0.01)
Gender	-	-
Age categories. Ref: 15-24		
25-34	0.036	0.036
	(0.05)	(0.05)
35-44	-0.006	-0.007
	(0.06)	(0.06)
45-54	0.058	0.057
	(0.06)	(0.06)
55-64	0.066	0.065
	(0.07)	(0.07)
65 and over	0.004	0.003
	(0.08)	(0.08)
Objective health	-0.012	-0.011
	(0.02)	(0.02)
Marital status. Ref: Single		
Married without children	0.080*	0.083*
	(0.05)	(0.05)
Married with children	0.047	0.050
	(0.06)	(0.06)
Single with children	0.074	0.075
	(0.07)	(0.07)
Other	-0.101	-0.101
	(0.08)	(0.08)
Educational status: Ref: Primary school		
Intermediate secondary education	-0.010	-0.012
	(0.07)	(0.07)
Higher secondary education	0.004	0.003
	(0.07)	(0.07)
Intermediate vocational education	0.014	0.013
	(0.07)	(0.07)
Higher vocational education	0.021	0.022
	(0.09)	(0.09)
University	0.078	0.079
	(0.08)	(0.08)
Others	0.064	0.064
	(0.11)	(0.10)
Not yet completed any education	0.187	0.181
	(0.15)	(0.15)
Not yet started an yeducation	-0.062	-0.057
	(0.07)	(0.07)

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	OLS estimates	
Occupational status. Ref : Employed or self-employed		
Unemployed	0.048	0.048
	(0.04)	(0.04)
Out of the labor force	0.045	0.046*
	(0.03)	(0.03)
Children	0.019	0.018
	(0.02)	(0.02)
Working hours	-0.002**	-0.002**
	(0.00)	(0.00)
Household income	0.024	0.025
	(0.02)	(0.02)
Living environment. Ref: Extremely urban		
Very urban	-0.120	-0.121
	(0.09)	(0.09)
Moderately urban	-0.111	-0.112
	(0.10)	(0.10)
Slightly urban	-0.093	-0.090
	(0.09)	(0.09)
Not urban	-0.232**	-0.228**
	(0.12)	(0.11)
Constant	0.200	0.268
	(0.22)	(0.22)
Observations	9180	9180
Number of groups	1188	1188
Time fixed effects	Yes	Yes

Standard errors are in parenthesis.* $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table 3.12 reports the results about the impact of life satisfaction on the decision to care. The significance of the life satisfaction (and its lag) on the decision to care show that they are simultaneously determined.

7.4.2 Controlling for omitted variable: The Durbin-Wu Hausman test

Table 3.13: The augmented regression test (Durbin-Wu-Hausman)

	The informal care decision	Life satisfaction
Informal		4.903*
		(2.83)
Residuals		-4.972*
		(2.83)
Gender	0.101***	-
	(0.02)	
Age categories. Ref: 15-24		
25-34	0.066*	-0.092
	(0.04)	(0.22)
35-44	0.101***	-0.231
	(0.04)	(0.32)
45-54	0.273***	-1.125
	(0.04)	(0.79)
55-64	0.294***	-1.223
	(0.04)	(0.84)
65 and over	0.244***	-1.076
	(0.04)	(0.71)
Objective health	-0.034*	0.289***
	(0.02)	(0.11)
Marital status. Ref: Single		
Married without children	0.051**	-0.289*
	(0.02)	(0.17)
Married with children	0.038	-0.176
	(0.04)	(0.17)
Single with children	0.051	-0.201
	(0.06)	(0.23)
Other	0.100*	-0.776**
	(0.06)	(0.35)
Intermediate secondary education	0.020	-0.589*
	(0.04)	(0.34)
Higher secondary education	0.038	-0.679*
	(0.05)	(0.36)
Intermediate vocational education	0.025	-0.689**
	(0.04)	(0.35)
Higher vocational education	0.038	-0.513
	(0.05)	(0.38)
University	0.118**	-0.975*
	(0.06)	(0.52)
Others	0.097	-1.076*
	(0.07)	(0.60)
Not yet completed any education	0.313**	-1.934**
	(0.15)	(0.95)
Not yet started any education	0.108**	-1.891***
	(0.05)	(0.42)
Occupational status.		
Ref : Employed or self-employed	Ref	Ref
Unemployed	0.086*	-0.702***
	(0.04)	(0.26)
Out of the labor force	0.011	0.149**
	(0.03)	(0.06)
Children	0.011	-0.206***
	(0.02)	(0.06)

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	The informal care decision	Life satisfaction
Working hours	-0.002***	0.010
	(0.00)	(0.01)
Household income	-0.011	0.074**
	(0.01)	(0.04)
Living environment. Ref: Extremely urban		
Very urban	-0.010	-0.147
	(0.03)	(0.28)
Moderately urban	-0.033	0.352
	(0.03)	(0.29)
Slightly urban	-0.003	0.144
	(0.04)	(0.27)
Not urban	0.007	-0.054
	(0.04)	(0.26)
Constant	-0.051	6.955***
	(0.13)	(0.57)
Observations	9180	9180
Number of groups	1188	1188
Time fixed effects	Yes	Yes
Residuals test Prob > chi2 = 0.079		

Standard errors in parenthesis clustered at the individual level in the first column.
* p<0.10, ** p<0.05, *** p<0.010

Results of the Durbin-Wu-Hausman test are presented in Table 3.13. The significant t-test if the residuals indicates that OLS is not consistent.

7.5 Difference GMM vs System GMM estimator

Table 3.14: Rule-of-Thumb (Blundell *et al.*, 2001)

	OLS		Difference GMM	
	Pooled	Fixed effects	One step	Two step
l.Life satisfaction	0.616***	0.079***	0.090***	0.085***
	(0.02)	(0.02)	(0.03)	(0.03)
Informal	-0.033	-0.064**	-0.139***	-0.071*
	(0.02)	(0.03)	(0.05)	(0.04)
Gender	0.017			
	(0.02)			
Age categories. Ref: 15-24				
25-34	0.157**	0.231**	0.178	0.269
	(0.07)	(0.12)	(0.17)	(0.18)
35-44	0.106	0.272**	0.247	0.370*
	(0.07)	(0.14)	(0.19)	(0.19)
45-54	0.107	0.240	0.217	0.382*
	(0.07)	(0.16)	(0.21)	(0.21)
55-64	0.172**	0.245	0.264	0.405*
	(0.07)	(0.17)	(0.23)	(0.22)
65 and over	0.117	0.146	0.210	0.427*
	(0.08)	(0.18)	(0.24)	(0.23)
Objective health	0.169***	0.111**	-0.037	-0.061
	(0.02)	(0.05)	(0.11)	(0.10)
Marital status. Ref: Single				
Married without children	0.141***	-0.053	0.049	0.040
	(0.03)	(0.10)	(0.26)	(0.20)
Married with children	-0.048	-0.007	0.270	0.321
	(0.07)	(0.13)	(0.29)	(0.27)
Single with children	-0.285***	0.041	0.455	0.403
	(0.08)	(0.16)	(0.31)	(0.30)
Other	-0.188**	-0.275	-0.731	-0.753
	(0.08)	(0.23)	(0.55)	(0.46)
Educational status: Ref: Primary school				
Intermediate secondary education	-0.006	-0.472	-0.494	-0.447
	(0.06)	(0.34)	(0.59)	(0.65)
Higher secondary education	-0.045	-0.479	-1.110**	-1.299*
	(0.06)	(0.35)	(0.54)	(0.67)
Intermediate vocational education	-0.029	-0.554	-1.409**	-1.733**
	(0.06)	(0.35)	(0.69)	(0.78)
Higher vocational education	0.012	-0.332	-0.342	-0.727
	(0.06)	(0.37)	(0.68)	(0.80)
University	0.038	-0.394	-0.877	-1.239
	(0.06)	(0.39)	(0.72)	(0.80)
Others	-0.089	-0.589	-1.012	-1.484*
	(0.10)	(0.55)	(0.74)	(0.81)
Not yet completed any education	0.146	-0.335	-1.021*	-0.850
	(0.16)	(0.32)	(0.52)	(0.67)
Not yet started any education	-1.217***	-1.385***	-1.042***	-1.324
	(0.07)	(0.31)	(0.25)	(2.70)
Occupational status.				
Ref : Employed or self-employed	ref	ref	ref	ref
	-	-	-	-
Unemployed	-0.324***	-0.274***	-0.288**	-0.318***
	(0.10)	(0.09)	(0.13)	(0.12)
Outofthelaborforce	0.119***	0.197***	0.136	0.096
	(0.04)	(0.05)	(0.11)	(0.12)

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| | OLS | | Difference GMM | |
	Pooled	Fixed effects	One step	Two step
Children	0.050**	-0.143***	-0.185*	-0.245**
	(0.03)	(0.04)	(0.11)	(0.12)
Working hours	0.001	-0.002	-0.002	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Household income	0.046**	0.016	-0.168*	-0.171***
	(0.02)	(0.02)	(0.09)	(0.06)
Living environment. Ref: Extremely urban				
Very urban	-0.041	-0.189	-0.366	-0.511
	(0.04)	(0.27)	(0.54)	(0.49)
Moderatel urban	0.005	0.192	0.552	0.923*
	(0.04)	(0.27)	(0.54)	(0.52)
Slightly urban	0.015	0.104	0.092	0.472
	(0.04)	(0.26)	(0.75)	(0.68)
No turban	0.022	-0.044	-0.165	0.148
	(0.04)	(0.25)	(0.54)	(0.52)
Constant	2.095***	6.921***		
	(0.22)	(0.51)		
Observations	9180	9180	8045	8045
Time fixed effects	Yes	Yes	Yes	Yes

Standard arrors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010.
The sample includes 1188 individuals.

According to Arellano and Bover (1995), the two-step GMM model provides more efficient and consistent estimates in the case of panel data than the first-step GMM model. In order to determine whether we had to perfom either a difference-GMM or a system-GMM model, we follow the second rule-of-thumb suggested by Blundell et al. (2001). Following these authors, the autoregressive model should be initially estimated by pooled OLS and a fixed effects approach. The pooled OLS estimate for the parameter of the lag of the dependent variable should be considered as an upper-bound estimate while the one of the fixed effects estimate is the lower-bound estimate. A difference-GMM estimate close or below the fixed effects estimate suggests a downward biais and points us to the use of a system-GMM estimator. As shown in Table 3.14, estimates from the difference GMM are close to those from the OLS with fixed effects, suggesting that system GMM estimator should be preferred instead.

7.6 Detailed results

7.6.1 Detailed results for the main specification

Table 3.15: OLS and two-step GMM estimates (detailed)

	OLS		GMM	
	Pooled	Fixed effects	Two-step	Two-step
l.Life satisfaction	-	-	0.088***	0.066***
			(0.01)	(0.01)
Informal	-0.121***	-0.070**	-0.087***	-0.086***
	(0.05)	(0.03)	(0.02)	(0.02)
Age categories. Ref: 15-24				
25-34	0.269*	0.234*	0.169***	0.228***
	(0.14)	(0.12)	(0.05)	(0.05)
35-44	0.152	0.270*	0.064	0.103**
	(0.15)	(0.15)	(0.06)	(0.05)
45-54	0.159	0.232	0.059	0.101*
	(0.15)	(0.16)	(0.06)	(0.05)
55-64	0.274*	0.237	0.173***	0.197***
	(0.15)	(0.18)	(0.06)	(0.06)
65 and over	0.250	0.137	0.117	0.136*
	(0.17)	(0.19)	(0.08)	(0.08)
Gender	0.047	-	-0.047	-0.050
	(0.06)		(0.03)	(0.03)
Objective health	0.426***	0.121**	0.118***	0.121***
	(0.06)	(0.05)	(0.04)	(0.04)
Marital status. Ref: Single				
Married without children	0.469***	-0.035	0.113	0.271***
	(0.07)	(0.11)	(0.07)	(0.07)
Married with children	0.010	0.016	0.126	0.231**
	(0.15)	(0.13)	(0.09)	(0.09)
Single with children	-0.687***	0.052	-0.552***	-0.472***
	(0.18)	(0.17)	(0.10)	(0.10)
Other	-0.318**	-0.277	-0.501***	-0.358***
	(0.15)	(0.24)	(0.09)	(0.09)
Educational status: Ref: Primary school				
Intermediate secondary education	-0.012	-0.491	-0.171**	-0.285***
	(0.13)	(0.34)	(0.07)	(0.06)
Higher secondary education	-0.148	-0.490	-0.440***	-0.362***
	(0.14)	(0.35)	(0.10)	(0.09)
Intermediate vocational education	-0.093	-0.567	-0.287***	-0.273***
	(0.13)	(0.35)	(0.10)	(0.10)
Higher vocational education	0.016	-0.322	0.053	0.023
	(0.13)	(0.37)	(0.09)	(0.08)
University	0.022	-0.389	0.053	0.039
	(0.14)	(0.40)	(0.10)	(0.10)
Others	-0.234	-0.593	-0.766***	-0.679***
	(0.21)	(0.54)	(0.11)	(0.10)
Not yet completed any education	-0.080	-0.376	-0.229**	-0.254**
	(0.18)	(0.31)	(0.11)	(0.10)
Not yet started any education	-1.319***	-1.356***	-1.123***	-1.156***
	(0.16)	(0.30)	(0.26)	(0.25)

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Table 3.15 reports detailed estimates of the main specification. It refers to Table 3.3 in the main text.

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	OLS		GMM	
	Pooled	Fixed effects	Two-step	Two-step
Occupational status.				
Ref : Employed or self-employed	Ref	Ref	Ref	Ref
	-	-	-	-
Unemployed	-0.422***	-0.276***	-0.259***	-0.284***
	(0.13)	(0.09)	(0.06)	(0.06)
Out of the labor force	0.217***	0.203***	0.152***	0.173***
	(0.08)	(0.05)	(0.06)	(0.06)
Children	0.129**	-0.151***	0.008	0.013
	(0.05)	(0.05)	(0.04)	(0.04)
Working hours	0.002	-0.002*	-0.005***	-0.004***
	(0.00)	(0.00)	(0.00)	(0.00)
Household income	0.123***	0.019	-0.067***	-0.089***
	(0.05)	(0.02)	(0.02)	(0.02)
Living environment. Ref: Extremely urban				
Very urban	-0.147	-0.198	-0.193**	-0.163*
	(0.10)	(0.28)	(0.09)	(0.10)
Moderately urban	-0.038	0.187	0.456***	0.425***
	(0.10)	(0.28)	(0.10)	(0.09)
Slightly urban	0.031	0.128	-0.159*	-0.146
	(0.10)	(0.27)	(0.09)	(0.09)
Not urban	0.044	-0.019	0.527***	0.580***
	(0.10)	(0.26)	(0.09)	(0.08)
Constant	5.425***	7.485***	7.309***	7.484***
	(0.44)	(0.46)	(0.23)	(0.20)
Number of observations	9180	9180	9180	9180
Number of groups	1188	1188	1188	1188
Time fixed effects	Yes	Yes	Yes	Yes
R-squared	0.10	0.02		
Number of instruments			474	470
AR(1)			0.000	0.000
AR(2)			0.067	0.131
Hansen test			0.777	0.508

Standard errors are in parenthesis. In the first column, standard errors are clustered at the individual level.
* $p<0.10$, ** $p<0.05$, *** $p<0.010$
All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.
We instrument the lag of the life satisfaction with its first and second lags in Model (3)
We instrument the lag of the life satisfaction with its second and third lags in Model (4).
We instrument other endogenous regressors with their first and second lags

7.6.2 Detailed results on the intensity and the duration of the caregiving episode

Table 3.16: Intensity and duration of caregiving (detailed)

	Two-step system GMM estimates			
	Frequency		Duration of the cargeiving episode	
l.Life satisfaction	0.086***	0.031***	0.106***	0.003
	(0.01)	(0.01)	(0.01)	(0.01)
Frequency	-0.006***	-0.018***		
	(0.00)	(0.00)		
Years of care. Ref: 0 year				
1 year			-0.100***	-0.158***
			(0.02)	(0.05)
2 years			-0.059**	-0.206***
			(0.03)	(0.05)
3 years			-0.139***	-0.251***
			(0.03)	(0.05)
4 years			-0.127***	-0.161***
			(0.04)	(0.05)
5 years			-0.156***	-0.203***
			(0.04)	(0.05)
6 years			0.020	-0.066
			(0.05)	(0.06)
7 years and over			-0.063	-0.109
			(0.06)	(0.07)
Gender	-0.059*	0.009	-0.054*	-0.002
	(0.03)	(0.04)	(0.03)	(0.04)
Age categories. Ref: 15-24				
25-34	0.219***	0.228***	0.287***	0.246***
	(0.05)	(0.05)	(0.05)	(0.05)
35-44	0.105**	0.157**	0.121**	0.191**
	(0.05)	(0.08)	(0.05)	(0.08)
45-54	0.094*	0.114	0.137**	0.167**
	(0.05)	(0.08)	(0.05)	(0.08)
55-64	0.208***	0.133*	0.264***	0.182**
	(0.06)	(0.08)	(0.05)	(0.08)
65 and over	0.151**	0.041	0.208***	0.096
	(0.07)	(0.09)	(0.06)	(0.10)
Objective health	0.099**	0.027	0.134***	0.147**
	(0.04)	(0.06)	(0.04)	(0.06)
Marital status. Ref: Single				
Married without children	0.216***	0.720***	0.189***	0.677***
	(0.06)	(0.08)	(0.05)	(0.08)
Married with children	0.216**	0.498***	0.155**	0.396***
	(0.09)	(0.13)	(0.08)	(0.13)
Single with children	-0.473***	0.250	-0.513***	0.097
	(0.10)	(0.15)	(0.08)	(0.16)
Other	-0.237***	0.027	-0.240***	-0.051
	(0.09)	(0.12)	(0.07)	(0.12)

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| | Two-step system GMM estimates | | | |
	Frequency		Duration of the cargeiving episode	
Educational status: Ref: Primary school				
Intermediate secondary education	-0.200***	-0.098	-0.156***	0.064
	(0.06)	(0.12)	(0.05)	(0.12)
Higher secondary education	-0.316***	-0.257**	-0.279***	-0.141
	(0.08)	(0.12)	(0.08)	(0.13)
Intermediate vocational education	-0.195**	0.037	-0.081	0.219**
	(0.09)	(0.10)	(0.08)	(0.10)
Higher vocational education	0.102	0.165	0.062	0.298***
	(0.07)	(0.11)	(0.07)	(0.11)
University	0.111	-0.041	-0.006	-0.038
	(0.09)	(0.11)	(0.08)	(0.12)
Others	-0.516***	-1.084***	-0.607***	-0.911***
	(0.09)	(0.20)	(0.08)	(0.21)
Not yet completed any education	-0.196**	0.406***	-0.286***	0.471***
	(0.09)	(0.15)	(0.09)	(0.13)
Not yet started any education	-1.043***	11.600**	-0.822***	16.960***
	(0.25)	(5.37)	(0.25)	(5.95)
Occupational status				
Ref: Employed or self-employed				
Unemployed	-0.287***	-0.582***	-0.321***	-0.440***
	(0.06)	(0.15)	(0.06)	(0.14)
Out of the labor force	0.160***	0.430***	0.174***	0.394***
	(0.05)	(0.07)	(0.05)	(0.07)
Children	0.008	-0.000	0.050	0.042
	(0.04)	(0.05)	(0.03)	(0.05)
Working hours	-0.004***	0.000	-0.005***	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Household income	-0.099***	-0.041	-0.090***	-0.013
	(0.02)	(0.03)	(0.02)	(0.03)
Living environment.				
Ref: Extremely urban Very urban	-0.136	0.014	-0.349***	-0.151
	(0.10)	(0.10)	(0.08)	(0.10)
Moderately urban	0.379***	0.293***	0.186**	0.211**
	(0.09)	(0.10)	(0.08)	(0.10)
Slightly urban	-0.213**	0.141	-0.335***	0.149
	(0.10)	(0.12)	(0.08)	(0.12)
Not urban	0.499***	0.735***	0.411***	0.682***
	(0.08)	(0.11)	(0.08)	(0.10)
Constant	7.451***	6.754***	7.265***	6.519***
	(0.19)	(0.32)	(0.18)	(0.28)
Observations	9180	9180	9180	9180
Time fixed effects	Yes	Yes	Yes	Yes

Standard errors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010
All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.
In all models, we instrument the lag of the life satisfaction with its second and third lags.
We instrument other endogenous regressors with their first and second lags in Model (1) and Model (3)
We instrument other endogenous regressors with their second and third lags in Model (2) and Model (4).

Table 3.16 reports detailed estimates about the intensity and the duration of the caregiving episode. It refers to Table 3.7 in the main text.

7.6.3 Detailed results using alternative specifications

Table 3.17: Alternative specifications (detailed)

	Number of lags			
	Model (1)	Model (2)	Model (3)	Model (4)
l.Happiness	0.032***			
	(0.01)			
l.Life satisfaction		-0.003	-0.065***	0.011
		(0.01)	(0.01)	(0.01)
Informal	-0.117***	-0.152***	-0.070***	-0.081***
	(0.02)	(0.05)	(0.02)	(0.03)
Gender	-0.008	0.030	0.046	-0.083**
	(0.03)	(0.05)	(0.04)	(0.04)
Age categories. Ref: 15-24				
25-34	0.119***	0.182***	0.255***	0.341***
	(0.04)	(0.05)	(0.05)	(0.07)
35-44	-0.040	0.151*	0.257***	0.108*
	(0.05)	(0.08)	(0.07)	(0.07)
45-54	0.031	0.105	0.178***	0.132**
	(0.05)	(0.08)	(0.06)	(0.06)
55-64	0.136***	0.140*	0.215***	0.256***
	(0.05)	(0.08)	(0.06)	(0.07)
65 and over	0.050	0.099	0.200***	0.197***
	(0.06)	(0.10)	(0.07)	(0.08)
Objective health	0.156***	0.087	0.115***	0.165***
	(0.03)	(0.07)	(0.04)	(0.05)
Marital status. Ref: Single				
Married without children	0.058	0.663***	0.721***	0.084
	(0.05)	(0.08)	(0.04)	(0.06)
Married with children	-0.015	0.474***	0.535***	0.107
	(0.06)	(0.14)	(0.10)	(0.09)
Single with children	-0.754***	0.188	0.269**	-1.056***
	(0.08)	(0.17)	(0.12)	(0.11)
Other	-0.507***	-0.028	-0.092	-0.564***
	(0.07)	(0.14)	(0.09)	(0.11)
Educational status: Ref: Primary school				
Intermediate secondary education	-0.160**	-0.171	-0.023	-0.260***
	(0.07)	(0.12)	(0.09)	(0.07)
Higher secondary education	-0.476***	-0.270**	0.101	-0.471***
	(0.07)	(0.12)	(0.09)	(0.10)
Intermediate vocational education	-0.046	0.111	0.245***	-0.377***
	(0.08)	(0.10)	(0.06)	(0.10)
Higher vocational education	0.033	0.198*	0.354***	-0.404***
	(0.07)	(0.11)	(0.08)	(0.10)
University	0.144	-0.034	0.142*	-0.262***
	(0.09)	(0.11)	(0.08)	(0.10)
Others	-0.682***	-1.166***	-0.974***	-1.053***
	(0.15)	(0.21)	(0.14)	(0.09)
Not yet completed any education	-0.403***	0.395***	0.689***	-0.868***
	(0.09)	(0.15)	(0.06)	(0.09)
Not yet started any education	-2.115***	16.394***	15.779***	-1.230***
	(0.27)	(5.92)	(5.30)	(0.25)
Occupational status. Ref : Employed or self-employed				
Unemployed	-0.014	-0.579***	-0.503***	-0.188***
	(0.02)	(0.14)	(0.06)	(0.06)
Out of the labor force	0.130***	0.372***	0.344***	0.211***
	(0.04)	(0.07)	(0.07)	(0.06)

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Table 3.18: *Continued from previous page*

		Number of lags		
	Model (1)	Model (2)	Model (3)	Model (4)
Children	0.099***	-0.011	-0.052	0.061*
	(0.02)	(0.05)	(0.05)	(0.03)
Workinghours	-0.005***	0.000	0.000	-0.003***
	(0.00)	(0.00)	(0.00)	(0.00)
Household income	-0.086***	-0.030	-0.036	-0.090***
	(0.02)	(0.03)	(0.03)	(0.02)
Living environment. Ref: Extremely urban				
Very urban	-0.131*	0.041	-0.190**	-0.537***
	(0.07)	(0.11)	(0.08)	(0.07)
Moderately urban	0.253***	0.331***	0.374***	0.260***
	(0.07)	(0.11)	(0.07)	(0.08)
Slightly urban	0.016	0.249*	0.148	-0.473***
	(0.09)	(0.13)	(0.09)	(0.06)
Not urban	0.569***	0.910***	0.854***	0.546***
	(0.08)	(0.11)	(0.09)	(0.09)
Constant	7.798***	6.768***	7.028***	8.274***
	(0.19)	(0.31)	(0.24)	(0.27)
Observations	9013	9180	9180	8184
Time fixed effects	Yes	Yes	Yes	Yes

Standard errors are in parenthesis. * $p<0.10$, ** $p<0.05$, *** $p<0.010$
All explanatory variables -except for time dummies, gender and age categories- are treated as endogenous.
In all models, we instrument the lag of the life satisfaction with its second and third lags.
We instrument other internal endogenous regressors with their first and second lags in Model (1) and Model (4)
We instrument other endogenous regressors with their second and third lags in Model (2)
We instrument other endogenous regressors with their third and fourth lags in Model (3).

Table 3.17 presents detailed estimates using alternative specifications. It refers to Table 3.7 in the main text.

Chapter 4

The impact of informal care provision on the caregiver partner's mental health[1]

Summary of the chapter

Using data from the *Survey of Health, Ageing and Retirement in Europe* (SHARE), we address how care provision by adult children affects the mental health of their partners. We control for the endogeneity due to the simultaneity of informal care provision and mental health issues with instrumental variables (IV) using the distance between respondents' and parents' households and the number of respondents' sisters as instruments. The results suggest that a higher intensity of care provided by the respondent to her own old-age parents leads to a smaller depression rate of her partner. In order to explain the positive impact of the informal care provision, we highlight two channels: the role of parental health and the follow-up depressive symptoms within the couple. We find that parental health has a negative impact on the partner's depression but does not conflate with the care effect. We control for the influence of caregiving on the respondents' mental health to understand whether spillover effects inside the couple exist. The results suggest that only men respondents and their partners are impacted by the caregiving activity in a similar way.

1 Introduction

For several decades, most European countries face up to the ageing population. Lower birth rates, decline in infant mortality and rising life expectancies explain such a demographic change. However, people living longer are more likely to need help due to cognitive or physical impairments rising with ageing. By 2060, the elderly dependency ratio might achieve the highest level of more than one old-age individual for every two working persons (Lanzieri, 2011). This fast-growing old-age population in need is mainly cared informally, either by family members or close relatives. Although the informal care provision is usually considered as more accessible and cheaper than the support provided by the State or via the private sector, it might impact caregivers' everyday life. Previous studies have widely documented that providing informal help can result in a series of effects on carers' health and family time.

The main goal of this paper is to analyze how the informal care provision impacts carers' family members. More precisely, we are interested in the well-being of individuals whose partners care for their own old-age parents.

The provision of informal help adversely impacts carers' health as this task is expected to be mentally stressful and time-consuming (Hirst, 2005; Chappell and Colin, 2002; Cooper et al., 2007). A meta-analysis by Pinquart and Sörensen (2003) highlights the negative impact of the informal care provision on psychological health of caregivers. More precisely, they find significant differences between caregivers and noncaregivers in perceived stress, depression, general subjective well-being, physical health, and self-efficacy (see also Schulz et al., 1995). Not only caregivers are psychologically weakened by carrying out support activities but they also bear physical costs. According to Pinquart and Sörensen (2007), several channels might explain the negative impact on caregivers physical health. First, caring for people over a long period of time causes physical impairments such as arthritis or back problems. Then, caregivers might neglect themselves, adopting an unhealthy lifestyle. Finally, psychological and physical health being highly correlated, caregivers suffering from distress or burden are more vulnerable to hypertension or heart diseases.

Informal care and health are highly related, not only because the caregiving process itself consists of unpleasant and difficult tasks to carry out repeatdly but also because caregivers witness continously impairments of people they care about. In this regard, Bobinac et al. (2010) highlight the direct impact of "the health of a patient on the welfare" on someone else, the so-called "family effect". The latter has to be distinguished from the "caregiving effect" that refers to the impact of

the informal care provision. Contrary to the caregiving effect, the family effect is related to the fact that people are directly influenced by their close relatives' health, whether or not they provide care. The authors show that not accounting for the family effect overestimates the care effect by 30%.

Howewer, the prevalence of adverse effects of the help provision on health has to be qualified as it may depend on specific socio-demographics characteristics. For instance, a close and loving relationship between the caregiver and the care recipient leads to lower depressive symptoms according to Savage and Bailey (2004). In this regard, Raschick and Ingersoll-Dayton (2004) find that adult children, as caregivers, experience more rewards than spousal caregivers. They suggest that spouses perceive informal care as a duty while adult children see it as social expectations. Additionnally, married caregivers are less likely to be impacted negatively by the care process than unmarried caregivers (Brody et al., 1995), probably because they benefit from spousal support.

Other studies have found a positive effect of caregiving on health. Cohen et al. (2002) as well as Ashworth and Baker (2000) highlight beneficial aspects of caring such as personal development, satisfaction with helping others, strengthening the relationship with the care recipient (Boerner et al., 2004). According to Braithwaite (2000), a close and loving relationship between caregivers and care recipients is associated with lower psychiatric symptoms.

All these studies deal with effects on carers but providing informal support have implications not only for carers' health but also for their family. Caring for elderly is likely to affect the well-being of caregivers and their family members, especially when care recipients are members of the household (Amirkhanyan and Wolf, 2006). Bookwala (2009) focuses on the carers' couple and show that experienced caregivers are less happy in their marriages. Using marital role inequity as a measure of marital quality, the author performs a series of mixed multivariate analyses of covariance comparing the marital role inequity among different groups, namely former, recent and experienced caregivers. Despite very interesting results, they cannot conclude on the causal relationship between the intensity of help and the marital quality of caregivers' couple. To the best of our knowledge, Bookwala's work is the only study that pays attention to the effect of informal care provision on caregivers' couple.

This paper attemps to fill this gap in the literature by extending the previous findings about the impact of care provision on caregivers' health to their partners. More precisely, we study the causal relationship between informal care provision and the mental health of caregivers' partners using panel data from the Survey of Health, Ageing and Retirement (SHARE). The explained variable accounts for depressive

symptoms related to one's mental health such as sadness, suicidability or irritability. We control for several characteristics concerning both the caregiver and her partner. We also use a Two-Stage-Least- Squares (2SLS) with instrumental variables approach in order to control for the potential endogeneity issue due to the reverse causality between the care provided and the depressive state of the partner. The informal care provision is instrumented with the distance between adult childrens' and their parents' household and the number of sisters of the potential caregiver.

We contribute to the literature by empirically estimating whether care provision by adult children also affects their partners' depressive state while controlling for endogeneity. We attempt to go further by exploring the channels that might explain our results. More precisely, we examine the influence of caregiving on adult childrens' depressive state and the role of parental health as underlying mechanisms of the causal relationship between caregiving and partners' mental health.

We find that a higher frequency of caregiving leads to a lower depression rate of adult childrens' partners. Although parental health impacts the partner's depression negatively, it does not conflate with the effect of care provision. As it does not interfere in the causal relationship between care and mental health, we conclude that this channel does not appear to be convincing. However, our results may be partly explained by the second channel we attempt to explore: depressive state spillovers within the couple. Looking at gender separately, we find that adult men's depressive state is impacted negatively by their decision to care, as it is for their partners, highlighting the spouses' depressive state correlation. In brief, adult men's and their partners' depression rate are similarly affected by caregiving.

The rest of the paper is organized as follows. The empirical strategy is explained in Section 2. Section 3 presents the data and the sample selection as well as summary statistics. The main results are reported in Section 4. A discussion on the different channels that could explain our results is provided in Section 5. Section 6 presents robustness tests and Section 7 concludes.

2   Empirical strategy

Let us consider an individual i *(i=1,...,n)* who is in a couple with individual j *(j=1,...,n)*. The subscript t stands for the periods of time. We measure the depression of individual i (D_{it}) which is a function of the care provided by individual j (C_{jt}) and two vectors of socio-demographic controls (Z_{it}) for individual i and (X_{jt}) for individual j. λ_t is a year fixed effect and α_k is a country fixed effect. The error

component (ϵ_{it}) is clustered at the individual level. This equation is estimated using a standard linear regression such that:

$$D_{it} = \beta_0 + \beta_1 C_{jt} + \beta_2 \mathbf{Z}_{it} + \beta_3 \mathbf{X}_{jt} + \lambda_t + \alpha_k + \epsilon_{it} \tag{4.1}$$

However, this simple model may be biased due to different endogeneity issues. First, we suspect the main variable, Care (C_{jt}), to be endogenous due to the reverse causality bias. The decision to provide care and the depression of caregivers' partners may be simultaneously determined. The caregiving frequency is likely to be taken in a function of the depressive state of the partner: adult children may dedicate less time to care for their parents if they are in partnership with depressed people. In order to test whether Care (C_{jt}) is actually exogenous, we perform an augmented regression test. This method consists in including the residuals of endogenous variables as a function of exogenous variables, in the baseline model (Davidson and Mackinnon, 1992). We then test for the statistical significance of the coefficient on the residuals using a t-test[2]. We reject the null hypothesis of exogeneity at 1% level and conclude that Ordinary Least Square (OLS) estimator is inconsistent.

Secondly, there are unobserved variables influencing depressive state of the partner that are correlated with the care provision. For instance, characteristics of the partner's family such as mental health history of the partner's parents are likely to impact both the depressive state of the partner and the care provided by adult children to his own parents. More specifically, the fact that partners are affected by their parents' mental health, leading to a higher depression score, impacts also the adult childrend decision to care.

To tackle these two issues, we perform a second model using 2SLS with instrumental variables. The matter of concern with this methodology is to find instruments for the endogenous variable. In order to get unbiaised estimates, instruments are required to be strong predictors of caregiving but uncorrelated with the residuals.

Past work has shown that the number of children, and particularly the number of daughters, is strongly correlated with the informal care provision. A large number of studies point out that daughters are the primary caregivers (Stone et al., 1987; Norton, 2000; Coe et al., 2013) meaning that a higher number of daughters increases the probability of being cared.

Other studies put forward the distance between children's and parents' households as a well-fitted instrumental variable for the informal care supply (Stern, 1995; Bonsang, 2009; Barnay and Juin, 2016). While the distance seems to be a strong

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[2]Detailed results are in Appendix, see Table 4.6.

predictor of informal care, the property regarding the independence of instrumental variables from the error term may fail. For instance, children could choose to move on closer to their parents when their health deteriorates. Howewer, Charles and Sevak (2005) show that children location does not endogenously responds to parents' health. Another threat to the exogeneity is that this instrument may be correlated with the depression of the partner through another channel than the care provision. For instance, the distance between adult childrens' and parents' households is likely to affect the depression of the partner via the geographical location of the partner's parents. Especially, it would be the case if the adult childrens' parents live far away from the ones of her partner. Although the exogeneity of the variable regarding distance is questionable, we choose to consider it as it passes the test of overidentification (see below).

We tested other instruments for informal care including the number of brothers, the number of grandchildren and their age[3]. In our estimations, however, these instruments are poorly correlated with informal care and hardly pass the overidentification test.

3 Data

Our estimations are done using the SHARE (Survey of Health, Ageing and Retirement in Europe) database. It is a multidisciplinary and cross-national survey that gathers more than 140,000 individuals over the age of 50 (and their partners) from 28 participating countries. The database provides information on health, socioeconomic status and both social as well as family networks. Seven waves are now available. Malter and Börsch-Supan (2013, 2015, 2017) provide more information on data collection procedure and methodological issues.

3.1 Sample selection criteria

In our analyses, we consider informal care provided by adult children to their old-age parents. In order to be eligible for our sample, these adult children have to be in a partnership. Their partners are also interviewed, irrespective of age.

Couples living in co-residency with parents are not considered since we look at the care provided outside the household. This is not a worrying restriction. Even

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[3]Cox (1987) questions whether the presence of a child increases the quantity of services provided by adult children to their elder parents. They show that grandchildren could be a strong predictor of informal care.

though co-residency is a source of informal care, restricting the sample to those who
are not living with their own parents allows us to control for joint production. If
caregivers and care recipients live together, two effects have to be distinguished: the
help provided due to poor health and the help provided due to cohabitating. Van
Den Berg and Spauwen (2006) point out the issue of joint production in the informal
care process and show that doing different tasks silmutaneously would bias the real
time caregivers dedicate to care.

Our sample comprises couples across nineteen European countries: Austria, Bel-
gium, Croatia, Czechia, Denmark, Estonia, France, Germany, Greece, Israel, Italy,
Luxembourg, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, The Nether-
lands in waves 4, 5 and 6 of the survey. We do not use data from Hungary because
information for waves 5 and 6 was not available. We choose not to focus on waves 1
and 2 because useful information was not available for a large part of the countries.

Additionally, adult children are 50 or older which meaning that their parents are
even older and more at risk of dependency. Restrictions mentioned above constitute
an observation panel of 12090.

3.2   Variables of interest

We aim at estimating the effect of informal care by adult children on their partners'
depressive state. The dependent variable (D_{it}) is a discrete ordinal variable scored
from 0 (not depressed) to 12 (very depressed) that represents whether partners
have felt depressed in the last month. We use a generated variable provided by
SHARE that represents the depression of each individual at each period of time
by considering twelve items: feeling sad or depressed, hopes for the future, suicidal
feelings, feeling guilty, sleeping troubles, interest in things, irritability, appetite,
feeling tired, concentration, enjoyment and tearfulness. Each one out of the twelve
items has the same weight and the sum of the answers to these questions gives a
depression score rated on a scale of 0 to 12. Combining the identifier module of the
survey, that allows us to link household members in a given wave, and the depression
score of all interviewed individuals, we are able to obtain the partner's depression
score.

The main explanatory variable (C_{jt}) is the informal care provided by adult chil-
dren to either her mother or her father or both in the last twelve months. From
information on the decision of caregiving and its frequency, a unique variable is built
which gives the informal care frequency provided. For this variable, five categories
are possible (no care provided, less often, almost every month, almost every week,

almost daily) scored from 0 to 4. In these waves of the survey, personal care and practical household help are the two types of help considered.

Further explanatory variables regarding adult children are denoted by $\mathbf{X}_{jt}$ and include age, gender, education, current job situation, wealth, number of hours worked, number of alive siblings, number of alive children and grandchildren[4]. $\mathbf{Z}_{it}$ contains partner's characteristics such as education, current job situation and age.

Table 4.1 presents the individuals characteristics of our sample. Men represent 44% of the sample. Both age of adult children and their partners are categorical variables. Three categories are possible: under 60 years, between 60 and 69 years old and more than 70 years old. The mean age is 58 years old for adult children and almost 63 years old for their partners. Current job situation is denoted by dummies variables that contain information on whether individuals are in the labor force (employed, self-employed or unemployed) or not (retired, homemaker, sick or disabled). Around 60% of the sample is still working. Including paid or unpaid overtime, on average adult children work roughly 23 hours a week. As for the caregiving frequency, 72.6% of the sample does not provide any help to her parents. Howewer, around 27% of the whole sample has declared to help, and almost 11.1% did it every week.

The depression score of partners is not really high with a mean of 1.95 (on a scale from 0 to 12). As shown in Table 4.2, more than 30% of the sample has selected items such as feeling sad or depressed, recent trouble sleeping or being irritable while only 4% of the sample have choosen suicidal feelings.

As for instruments, we consider the number of adults' sisters and the distance between childrens' and parents' households. SHARE provides information about geographical proximity of children from parents. If parents live separately, we consider the one who lives the farest from children. Indeed, living far away from parents' home, compared to residing in the same neighbourhood, may have a stronger negative impact on the caregiver's couple as it is more time-consuming and implies higher travel costs. Eight different categories are defined[5]: in the same building, less than 1 km away, between 1 and 5 km, between 5 and 25 km, between 25 and 100 km, between 100 and 500 km or more than 500 km. We consider the center of the bandwidth of each category. On average, adult children live 73.8 kilometers away from their parents' household.

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[4]Wealth is the household net worth. Children including natural children, those of partner, fostered, adopted and stepchildren. Grandchildren including those of partners.

[5]The category concerning children living with parents in the same household is excluded since we focus on the help provided outside the household.

Table 4.1: Sample summary statistics

Variables	Mean	Std. Dev.
Adult children variables		
Care (%)		
No care	72.60	
Less often	4.04	
Almost monthly	6.63	
Almost weekly	11.02	
Alsmot daily	5.71	
Age	58.24	5.23
50 - 60	62.42	
60 - 69	35.09	
> 69	2.50	
Marital status (%)		
Married, living with spouse	91.68	
Registered partnership	2.22	
Never married	2.21	
Divorced	3.34	
Widowed	0.55	
Depression	2.01	2.03
Men	0.44	0.5
Siblings	2.39	1.72
Year of education	12	4.23
In the labor force	0.6	0.49
Hours worked	22.95	20.96
Partners variables		
Depression of partner	1.94	2.02
Age of partner	62.94	7.03
< 60	31.84	
60 - 69	51.09	
> 69	17.07	
Year of education of partner	11.97	4.3
Partner in the labor force	0.59	0.49
Household variables		
Wealth	36.05	54.04
Children	3.43	2.16
Grandchildren	1.63	2.26
Instruments		
Distance	73.73	152.41
Number of sister	1.21	1.19
N	12090	

Regarding the second instrumental variable, we focus on the number of adults' sisters rather than looking at the proportion of sisters[6]. The latter gives us less information about the intensity of caregiving: the proportion of sisters takes the

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[6]We compare two IV regressions, using the number of sisters and the proportion of sisters. The F-test of excluded intruments with the number of sisters is higher than the one with the proportion. We also compare the overidentification test of all intruments and we find that the p-value is higher when using the number of sisters's. As the null hypothesis is that instruments are valid, we conclude that the set of instruments considering the number of sisters is less likely to be endogenous.

same value whether the potential caregiver has one sister and no brother or four sisters and no brother, while the probability of caring is much higher in the first case.

Table 4.2: Decomposition of the depression score

Variables	Percent	Std. Dev.
Sad or depressed	0.35	0.48
Sleep	0.31	0.46
Irritability	0.31	0.46
Fatigue	0.28	0.45
Tearfulness	0.21	0.41
Concentration	0.13	0.34
Pessimism	0.11	0.32
Enjoyment	0.09	0.28
Guilty	0.08	0.27
Interest	0.06	0.23
Appetite	0.05	0.22
Suicidality	0.04	0.2
N	12090	

4   Estimation results

Table 4.3 presents our estimation results. All specifications include country and time fixed effects, and standard errors are clustered at the individual level in order to account for the dependency of observations. In the first column, we show the results from the OLS regression on depression of the partner treating *informal care as exogenous*. Informal care is associated with a positive but insignificant effect on partner's depression. This suggests that the provision of informal care has no impact on the partner's depression. Regarding individual charateristics, partner's depressive state is higher when adult children are men. Wealth of the household decreases the depression of partners. Assuming exogeneity of informal care by adult children suggests that a higher intensity of care has no effect on the depression of the caregiver's partner. However, these estimates may be biased due to endogeneity.

The second column of Table 4.3 presents the 2SLS[7] with instrumental variables, treating *informal care as endogenous*. In this case, informal care is associated with a negative and significant effect ($p<0.01$) on the partner's depression. In other words, a higher intensity of care leads to a lower depressive state of the partner. Regarding partners' charactertistics, the depression score is lower among both high educated, older and wealthy individuals as well as those in the labor force. As for

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[7]The first stage of the 2SLS regression, reported in the Appendix (see Table 4.7) shows that the first condition of the model is held.

other variables, being a man or having grandchildren increases the depression score of the partner.

The reliability of the 2SLS results depends on the strength of the instruments. Considering the full sample, the F-test of the excluded instruments prove that these are valid as they are strongly correlated with the endogenous regressor ($F = 341.57$, $p<0.01$). Given that there are two instruments for one endogenous regressor, testing overidentification is necessary to be sure that instruments are exogenous and not correlated with the error term. The model passes the test of overidentifying restrictions. The null hypothesis stating that instruments are valid is not rejected and means that the instruments are uncorrelated with the error term ($\chi^2_1 = 0.17$; $p=0.67$).

Looking at gender separately, it is worth noting that men's partners are much more impacted by the care provision than women's ones ($0.528 > 0.194$). Both the F-test of excluded instruments ($F = 102.29$, $p<0.01$; $F = 246.86$, $p<0.01$) as well as the overidentification test ($p=0.65$; $p=0.28$) confirm the exogeneity of the instruments.

To sum up, while the first specification exhibits an insignificant effect of caregiving on the partner's depression, the use of instrumental variable approach, with reliable instruments, shows that the coefficient of caregiving is significant and negatively correlated to depression. This suggests that a higher intensity of care provided by adult children leads to a smaller depression rate of their partners. These findings confirm our intuition that informal care by adult children not only has an impact on the carer herself but also on her family and especially, on her partner. More specifically, our instrumental variable estimates tend to be in the stream of the literature that found a positive effect of help on carers' mental health (Cohen et al., 2002; Ashworth and Baker, 2000).

5 Informal care and caregivers partners' depressive state: the channels

We attempt to go further in explaining the positive impact of informal care provision on the partner's depression by exploring two channels: the role of parental health and spillover effects inside the couple.

Table 4.3: The impact of care provision on the partner's depressive state

	OLS	2SLS		
	Full	Full	Women	Men
Adult children variables				
Care	0.006	-0.301***	-0.528**	-0.194**
	(0.01)	(0.09)	(0.22)	(0.09)
Men	0.650***	0.558***		
	(0.04)	(0.05)		
Age. Ref: 50-60				
60-70	-0.178***	-0.157***	-0.186**	-0.123*
	(0.05)	(0.05)	(0.09)	(0.07)
70-90	0.130	0.102	-0.000	0.157
	(0.15)	(0.15)	(0.25)	(0.17)
Marital status				
Married, living with spouse				
Registered partnership	0.098	0.068	0.174	-0.067
	(0.13)	(0.14)	(0.22)	(0.18)
Never married	0.085	0.095	0.006	0.174
	(0.13)	(0.13)	(0.19)	(0.19)
Divorced	0.192	0.218*	0.470**	0.044
	(0.12)	(0.12)	(0.20)	(0.15)
Widowed	-0.093	-0.170	-0.261	-0.123
	(0.21)	(0.23)	(0.43)	(0.26)
Siblings	0.006	-0.013	-0.013	-0.014
	(0.01)	(0.01)	(0.02)	(0.02)
Education	-0.009	-0.007	-0.012	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)
Labor force	-0.088	-0.037	-0.210	0.062
	(0.09)	(0.09)	(0.18)	(0.11)
Hours worked	0.000	-0.001	0.003	-0.004
	(0.00)	(0.00)	(0.00)	(0.00)
Partners variables				
Age of partner. Ref: < 60				
60-70	-0.126**	-0.099*	-0.121	-0.081
	(0.05)	(0.05)	(0.08)	(0.07)
70-90	-0.226***	-0.172**	-0.124	-0.190*
	(0.08)	(0.09)	(0.16)	(0.10)
Education of partner	-0.023***	-0.024***	-0.023**	-0.024***
	(0.01)	(0.01)	(0.01)	(0.01)
Partner in labor force	-0.373***	-0.368***	-0.422***	-0.316***
	(0.05)	(0.05)	(0.08)	(0.06)
Household variables				
Children	0.007	0.006	0.011	0.003
	(0.01)	(0.01)	(0.02)	(0.01)
Grandchildren	0.026**	0.021*	0.000	0.032**
	(0.01)	(0.01)	(0.02)	(0.01)
Wealth	-0.001***	-0.001***	-0.001**	-0.001**
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	1.776***	1.976***	2.709***	1.802***
	(0.11)	(0.13)	(0.21)	(0.15)
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Observations	12090	12090	5361	6729
F-test of excluded instruments		341.57***	102.29***	246.86***
Overidentification test		0.17 (p=0.67)	0.20 (p=0.65)	1.18 (p=0.28)
Underidentification test		501.47***	168.99***	334.19***

Standard errors are in parenthesis, clustered at the individual level
The sample includes 9609 individuals.
* $p<0.10$, ** $p<0.05$, *** $p<0.010$.

5.1 Caregiving effect vs family effect

A first argument that may explain the positive effect of informal care provision on the partner's depression is the role of parental health status. The latter may represent an important explanation of partners' depressive state. For instance, they may be more or less depressed depending on the health status of their parents-in-law. According to Barnay and Juin (2016), informal care improves the old-age relatives' mental health contrary to formal care. More precisely, it reduces the risk of depression for the disabled elderly. Caregivers' partners could be impacted by caring activities positively because they witness an improvment of the health of their parents-in-law or at least, they are concerned by their well-being. Not taking this into account at all is likely to affect our results since the effect of parental health may be attributed to the care effect. In other words, the positive effect of care on partners' depression we have observed in the main regression may include the effect of parental health.

Nevertheless, we cannot measure the parental health improvement with our data due to both the high level of attrition and a too short time period. In this paper, only three waves are considered, and we cannot follow enough individuals whose parents are alive, through more than one or two waves.

According to Bobinac et al. (2010), one can identify two effects of having old-age parents in need: the caregiving effect and the family effect. The first one refers to either the positive or the negative effects on the caregiver due to help activities; as mentioned above, literature has already shown that caregiving is physically and mentally challenging. The second effect is related to the fact that people are directly influenced by their close relatives' health, whether or not they provide care. More precisely, witnessing regularly parents' mental and physical impairments may produce negative feelings for their children. These authors use the health of the care recipient as a proxy of the family effect and hypothesize a positive impact on the subjective well-being of the caregiver.

In order to disentangle the caregiving effect from the role of parental health, we follow Bobinac et al. (2010) procedure by estimating the 2SLS with instrumental variables including the health of care recipients, namely the parents. The first three columns of Table 4.4 show the results. Comparison of these new results to the baseline ones shows that the coefficient of caregiving is still significant ($p<0.01$) and of the same sign. This reveals that the family effect is not conflated with the caregiving effect and adding the health of parents does not impact the main results of the analysis but make them more precise and reliable. The coefficient of

the parental health is positive which proves that partners are more depressed when their parents-in-law have a poor health status. These results are in line with those of Bobinac et al. (2010) who find a positive relationship between subjective well-being and health of care recipient.

Thus far, we have disentangle the effect of care from the one of parental health. However, despite interesting results, we conclude that parental health probably does not explain the positive impact care has on partner's depression as it does not interfere in this causal relationship.

5.2 Follow-up depressive symptoms inside the couple

Another argument that may explain our results is the depressive state spillovers within the couple. The positive effect of caregiving on the caregiver's health through channels such as enjoyment, companionship, fulfillment, could be directly reflected in the partner's health. Siegel et al. (2004) find that having a spouse with depressive symptoms is associated with "higher follow-up depressive symptoms" in the partner. People living together with sad or depressed partners are more likely to become depressed themselves. By contrast, we can suspect that caregivers' partners are less depressed because caregivers are themselves less depressed due to caring activities.

We explore this channel by estimating 2SLS with instruments using a new dependent variable: the depressive state of the caregiver. The reason for doing so is that both the depressive state of the partner and the one of the caregiver might follow the same trend.

The last three columns of Table 4.4 show the results using the depression of adult children as the explained variable. Considering the full sample, a high frequency of care provision leads to a smaller depression rate. Adult men are impacted by the informal care provision positively while women are not. However, it is worth noting that p-values of the overidentification tests for both full and women samples are highly significant. This means that the instruments are not strictly exogenous due to the correlation with the error term leading to biaised results.

Men subsample is the only case where instruments are valid. Howewer, the result for care is not very strong ($p < 0.1$) and depressive symptom spillovers do not appear to be fully convincing as the single explanation, highlighting the existence of another black-boxed channel.

Table 4.4: The impact of care provision on both the partner's and the adult child's depressive state including parental health.

	Depressive state of partner			Depressive state of adult children		
Gender of adult children	Full	Men	Women	Full	Men	Women
Adult children variables						
Care	-0.295***	-0.515**	-0.190**	-0.203**	-0.331*	-0.153
	(0.09)	(0.22)	(0.09)	(0.10)	(0.18)	(0.11)
Parental health	0.146***	0.116***	0.163***	0.236***	0.191***	0.270***
	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)
Men	0.559***			-0.743***		
	(0.05)			(0.05)		
Age. Ref: 50-60						
60-70	-0.160***	-0.183**	-0.131**	-0.224***	-0.279***	-0.193**
	(0.05)	(0.09)	(0.07)	(0.05)	(0.07)	(0.08)
70-90	0.097	0.001	0.145	-0.219	-0.150	-0.255
	(0.15)	(0.25)	(0.17)	(0.14)	(0.21)	(0.18)
Marital status						
Married, living with spouse						
Registered partnership	0.072	0.186	-0.075	0.093	0.059	0.131
	(0.14)	(0.22)	(0.18)	(0.13)	(0.15)	(0.21)
Never married	0.082	0.000	0.153	0.186	0.287*	0.019
	(0.14)	(0.20)	(0.19)	(0.13)	(0.17)	(0.19)
Divorced	0.199	0.453**	0.026	0.327***	0.229	0.447**
	(0.12)	(0.20)	(0.15)	(0.12)	(0.16)	(0.18)
Widowed	-0.193	-0.306	-0.125	0.175	-0.431	0.569
	(0.23)	(0.43)	(0.26)	(0.28)	(0.32)	(0.37)
Siblings	-0.015	-0.015	-0.014	0.005	0.012	-0.001
	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Education	-0.006	-0.011	-0.001	-0.011*	-0.002	-0.015*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
In the labor force	-0.030	-0.204	0.069	-0.367***	-0.673***	-0.169
	(0.09)	(0.17)	(0.11)	(0.10)	(0.15)	(0.12)
Hours worked	-0.001	0.003	-0.003	-0.002	0.005	-0.007**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Partners variables						
Age of the partner. Ref: < 60						
60-70	-0.108**	-0.130	-0.091	-0.109**	-0.107	-0.079
	(0.05)	(0.08)	(0.07)	(0.05)	(0.07)	(0.08)
70-90	-0.188**	-0.138	-0.204**	-0.144*	-0.329**	-0.059
	(0.09)	(0.16)	(0.10)	(0.09)	(0.13)	(0.12)
Education of partner	-0.022***	-0.023**	-0.022***	-0.017***	-0.013	-0.021**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Partner in the labor force	-0.363***	-0.422***	-0.307***	-0.029	-0.098	0.048
	(0.05)	(0.08)	(0.06)	(0.05)	(0.07)	(0.07)
Household variables						
Children	0.006	0.011	0.004	0.017	0.038**	-0.003
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
Grandchildren	0.022**	0.000	0.033**	0.029**	0.016	0.040***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Wealth	-0.001***	-0.001**	-0.001**	-0.001***	-0.001***	-0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	1.422***	2.262***	1.189***	1.589***	0.900***	1.542***
	(0.14)	(0.24)	(0.16)	(0.14)	(0.20)	(0.19)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12090	5361	6729	12090	5361	6729
F-test of first-stage	345.40***	102.81***	249.69***	345.39***	102.81***	249.69***
Overidentification test	0.16	0.25	1.29	6.33	0.39	6.44
	(p=0.69)	(p=0.62)	(p=0.25)	(p=0.01)	(p=0.53)	(p=0.01)
Underidentification test	506.35***	170.22***	336.56***	506.35***	170.22***	336.56***

Standard errors are in parenthesis, clustered at the individual level.
The sample includes 9609 individuals.
* p<0.10, ** p<0.05, *** p<0.010.

6 Robustness tests

In order to test the validity of our results, we perform a series of robustness tests[8]. We look at a different measure of care as well as at other dependent variables. Then, we test the robustness of our results by taking into account the potential caregiving episode of the partner.

6.1 Alternative measure of care and dependent variables

Our initial dependent variable is a depression score rated on a scale from 0 to 12. We check whether choosing different measures of depression, and more generally, of well-being is likely to affect our results.

First, we test a binary measure of the depressive state, assigning 1 to individuals that had a score higher than 4 on our initial scale. We estimate a linear probability model. The results presented in the first column of Table 4.5 show that using a binary mesure of the depressive state does not affect the overall impact of the care provision, even though the size of the coefficient has slighty decreased compared with our initial specification ($0.301 > 0.033$).

Then, we control whether our results are sensitive to the use of another mental health measure, such as the life satisfaction. We use a generated variable provided by SHARE that represents the life satisfaction of each individual at each period of time, scored from 0 (completely dissatisfied) to 10 (completely satisfied). As with the depression variable, we are able to link household members due to the identifier module of the survey which allow us to obtain partners' life satisfaction scores. Based on the hypothesis that lower depression scores lead to a higher life satisfaction level, our results hold using this second specification, as shown in column 2 of Table 4.5. In other words, the more care adult children provide, the more satisfied their partners are. However, it is worth noting that partners' life satisfaction does not appear to be impacted by adult children gender while all other specifications point out that partners are more depressed when adult children are men.

In a third specification, we are interested in the measure of the care provision. Instead of using a frequency variable scored from 0 (no care provided) to 4 (care provided almost daily) as we did initially, we test the extensive margin with a binary measure of whether adult children provide care or not in the last twelve months. The results, presented in column 3 of Table 4.5, show that using the extensive margin does not affect our conclusion about the negative impact of care on partners'

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[8]All first stages of 2SLS performed in this section are in Appendix, see Table 4.8.

depressive state. However, the size of care coefficient has increased significantly with a value of almost 1, meaning that caring for old-age parents might decrease partners' depression score by one point on a scale rated from 0 to 12.

6.2   Alternative sample, using cross-sectionnal data

The previous analysis does not take into account the potential caregiving episodes of partners. Initially, we looked at the adult child caregiving activity and its impact on the partner's depressive state, disregarding whether the partner is also a caregiver. However, it could bias our estimations since it gets difficult to disentangle the effect of caregiving by adult children on their partners' depressive state from the one of caregiving by partners on their own depressive state.

Unfortunately, waves 4 and 5 of SHARE do not provide any information about the care provided by the partner: only one out of the two members of the couple answers the question "in the last twelve months, have you personnally given personal care or pratical household help to a family member living outside your household, a friend or neighbour ?" However, the sixth wave includes this information and both members of the couple are interviewed about the care they have provided. Using cross-sectional data from this wave, we look at the effects of caregiving on the partner's depressive state but we exclude couples whose both members are caregivers.

The last column of Table 4.5 reports the results from the 2SLS specification using cross-sectional data from wave 6 of the survey. Overall, it suggests that a higher intensity of care lead to a lower depressive state of the partner. However, it has to be noticed that both the size and the significance of the coefficient have decreased compared with our main specification.

Table 4.5: Robustness tests for alternative specifications.

	2SLS			
	Binary depression	Life satisfaction	Extensive margin	Cross sectional
Adult children variables				
Care	-0.033**	0.183***		-0.201*
	(0.01)	(0.07)		(0.12)
Extensive			-0.988***	
			(0.30)	
Men	0.067***	0.014	0.556***	0.598***
	(0.01)	(0.04)	(0.05)	(0.07)
Age. Ref: 50-60				
60-70	-0.026***	0.158***	-0.161***	-0.171**
	(0.01)	(0.04)	(0.05)	(0.07)
70-90	-0.011	0.066	0.099	0.239
	(0.02)	(0.11)	(0.15)	(0.19)
Marital status				
Married, living with spouse				
Registered partnership	-0.005	-0.121	0.059	-0.048
	(0.02)	(0.10)	(0.14)	(0.16)
Never married	-0.000	-0.126	0.115	0.208
	(0.02)	(0.11)	(0.14)	(0.17)
Divorced	0.025	-0.256***	0.208*	0.073
	(0.02)	(0.09)	(0.12)	(0.14)
Widowed	-0.063**	0.017	-0.162	-0.139
	(0.03)	(0.21)	(0.24)	(0.28)
Siblings	-0.002	0.010	-0.015	-0.008
	(0.00)	(0.01)	(0.01)	(0.02)
Education	0.000	0.017***	-0.004	-0.011
	(0.00)	(0.00)	(0.01)	(0.01)
In the labor force	0.000	0.075	-0.012	-0.233*
	(0.01)	(0.07)	(0.10)	(0.13)
Hours worked	-0.000	0.002	-0.001	0.002
	(0.00)	(0.00)	(0.00)	(0.00)
Partners variables				
Age of partner. Ref: < 60				
60-70	-0.009	0.027	-0.097*	-0.117
	(0.01)	(0.04)	(0.05)	(0.07)
70-90	-0.024*	0.181***	-0.170*	-0.292***
	(0.01)	(0.06)	(0.09)	(0.11)
Education of partner	-0.003***	0.009**	-0.023***	-0.028***
	(0.00)	(0.00)	(0.01)	(0.01)
Partner in the labor force	-0.049***	0.225***	-0.365***	-0.375***
	(0.01)	(0.04)	(0.05)	(0.07)
Household variables				
Children	-0.001	0.016**	0.007	-0.006
	(0.00)	(0.01)	(0.01)	(0.01)
Grandchildren	0.004**	0.008	0.020*	0.039***
	(0.00)	(0.01)	(0.01)	(0.01)
Wealth	-0.000***	0.002***	-0.001***	-0.002***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.143***	7.838***	1.962***	2.278***
	(0.02)	(0.10)	(0.13)	(0.19)
Time fixed efects	Yes	Yes	Yes	No
Country fixed effects	Yes	Yes	Yes	Yes
Observations	12090	12090	12090	6274
F-test of first-stage	341.57***	341.57***	221.34***	237.42***
Overidentification test	0.18 (p=0.66)	0.42 (p=0.51)	0.13 (p=0.72)	1.06 (p=0.20)
Underidentification test	501.47***	501.47***	343.74***	344.65***

Standard errors are in parenthesis, clustered at the individual level in the first three columns.
The sample includes 9609 individuals, except in the last specification.
* p<0.10, ** p<0.05, *** p<0.010.

7 Conclusion

This paper analyses the impact of caregiving by adult children on their partners' depressive state. Using data from SHARE, we first use an OLS model estimating the effects of care provision on partners' depressive state among adult children aged 50 years old and over in nineteen European countries. As we suspect the main variable of interest to be endogenous, a second model is then estimated with 2SLS using the number of daughters and the distance between caregivers and parents as instruments. While the OLS specification exhibits a positive but insignificant effect of caregiving on depression, the use of instrumens yields a significantly negative coefficient. This suggests that a higher intensity of care provided by adult children leads to a smaller depression rate of their partners.

We attempt to explore two channels that might explain our results: the role of parental health and the spillover effects inside the couple.

Considering the first one, it cannot be tested correctly due to data restriction. However, we take into account the family effect highlighted by Bobinac et al. (2010) in order to control for the impact of parents' health status on caregivers partners. Our results are in line with theirs showing that the care effect is different from the family one.

As for the second one, our findings show that adult men are also impacted by the informal care provision. This result may be consistent with our hypothesis of depressive state spillovers wihtin the couple. However, despite interesting findings, the endogeneity of the instruments for two regressions out of three and the weakness of the significance level considering adult men lead us to conclude that spillover effects are only a partial explanation to our suprising results.

Limitations of this work consitute an obstacle to fully understand the puzzle. First, this study focuses on three waves. This prevent us from testing correctly the argument about the improvement of parental health. Additionally, some studies have analysed the long-term effect of providing care (Bookwala, 2009). The time period considered in this paper is too short to capture entirely the impact of caregiving and its follow-up symptoms. Secondly, we are not able to control for couples whose both members are caregivers in waves 4 and 5 due to data restrictions. Obviously, perfoming the same analysis with complete information regarding the care provision of both caregivers and their partners would strenghen the results.

Overall, this paper underlines the complexity of the relationship between informal care and mental health. Many studies have analysed the impact of informal care provision on mental health, limiting their work to caregivers. We attempt to

go further and provide hints on the relationship between informal care and mental health of the partner suggesting that the consequences of caring activities are more widespread than what the literature has shown so far.

8 Appendices

8.1 Augmented regression test (DWH test)

Table 4.6 reports the results for the augmented regression test. The residuals of the endogenous variable have been including as a function of exongenous variables in the baseline model. The small *p*-value of the t-test indicates that OLS is inconsistent.

Table 4.6: Augmented regression using OLS and t-test of the residuals.

	OLS	
Dependent variables	Care	Depression of partner
Residuals		-0.316***
		(0.09)
Instruments		
Distance	-0.001***	
	(0.00)	
Sisters	-0.037**	
	(0.02)	
Adult children variables		
Care		0.015
		(0.01)
Men	-0.310***	0.558***
	(0.03)	(0.05)
Age. Ref: 50-60		
60-70	0.065**	-0.157***
	(0.03)	(0.05)
70-90	-0.082	0.102
	(0.08)	(0.15)
Marital status		
Married, living with spouse		
Registered partnership	-0.071	0.068
	(0.08)	(0.13)
Never married	0.045	0.095
	(0.08)	(0.13)
Divorced	0.067	0.218*
	(0.07)	(0.12)
Widowed	-0.293**	-0.170
	(0.13)	(0.22)
Siblings	-0.030***	-0.013
	(0.01)	(0.01)
Education	0.008**	-0.007
	(0.00)	(0.01)
In the labor force	0.172***	-0.037
	(0.06)	(0.09)
Hours worked	-0.004***	-0.001
	(0.00)	(0.00)

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	OLS	
Dependent variables	Care	Depression of partner
Partners variables		
Age of partner. Ref: < 60		
60-70	0.086***	-0.099**
	(0.03)	(0.05)
70-90	0.188***	-0.172**
	(0.05)	(0.09)
Education of partner	-0.001	-0.024***
	(0.00)	(0.01)
Partner in the labor force	0.015	-0.368***
	(0.03)	(0.05)
Household variables		
Children	-0.004	0.006
	(0.01)	(0.01)
Grandchildren	-0.018***	0.021*
	(0.01)	(0.01)
Wealth	0.001**	-0.001***
	(0.00)	(0.00)
Constant	0.685***	1.976***
	(0.08)	(0.13)
T-test of residuals: $(\chi^2_1) = 11.58$ $(p<0.001)$		
Observations	12090	12090

The sample includes 9609 individuals. Standard errors are in parenthesis, clustered at the individual level. * p<0.10, ** p<0.05, *** p<0.010.

8.2 First stages of 2SLS

Tables 4.7 and Table 4.8 report first and second stages of the main specification as well as of alternative specifications. The instruments, distance and sisters, are jointly significant in the endogenous variable (C_{jt}). The property regarding the strong correlation between instrumental variables and the endogenous regressor is confirmed. These tables refer, respectively, to Table 4.3 and Table 4.4.

Table 4.7: First stages of 2SLS of main specification.

	First stages		
	Full	Women	Men
Instruments			
Distance	-0.001***	-0.001***	-0.002***
	(0.00)	(0.00)	(0.00)
Sisters	-0.037**	-0.003	-0.063***
	(0.02)	(0.02)	(0.02)
Adult children variables			
Men	-0.310***		
	(0.03)		
Age. Ref: 50-60			
60-70	0.065**	0.000	0.115**
	(0.03)	(0.04)	(0.05)
70-90	-0.082	-0.136	0.048
	(0.08)	(0.09)	(0.14)
Marital status			
Married, living with spouse			
Registered partnership	-0.071	-0.060	-0.066
	(0.08)	(0.10)	(0.13)
Never married	0.045	-0.021	0.134
	(0.08)	(0.10)	(0.13)
Divorced	0.067	0.087	0.044
	(0.07)	(0.10)	(0.10)
Widowed	-0.293**	-0.219	-0.332*
	(0.13)	(0.16)	(0.19)
Siblings	-0.030***	-0.032**	-0.027
	(0.01)	(0.01)	(0.02)
Education	0.008**	0.009*	0.010*
	(0.00)	(0.00)	(0.01)
In the labor force	0.172***	-0.003	0.251***
	(0.06)	(0.09)	(0.08)
Hours worked	-0.004***	-0.002	-0.005***
	(0.00)	(0.00)	(0.00)
Partners variables			
Age of partner. Ref < 60			
60-70	0.086***	0.022	0.191***
	(0.03)	(0.04)	(0.05)
70-90	0.188***	0.023	0.294***
	(0.05)	(0.07)	(0.07)
Education of partner	-0.001	0.002	-0.003
	(0.00)	(0.01)	(0.01)
Partner in the labor force	0.015	0.062	-0.015
	(0.03)	(0.04)	(0.05)
Household variables			
Children	-0.004	-0.002	-0.005
	(0.01)	(0.01)	(0.01)
Grandchildren	-0.018***	-0.015*	-0.021**
	(0.01)	(0.01)	(0.01)
Wealth	0.001**	0.000	0.001**
	(0.00)	(0.00)	(0.00)
Constant	0.685***	0.354***	0.660***
	(0.08)	(0.09)	(0.12)
Time fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Observations	12090	5361	6729

Standard errors are in parenthesis, clustered at the individual level
* p<0.10, ** p<0.05, *** p<0.010.

Table 4.8: First stages of 2SLS of alternative specifications.

	2SLS			
	Binary depression	Life satisfaction	Extensive margin	Cross sectional
Instruments				
Distance	-0.001***	-0.001***	-0.001***	-0.001***
	(0.00)	(0.00)	(0.00)	(0.00)
Sisters	-0.037**	-0.037**	-0.037**	-0.023
	(0.02)	(0.02)	(0.02)	(0.02)
Adult children variables				
Men	-0.310***	-0.310***	-0.310***	-0.307***
	(0.03)	(0.03)	(0.03)	(0.03)
Age. Ref: < 60				
60-70	0.065**	0.065**	0.065**	0.053
	(0.03)	(0.03)	(0.03)	(0.04)
70-90	-0.082	-0.082	-0.082	-0.043
	(0.08)	(0.08)	(0.08)	(0.10)
Marital status				
Married, living with spouse				
Registered partnership	-0.071	-0.071	-0.071	-0.040
	(0.08)	(0.08)	(0.08)	(0.10)
Nevermarried	0.045	0.045	0.045	0.049
	(0.08)	(0.08)	(0.08)	(0.10)
Divorced	0.067	0.067	0.067	-0.044
	(0.07)	(0.07)	(0.07)	(0.09)
Widowed	-0.293**	-0.293**	-0.293**	-0.219
	(0.13)	(0.13)	(0.13)	(0.19)
Siblings	-0.030***	-0.030***	-0.030***	-0.037***
	(0.01)	(0.01)	(0.01)	(0.01)
Education	0.008**	0.008**	0.008**	0.013***
	(0.00)	(0.00)	(0.00)	(0.00)
In the labor force	0.172***	0.172***	0.172***	0.189**
	(0.06)	(0.06)	(0.06)	(0.08)
Hours worked	-0.004***	-0.004***	-0.004***	-0.005***
	(0.00)	(0.00)	(0.00)	(0.00)
Partners variables				
Age of partner. Ref: < 60				
60-70	0.086***	0.086***	0.086***	-0.008
	(0.03)	(0.03)	(0.03)	(0.04)
70-90	0.188***	0.188***	0.188***	0.101
	(0.05)	(0.05)	(0.05)	(0.06)
Education of partner	-0.001	-0.001	-0.001	0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Partner in the labor force	0.015	0.015	0.015	0.015
	(0.03)	(0.03)	(0.03)	(0.04)
Household variables				
Children	-0.004	-0.004	-0.004	-0.004
	(0.01)	(0.01)	(0.01)	(0.01)
Grandchildren	-0.018***	-0.018***	-0.018***	-0.010
	(0.01)	(0.01)	(0.01)	(0.01)
Wealth	0.001**	0.001**	0.001**	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.685***	0.685***	0.685***	0.743***
	(0.08)	(0.08)	(0.08)	(0.11)
Time fixed effects	Yes	Yes	Yes	No
Country fixed effects	Yes	Yes	Yes	Yes
Observations	12090	12090	12090	6274

In the first three columns, the sample includes 9609 individuals and standard errors are in parentheses, clustered at the individual level. * p<0.10, ** p<0.05, *** p<0.010.

General conclusion

This dissertation contributes to a better understanding of the factors determining the informal care provision. This short section presents an overview of the main results and contributions brought throughout the four chapters as well as potential improvments of present works.

Main results and contributions

Chapter 1 has been dedicated to the analysis of the relationship between longevity and income in European countries. The main contribution of this study is the highlighting of longevity inequalities depending on income classes using Pamuk (1985, 1988)'s method. We find that the differential of mortality depending on income is higher when we consider men only. Indend, disparties in terms of years of life arise from a country to another with low inequalities in northern European countries and significant inequalities in eastern European countries.

    Chapter 2 of this dissertation examines the incentives triggering informal care provision considering an ascendent family model, that is, from children to parents. It aims at disentangling three potential motivations of informal caregivers: altruism, ecchange and family norms. Little of the literature accounts for these three motives as a whole as we do in this Chapter. We focus on adult children over 50 in order to be sure that their parents are more than 65 years old. Indeed, the likelihood to be dependent is higher after this age. Using a binary response probit, we measure the impact of these three motives on the decision to care. Results suggest that, when one parent is still alive, altruism and exchange motives are the drivers of the decision to care in the majority of European countries, while the role of family norms prevails in southern European countries. These findings show how different the motivations of caring are from one country to another. This is due to microeconomics characteristics, but may also come from various macroeconomics features such as the formal care supply. Addressing this issue, we can draw some insights in terms of LTC public policies. These information are also highly relevant for insurance companies. Indeed, depending on the prevailing motives, the informal care provision may crowd

out the formal care demand, or at least decrease the probability for the population to suscribe to either a private or a public insurance.

Now that the drivers of informal care provision have been highlighted, **chapters 3** and **4** focus on its consequences. More particularly, the **third chapter** analyses the impact of informal care provision on life satisfaction of Dutch caregivers. Using a panel based GMM estimator, allowing us to control for different sources of endogeneity, we estimate the causal relationship between informal care and life satisfaction of the caregiver. Our findings point the adverse impact of the decision to care, particularly for women, individuals being in co-habitation with children and employed or self-employed individuals. Our results reveal the importance to account for indirect costs that are borne by caregivers. It would be thus interesting to include some compensating mechanisms to relieve caregivers of their responsabilities when policies substitute institutional residential care towards more home and community based care, as it has been the case in The Netherlands.

Chapter 4 offers another contribution to the literature on the indirect costs of the provision of informal care on someone's health. Based on the literature focusing on the causal effect of the decision to care on caregivers' well-being, we extend this analysis to the caregiver's couple. To the best of our knowledge, we are among the first to provide this empirical investigation, although preliminary, about the link between caregiving and caregivers' partners' mental health. Contrary to the negative impact on caregivers' life satisfaction (see **Chapter 3**), we find that providing care decreases the depressive state of caregivers' partners. We thus investigate the factors that may drive the negative correlation between depressive state and decision to care. While spousal spillover effects might be one partial explanation to this surprising result, the role of parental health has been excluded as being a key element. The relationship between caring and the caregivers' couple still nedds to be analysed and more studies are needed to prove the robustness of the positive effect of informal care.

All these findings (Chapter 2, Chapter 3 and Chapter 4) have been highlighting by using data from the *Survey of Health, Ageing and Retirement and Europe* (SHARE) and from *Longitudinal Internet Studies for the Social Sciences* (LISS). The main advantage of these databases is that they provide rich information over time. This allows us to use panel data estimation (**Chapter 2** and **Chapter 3**) that increases the precision of the estimations and provides evidence on dynamic issues. It also allows us to use pooled data estimation (**Chapter 4**) in order to control for the dependency of the observations. Using these empirical methodologies strenghen

our results since they are not only based on simple correlation.

Future research

Our work has, however, some limitations that might be an open door to future research.

The first limit is the lack of information on care recipient in **Chapter 3**. Unfortunately, we have no information on the relationship between the caregiver and the care recipient. We then consider all the types of care recipient (non family members, friends, children). Obviously, it can be expected that caring for a disabled child or a dependent parent do not have the same implications for caregivers. First, informal and formal care arrangments might be different insofar as the formal care framework differs in both cases. Second, helping her own disabled child during her whole life has probably nothing to do with caring for old-age parents in their terminal years in terms of opportunity costs, types of help and personal investment. It would be interesting to conduct this analysis focusing on old-age recipient only. By doing so, we would have completed our analysis, conducted throughout this thesis, on the implications for informal caregivers helping their dependent parents.

A limitation that we have encountered in **Chapter 1** is the assumption on the hierarchisation of the society. Income classes are mechanically correlated with education levels. Although rational, future research should relax this assumption. Another limit of this work is that our results are descriptive. We do not study any causal relationship between longevity and income classes.

A frustrating point in **Chapter 4** is the lack of empirical findings concerning the positive impact of care on caregivers' partners' depressive state. Despite having tested two channels that seem to be the most intuitive, we are not able to clearly explain why partners are less depressed when adult children care for their parents. Further research should expand this analysis by considering other underlying mechanisms.

One of the limitations of **Chapter 2**, that consitutes simultaneoulsy the originality of this work, is the definitions of the motivations of the decision to care. More particularly, an altruistic person is defined as someone who took part into charity activities. Although the literature has shown that altruism might be a motive of charity participation, we do not consider any other reason for volunteering (e.i.: warm-glow or social contact). This decision is needed in our framework but it is

still questionnable and future work might redefine altruism, for instance, by including the motives of volunteering that are available in one wave of SHARE. Finally, as mentionned in **Chapter 2**, we consider an ascendant family model, that is, we only look in one direction while one might argue that interegenerational support uses to be a complete relationship. We aim at study what is behind the ascending aid decision, and by doing so, we lack observable behavior of the parents. Future work should consider an alternative framework in order to account for two-sided relationship.

Throughout these chapters, some issues were not addressed. There might also be promising lines for future work. First, while **Chapter 3** and **Chapter 4** examine the impact of the informal care provision on both caregivers' health and couple, we have not studied the relationship between informal care and caregivers' employment. More precisely, it would be interesting to analyse the effects of providing some years after the caregiving episode has come to an end on employment outcomes. We know that caregivers are likely to reduce their working hours and we might wonder whether the caregiver go back to work after having cared for her old-age parents or whether he keeps on working part-time.

Another topic that we have not dealt with is the informal care demand. Along this work, we have focused our analyses on the supply side, that is, informal caregivers' behaviors. In order to complete this work, it would be interesting to turn our attention to the following questions: do old-age people prefer to stay at home, being cared informally by their relatives or do they prefer to move to a nursing home ? Do they want to shape their family's behaviors in order to increase their probability of being cared or do they want to be cared by non-family members ?

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Marie Blaise
Essays on longevity, ageing and informal care

Résumé

Du contexte de vieillissement démographique en Europe, dont sa prévalence et sa générali-sation au continent européen le rendent inédit et sans précédent, découle un certain nombre de problématiques. Ainsi, l'augmentation du nombre de personnes âgées, et plus partic-ulièrement, de personnes âgées en situation de dépendance démocratise la question de leur prise en charge et du rôle de chacune des parties prenantes. Cette thèse se propose d'étudier les problématiques relatives au vieillissement et à l'offre d'aide informelle. Le pre-mier Chapitre étudie la relation entre mortalité et revenu. Le deuxième Chapitre s'intéresse aux motivations des enfants comme aidants informels de leurs parents. Les troisième et quatrième Chapitres analysent, respectivement, l'impact de l'aide informelle sur la santé de l'aidant et sur celle de son partenaire.

Mots-clés: vieillissement; dépendance; aide informelle.

Abstract

In a context of population ageing, the number of poeple requiring Long-Term Care (LTC) is expected to increase. This fast-growing old-age population is mainly cared informally, either by family members or close relatives. This thesis aims at contributing to the existing knowledge about ageing and informal care. The first Chapter examines the relationship between longevity and income in European countries. In Chapter 2, we study the incen-tives of adult children to care their old-age parents. Chapter 3 and Chapter 4 address, respectively, the consequences of the decision to care on both caregivers' health as well as on caregivers' couple.

Keywords: ageing; disability; informal care.