



# Being dependent rather than handicapped in France: Does the institutional barrier at 60 affect care arrangements?

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Marianne Tenand. Being dependent rather than handicapped in France: Does the institutional barrier at 60 affect care arrangements?. 2018. halshs-01889452

**HAL Id: halshs-01889452**

**<https://shs.hal.science/halshs-01889452>**

Preprint submitted on 6 Oct 2018

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**WORKING PAPER N° 2018 – 48**

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Being *dependent* rather than *handicapped* in France:  
Does the institutional barrier at 60 affect care arrangements?\*

Marianne TENAND<sup>†</sup>

August 2018

**Abstract**

Individuals having difficulties to perform the activities of daily living may benefit from public long-term care (LTC) support. France distinguishes between *handicap* benefits, accessible to individuals below 60, and *dependence* schemes, for individuals aged 60 and older. This paper assesses the effects of the age 60 threshold in the French LTC policies using the French Health and Disability Survey (HS 2008–2009) in two ways. First, we estimate the effect of being 60 and older on the probability to receive non-medical formal care and informal home care, controlling for a rich set of socio-demographic characteristics and age effects. Being a “dependent elderly” rather than a “handicapped adult” little affects the probability to receive home care; however, it increases formal care utilization and, to a lesser extent, decreases the probability to receive informal care. Second, we implement a Regression Discontinuity (RD) approach and provide evidence that the institutional age threshold affects living arrangements, as individuals above age 60 are more likely to be recorded as living in an institution. The architecture of LTC policies affects the way individuals’ day-to-day difficulties are being compensated, thereby undermining horizontal equity in the use of formal LTC.

**JEL Classification:** C30, I12, J14, J18.

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\*Access to the *Handicap-Santé* survey was granted by *Réseau Quételet*. I gratefully acknowledge financial support to my doctoral research from *Fondation Médéric Alzheimer*. I am grateful to Agnès Gramain for her patient supervision and many suggestions, to Emmanuelle Cambois, Clémentine Garrouste, Pierre-Yves Geoffard, Nicolas Jacquemet, Florence Jusot, Renske Hoefman, Owen O’Donnell, Anne Penneau, Sylvain Pichetti, Simon Rabaté, Thomas Siedler, Carole Treibich and Florence Weber, as well as to the participants of various conferences (LoLaHESG, JESF, ILPN, EuHEA, Journées Maurice Marchand des Doctorants en économie de la santé) and of seminars at PSE, CES and EUR for their useful remarks. All remaining errors are mine.

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# 1 Introduction

In France, about 12% of the adult population has difficulties to perform one or more activities of daily living, due to physical or cognitive limitations (Drees 2008b). Developed countries have implemented public transfers and specific regulation aiming at compensating such difficulties. Besides accessibility obligations and the provision of income replacement for those who cannot work because of their disability, most countries offer cash or in-kind transfers to help individuals paying for the assistance in daily life required on a long-term basis. In economic terms, these long-term care (LTC) programs aim at covering part of the *expenditure costs* of disability, which can be loosely defined as the extra expenditures incurred by a disabled person to reach the situation of an individual similar in all regards but with no disability (Stapleton et al. 2008).

About 1.9 million individuals (3.6% of the adult population) benefited from public LTC benefits in France in 2014, for a public spending of 18 billion euros, or 0.6% of GDP (Amar et al. 2016, Amar 2016, Drees 2016).<sup>1</sup> One remarkable feature of the French LTC policies is that the schemes vary with the age of individuals. A person aged less than 60 with restrictions in the activities of daily living will be considered as “handicapped”, while she will be classified as a “dependent elderly” if she is 60 and older. The administrative threshold of age 60 creates two groups for public action: belonging to one population rather than to the other has consequences upon eligibility to LTC subsidies and their generosity.

In 2005, a law was passed<sup>2</sup> in response to the new conception of disability endorsed by the World Health Organization<sup>3</sup> and to the numerous voices calling for a universal right to disability compensation (Bonnet 2004, Frinault 2005). The 2005 law announced the convergence of handicap and dependence schemes. Unification has not been implemented so far, partly because of the public finance crisis; nonetheless, the law has reinforced the debate around the “barrier of age 60” (Weber 2011). Little is known though about the effects it induces. Because of lack of appropriate data, few quantitative studies include both the “handicapped adults” and the “elderly dependent”. Yet, in order to assess the fairness of the system and calibrate a possible reform, it is necessary to evaluate whether current schemes cause an “elderly dependent” to be compensated differently

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<sup>1</sup>This figure does not take into account the transfers or in-kind care provided to children. It includes public spending covering either disability compensation or the boarding and lodging costs for individuals residing in an institution. It does not include nursing services provided in the community nor medical care provided in institution.

<sup>2</sup>*Loi 2005-102 du 11 février 2005 pour l'égalité des droits et des chances, la participation et la citoyenneté des personnes handicapées, JORF du 12 février 2005.*

<sup>3</sup>The International Classification of Functioning, Disability and Health, or ICF, was officially adopted in 2001 (?). In particular, it states that disability compensation should not be based on age.

from a “handicapped adult” with similar needs.<sup>4</sup>

In this paper, we estimate the impact of the institutional threshold at age 60 on the LTC received by individuals with restrictions in the activities of daily living. What we aim at capturing is the effect of falling within a regime of social rights (dependence schemes) rather than within another (handicap policies), on the probability to use LTC. Our outcomes of interest include both formal care and informal care utilization. Indeed, the bulk of daily assistance to the disabled is provided under the form of human care, as opposed to technical assistance. Most LTC schemes subsidize professional care and disabled individuals often also receive the help of relatives, especially when they keep living in the community. In addition, informal care use may also benefit from some financial compensation in France and its provision may thus be directly affected by the age 60 threshold.

We use the 2008 French Disability and Health Survey on Households (HSM) to get a sample of 3,121 community-dwelling individuals aged 50 to 74 years-old with activity restrictions. A bivariate probit is used to take into account both the binary nature of our outcomes and the simultaneity of the decisions of formal home care utilization and informal care provision. We control for a rich set of socio-demographic and family characteristics that may affect home care use and include age effects.

We find that individuals who are considered to be “dependent elderly” have a higher probability to receive formal care, without changes in epidemiological conditions and in other factors influencing home care use fully explaining the observed pattern. Conversely, they have a lower probability to be provided assistance with the activities of daily living by their relatives, although this effect is less robust. Our results suggest that belonging to the policy perimeter of “dependence” policies increases access to professional home care services, which then partly substitutes for informal care provision. This pattern is consistent with evidence showing informal care and non-medical formal home care being substitutes (Bonsang 2009, Van Houtven & Norton 2004).

These effects hold conditional on living in the community. Complementing our data with a small dataset gathering community-dwelling and institutionalized individuals (N=12,784), we implement a sharp Regression Discontinuity Design strategy and find that the age 60 institutional threshold also affects the probability to live in an institution on a permanent basis.

Our paper contributes to the existing literature in three ways. First, it stands as the

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<sup>4</sup>Following the economic theories of responsibility, we may reject the consequentialist approach to disability, and imagine social justice criteria that would justify differential rights to compensation. To our knowledge, such criteria have not been put forward yet in the French debate; we thus consider here that compensating expenditure costs associated with handicap and dependence at different levels is *a priori* not a fair policy.

first quantitative evaluation of the age 60 threshold embedded in the French LTC design. It thus provides empirical elements currently missing in the debate around LTC policies, above and beyond the results of the two existing studies that documented the impact of LTC public support on home care use among either the dependent elderly (Fontaine 2012) or the handicapped (Espagnacq 2013).

Second, we add to the recent studies of the impact of the architecture of social policies on care arrangements. By comparing the LTC policies in different countries, recent studies have shown that the design of LTC schemes not only influences formal care use, but also has an impact on the relationship between professional care and informal care provision (Motel-Klingebiel et al. 2005, Bakx et al. 2015).

Third, our article contributes to the literature more specifically interested in the effects of home care subsidies on formal and informal care utilization. Overall, past studies have evidenced a substantial effect of home care programs on the use of professional care for community-dwelling disabled elderly (Christianson 1988, Ettner 1994, Pezzin et al. 1996, Stabile et al. 2006, Rapp et al. 2011, Fontaine 2012). Whether an increased use of formal care crowds-out informal care provision is less clear-cut, depending on the types of tasks that are considered and whether effects are investigated at the extensive or intensive margin. Given the substantial impacts institutional contexts were found to have on LTC arrangements, it is important to assess whether existing evidence is robust across time and countries. By exploiting variation in individual benefits due to an arbitrary institutional rule, we provide credible evidence that, in France, not only the use of home care but also living arrangements are sensitive to the design of LTC policies and the underlying financial incentives and characteristics of LTC services being supplied. Though in an indirect way, our results also confirm that professional care consumption is price-elastic, as demonstrated by Bourreau-Dubois et al. (2014), Hege (2016), Non (2017) and Roquebert & Tenand (2017).

The paper proceeds as follows: Section 2 provides an overview of the French LTC schemes for individuals living in the community. After presenting the data (Section 3), we explain our empirical strategy (Section 4) and present the set of results on home care use (Section 5). Section 6 discusses the interpretation of the results and assesses the impact of the age threshold on living arrangements. Section 7 concludes.

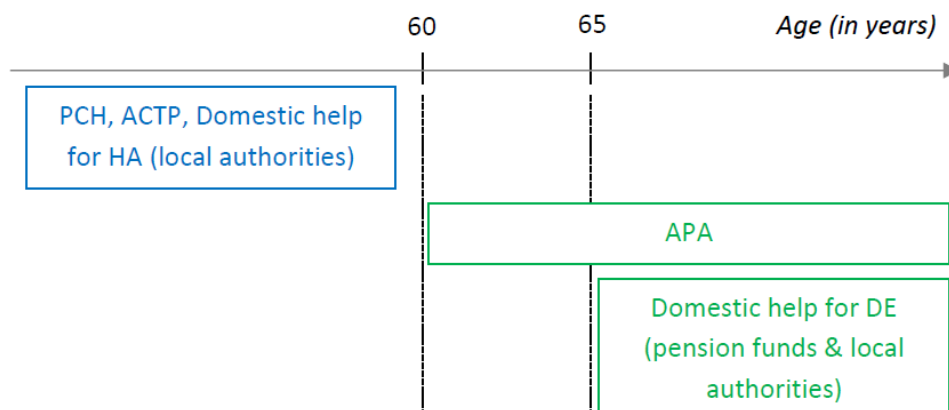
## 2 Institutional context

### 2.1 The age 60 barrier in the French LTC schemes

In France, national solidarity towards disabled individuals is part of the Welfare State, which provides tax- and contribution-funded LTC support. In 1975, a law gave the “disabled persons” an official recognition and created the first public scheme intended to help individuals getting assistance with the activities of daily living.<sup>5</sup> Although eligibility rules were very restrictive, the *Allocation compensatrice pour tierce-personne* (ACTP) was the first institutional recognition of the needs of a regular human assistance induced by disability.

The 1970s and 1980s also witnessed the emergence of a medical conception of aging. The expression of “dependent elderly” was coined by geriatricians who argued that elderly individuals’ physical and cognitive decline makes them essentially “dependent” on others (Delomier 1973). Combined with growing concerns over population aging and the sustainability of the welfare system, this conception gave rise to the creation of a program specific to the elderly in 1997. Since then, the threshold of age 60, which was chosen in reference to the minimum retirement age at the time, has shaped LTC public schemes. As displayed in Figure 1, for individuals below 60, *handicap* policies apply, while individuals 60 and older may benefit from old-age and *dependence* schemes.<sup>6</sup>

Figure 1: LTC schemes in France, for individuals living in the community: Age thresholds of ages 60 and 65.



NOTES: “HA” stands for handicapped adults, “DE” stands for dependent elderly. Schemes listed in the blue box are accessible to handicapped adults, while schemes listed in the green box are open to the dependent elderly. The figure describes the schemes applying since the creation of PCH in 2006.

<sup>5</sup> *Loi 75-534 du 30 juin 1975 d’orientation en faveur des handicapés, JORF du 1<sup>er</sup> juillet 1975.*

<sup>6</sup> A more detailed history and institutional analysis of French LTC schemes can be found in Bonnet (2004), Frinault (2005), Ennuyer (2013), Capuano & Weber (2015), Capuano (2017).

## 2.2 The existing at-home LTC schemes

### Overview of the schemes

In the 2000s, both handicap and dependence schemes were reformed, so as to benefit more individuals. In 2002, the *Allocation personnalisée d'autonomie* (APA) was created as the new LTC scheme targeted to the elderly. Accessible to individuals with a certain severity of disability, no matter their income, APA subsidizes home services that make possible for individuals aged 60 and older who live in the community to “age in place”.<sup>7</sup>

In 2014, about 1,1 million individuals living in the community benefited from the LTC benefits managed by the departments. The majority of recipients (77%) are aged 60 and older. APA is the largest scheme, with 740,000 beneficiaries. About 240,000 individuals aged less than 60 received either PCH or ACTP (respectively 83% and 17%). As shown by Table I, more public money is spent on the elderly than on the handicapped adults, but the average benefit of recipients under 60 is 50% higher. Of course, this is only weak evidence of differences in schemes’ generosity.

Table I: LTC schemes: Spending and number of community-dwelling recipients in 2014.

	<b>Total spending,</b> in million euros over the year	<b>Number of recipients</b>	<b>Average benefit, per recipient, in euros per month</b>
LTC transfers for beneficiaries with age below 60	M€1,636	255,386	€562
LTC transfers for beneficiaries aged 60 and older	M€3,843	837,387	€382

SOURCE: Drees, *La protection sociale en France et en Europe en 2014* (Drees 2016).

NOTES: “M” stands for million. Figures do not include domestic help provided to the elderly by pension funds, nor specific transfers available to juveniles. Figures only include community-dwelling beneficiaries of LTC schemes and associated spending. In 2014, 9% of LTC beneficiaries aged 60+ benefit from *handicap* schemes given that their handicap was recognized before age 60.

### Eligibility conditions

Eligibility is defined thanks to a standardized disability scale: combining the restrictions in the Activities of Daily Living (ADL) and in the Instrumental Activities of Daily Living (IADL),<sup>8</sup> the *AGGIR* scale defines 6 groups of dependence, 4 of which granting

<sup>7</sup>The idea that dependent elderly should be “maintained at home” is a guideline of dependence policies in France as in most countries. This can be explained by budgetary reasons, but also because aging in place is the option that is generally preferred by individuals and their families (Colombo et al. 2011). Nonetheless, in France public schemes exist also for individuals receiving institutional care, but they do not work the same. As we focus primarily on community-dwelling individuals, we describe only LTC schemes available to this population (they represent 60% of LTC policy beneficiaries in France).

<sup>8</sup>Conventionally, seven activities are listed as ADL: bathing or showering, personal hygiene and grooming, toilet hygiene, dressing, serving one’s food and drink, self-feeding, getting in and out of the bed, sitting



eligibility for APA. For each potential beneficiary, a personalized assessment of needs is organized at the house of the individual: a team made of nurses and social workers evaluates what types of activities the beneficiary requires assistance with and at what frequency.

As to regard handicap schemes, in 2006 a new benefit, the *Prestation de compensation du handicap* (PCH), was created to progressively replace ACTP for individuals below age 60.<sup>9</sup> PCH works similarly to APA, but co-payment schedule and disability conditions for eligibility differ. Eligibility is granted if the individual cannot perform *at all* one or more of a list of 19 essential activities (physical mobility, personal care, administrative tasks, communication or basic social relationships), or when the person cannot perform *without major difficulties* two or more of these activities. The applicant must be aged less than 60, or show that her disabilities were anterior to her 60<sup>th</sup> birthday.

Departmental Councils, which are the entities in charge of LTC policies,<sup>10</sup> may also subsidizes means-tested domestic help to individuals aged less than 60 who did not get access to PCH, and to individuals aged 65 or over who could not obtain APA. Finally, pension funds may grant their retired affiliates aged 65 or more who do not meet the disability criteria to get access to APA with a subsidy on home care services.

## Content of the schemes

APA can be used to finance housing adaptation or some technical assistance devices; the bulk of transfers (93% in 2014, [Amar et al. \(2016\)](#)) is however used to pay for professional home care services. This is also true for PCH, albeit specific credits, not fungible with those intended to human care subsidies, are open for technical assistance devices, housing adaptation, transportation or animal assistance. PCH-financed human care, which amounts to 92% of PCH spending ([Amar et al. 2016](#)), is mainly provided by professional workers or, in some cases, by relatives, as APA and PCH can be used to financially compensate or even employ informal caregivers under restrictive conditions. Contrary to APA though, PCH cannot be used to pay for domestic help: PCH-financed professional caregivers must deliver personal care, monitoring or IADL support other than housekeeping.

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and getting up ([Katz et al. 1970](#)). IADL correspond to the Instrumental Activities of Daily Living: they designate activities that are not essential to the survival of an individual but that need to be performed on a daily basis for an individual to live in the community ([Lawton & Brody 1969](#)).

<sup>9</sup>ACTP has not been granted to new recipients since 2006, but still benefits surviving recipients.

<sup>10</sup>LTC schemes in France are not part of the social insurance system (*Sécurité sociale*), but are considered as social transfers. Although they are defined at the national level, they are organized at the departmental level (by *Conseils départementaux*).

## Benefits and co-payments

When used to pay for professional care, all schemes except for ACTP work as an hourly subsidy on the price of care services: on each hour for which she is entitled to public support, the beneficiary must pay an out-of-pocket price that depends on the home care provider price and on the individual co-payment rate.<sup>11</sup> With APA, PCH and domestic help programs, beneficiaries are required to pay a financial participation equal to a certain share, set by a national co-payment schedule, of either the actual price charged by their care provider or a lump-sum tariff.<sup>12</sup> In practice, the co-payment rate of PCH beneficiaries is zero except for those with high assets, while the co-payment rate set by APA varies from 0 to 90% depending on the beneficiary's income.

For APA, PCH and departments' or pension funds' domestic help, the maximum number of hours eligible for the subsidy is set at the moment of the needs assessment visit. For APA, the volume eligible to a subsidy must lay below the dependence group-specific ceiling, which is higher for individuals with more severe disability. Ceilings also apply for domestic help subsidized by pension funds and means-tested domestic help schemes financed by Departmental Councils. On the contrary, the pre-set ceiling for human care subsidized by PCH is not binding.

## 2.3 Comparing handicap and dependence schemes

We will not dig further into the differences between the schemes.<sup>13</sup> The three important points to bear in mind are: first, there exist public subsidies to foster home care utilization by individuals with ADL/IADL restrictions. Second, home care subsidies are not the same if you are 60 or over, or if you are under this age threshold. Third, an *a priori* assessment of the effects of this institutional distinction is hard to make, because of the many differences in eligibility rules, conditions, contents and ceilings.

As a consequence, deriving precise predictions on the relative advantages of handicap schemes over dependence policies is especially difficult to achieve for two main reasons. First, eligibility criteria in terms of disability are fairly different for APA and PCH and eligibility decisions are not processed by the same entities. Second, documenting the differences in the out-of-pocket price of care between an APA recipient and a PCH beneficiary is made difficult by the substantial leeway that Departmental Councils retain in defining the APA and PCH policy parameters, and by the local variations in the characteristics of

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<sup>11</sup>See Chapters 2 and 3 of this thesis for more information on the APA co-payment schedule.

<sup>12</sup>For PCH, lump-sum tariffs are used when beneficiaries receive care from an over-the-counter worker or from a home care structure that is not "authorized" (*prestataire agréé non autorisé*). These tariffs are defined at the national level. For APA, Departmental Councils are free to choose how they want to apply the co-payment schedule and to set their level of lump-sum tariffs.

<sup>13</sup>Further details can be found in Appendix A.1.

home care supply. Nonetheless, we may tentatively predict two things: first, an elderly dependent is expected to get better access to domestic help than a handicapped adult, all other things being equal, given that PCH does not subsidize this type of care. On the contrary, the use of personal care and monitoring should benefit from higher subsidies with PCH than with APA, except for low-income individuals.

Rather than relying on ad hoc case studies, our paper proposes to use quantitative methods to assess whether LTC utilization is, overall, affected by the discontinuity of public policies at age 60. We will compare individuals with ADL or IADL restrictions, below and above age 60. Those individuals are not necessarily recipients of or even eligible for a subsidy. This way, we intend to capture the aggregation of different potential effects: the institutional difference between handicap and dependence policies may induce individuals 60 or older to be more likely to be eligible for and to claim home care subsidies (or the reverse); then, conditional on receiving the subsidy, belonging to one population rather to the other may induce differential care utilization because of differential generosity or content of the subsidy. Empirically, this will amount to estimating an Intention To Treat (ITT) effect.

### 3 Data and descriptive statistics

#### 3.1 HSM survey

We first use the French Disability and Health Survey on Households (*Enquête Handicap-Santé-Ménages*, or HSM). The survey was conducted by the French National Institute of Statistics (Insee) and the Statistical Direction of the Ministry of Health and Social Affairs (Drees) in 2008, and is representative of the French population living in the community.<sup>14</sup> This dataset contains detailed information about the restrictions in the ADL/IADL experienced by the respondents and their socio-demographic characteristics and family setting. It also includes information about the nature of home care provided (informal or formal care, activities the individual is assisted with), as well as about caregivers.

Since the survey sample includes both individuals below age 60 and “elderly” respondents, it allows us to compare the care arrangements in the sub-populations on the two sides of the age 60 threshold.<sup>15</sup> Furthermore, individuals affected by disabilities and health problems were over-sampled in the survey design, enabling to work on handicap

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<sup>14</sup>The institutionalized population (living in a nursing homes, handicap or rehabilitation centers and psychiatric hospitals) was the target of a companion survey, *Handicap-Santé-Institutions* (HSI, 2009).

<sup>15</sup>This is an important advantage of HSM over administrative datasets or elderly-specific surveys. As underlined by Colvez & Villebrun (2003), assessing the inconveniences of institutional age barriers cannot be done with administrative data that are collected on the beneficiaries of a given public transfer.

and dependence questions with reasonable sample sizes.<sup>16</sup>

## 3.2 Sample selection

Our population of interest includes all individuals that potentially require assistance to perform the tasks of everyday life. We drop individuals that can perform alone the entire set of ADL and IADL with no difficulties. We retain only individuals aged 50 to 74 to study what happens around the threshold of age 60. From an epidemiological point of view, the prevalence of functional limitations tends to increase for individuals in their fifties (Cambois et al. 2013), but the prevalence of severe activity restrictions markedly increases only after age 80, when severe cognitive limitations come along severe difficulties to perform some basic physical activities (Dos Santos & Makdessi 2010). We end up with a sample of 3,121 individuals.<sup>17</sup>

Individuals with ADL or IADL restrictions represent 10.9% of the 16.8 millions people living at home aged 50 to 74. Among individuals who are aged 50 to 60, the proportion of those with ADL or IADL restrictions is lower than 10%; this proportion rises steadily from 10% to 15% between age 60 and 65, and reaches 25% before just before age 75.

## 3.3 Formal and informal care use

### Definition of outcomes

We focus on two types of home care: domestic help, personal care and other assistance with ADL/IADL provided by *professional workers* of the socio-medical sector, and care provided by *relatives*. HSM provides information on the types of tasks performed by all the caregivers declared by a respondent. We consider that an individual receives informal care if at least one of her relatives assists her with the activities of daily living. If the individual “only” gets material and financial help or psychological support from her family, we consider she does not receive informal care.<sup>18</sup>

Regarding professional care, it is important to distinguish between *cure* and *care*: an individual who has a temporary health problem may receive the frequent visits of medical and para-medical professionals (doctors, nurses, physiotherapists, etc.), and will be recorded in HSM as receiving professional care. However, this type of formal care does

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<sup>16</sup>HSM sample was drawn using the results of a preliminary survey, *Enquête Vie quotidienne et santé* (VQS). See Appendix A.2 for additional information on the sampling design and the implications for inference.

<sup>17</sup>The initial sample of individuals aged 50 to 74 unable to perform alone at least one ADL or IADL was made of 3,132 individuals. We dropped 11 individuals for which some information was missing. See Appendix A.2.

<sup>18</sup>On the other hand, (the few) relatives who are declared as paid caregivers are considered as providing *informal* care.

not relate to LTC schemes: in France, medical services are paid by public and private health insurances or out-of-pocket, and cannot be financed through home care programs.<sup>19</sup> Thus, an individual is said to receive formal *care* if she is assisted by a professional worker with ADL and IADL; she is considered as *not* receiving formal care if she receives *only* frequent *cure*,<sup>20</sup> without any informal or formal *care*.

The dataset contains also information on the frequency of caregivers' interventions and the average hours of care received by each formal or informal caregiver. However, volume of care is often missing for informal caregivers in the survey.<sup>21</sup> In order to retain in our sample those individuals co-residing with their spouse, parents, children or other relatives, who are often not responding to questions about volume of care provided, we chose to study informal care utilization at the extensive margin only. Both our informal care and formal care utilization variables are thus binary.

### Home care utilization around the age 60 threshold

Figure 2 (Panel A) displays care utilization rates as estimated for the two sub-populations of interest. Predominance of informal care is visible in the two groups (about 60% of our population of interest is helped by relatives). This pattern is also observed in most other OECD countries (Fujisawa & Colombo 2009). Yet the 50–59 year-old are less likely to receive any LTC, by about 7 percentage points. They more frequently receive the assistance of informal caregivers only (49% *versus* 42% for individuals 60 and older). On the contrary, they are much less likely to receive professional home care: while 31% of the 60–74 years old receive the assistance of a professional LTC worker at home, it is only the case of 18% of the individuals in the younger sub-population. A  $\chi^2$  test leads to reject that the distribution of LTC arrangements is the same in the two sub-populations ( $p < 0.001$ ).

[Figure 2 to be found on the following page.]

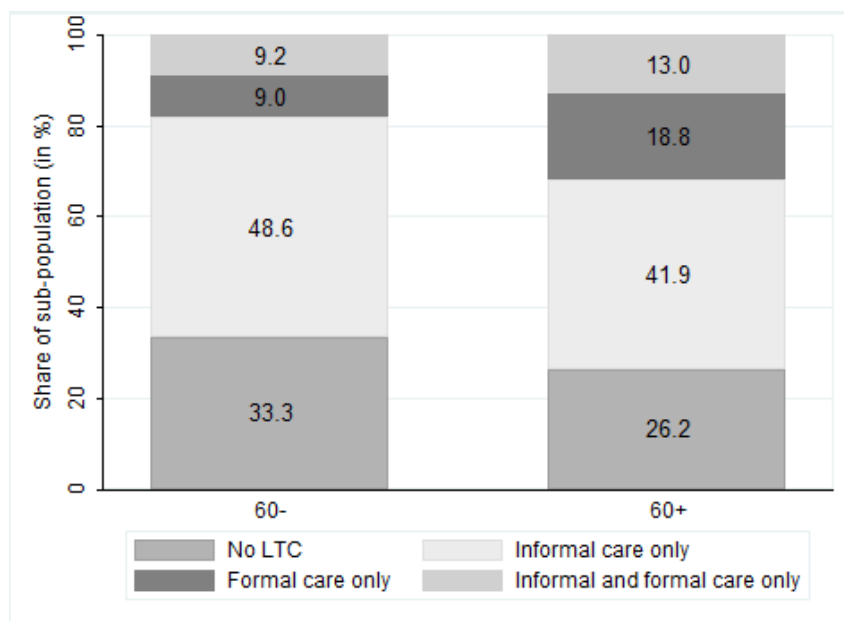
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<sup>19</sup>In addition, nursing care and some personal care are provided to the disabled by nurses. Although they may be regarded as LTC, these services are considered as health care and paid by health insurances.

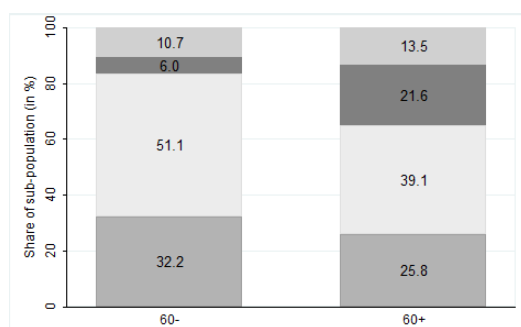
<sup>20</sup>For details on the way we defined “frequent cure”, see Appendix A.3.

<sup>21</sup>This is not a specific weakness of HSM: informal caregivers are often reluctant or simply unable to estimate the number of hours they spend assisting their relatives (Paraponaris et al. 2012), and similarly individuals who receive help from their relatives are not necessarily able or willing to “count”. It is especially problematic for spouses and, more generally, co-residing relatives, for who the frontier between regular domestic work and assistance to a disabled relative may be blurred. For that reason, the designers of HSM survey filtered the questions asked about co-residing caregivers: for those relatives, frequency and volume of care are not asked.

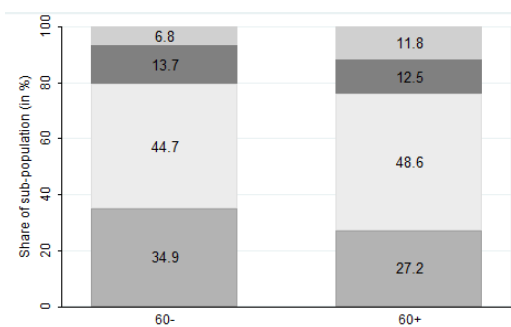
Figure 2: Home care use among disabled individuals, population aged 50–74.



Panel A: Individuals aged 50–74.



Panel B: Women aged 50–74.



Panel C: Men aged 50–74.

POPULATION: French population aged 50 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N=3,121 individuals). Statistics are computed using survey weights.

SOURCE: Insee–Drees, HSM 2008.

Among those receiving professional home care, individuals aged 60 and older are less likely to have been receiving formal LTC for less than 5 years (40%, against 50%). Among those receiving informal assistance with the activities of daily living, individuals aged 60–74 are less likely to have been provided help for less than a year (4% against 8%) and more likely to have been helped for more than 5 years (65% against 60%). However, these figures take into account the financial help and psychological support that may be provided by relatives: assistance with ADL and IADL may be more recent. In addition, for both formal and informal care, we cannot reject that the conditional distribution of the age of assistance is the same in the two sub-populations.

The comparison of Panels B and C of Figure 2 shows that care arrangements are substantially different for women and men. Men and women are equally likely to receive professional and informal care before age 60; however, the utilization rate of professional care becomes much higher for women than for men after age 60 (35% versus 24%). Men are much more likely to be provided informal care without any professional home care, especially when they are 60 or more. Demographics may partly explain this pattern, as elderly women are less likely to have a partner at home or children (Gaymu et al. 2008); yet gender differences in terms of caregiving implication are also likely to play a role.

These figures highlight the necessity to control for differences in the demographic and socio-economic composition of each subpopulation to identify the effect of LTC policies on care arrangements separately from that of other determinants of LTC policies; they also provide a rationale for investigating into potential differential effects by gender.

To get a more precise idea of how LTC utilization evolves around the age 60 threshold, Figures 3 to 5 display population-average LTC utilization rates by civil age. On each graph, we add two fitted lines to capture an age trend in LTC utilization: to allow this trend to differ before and after the age 60 threshold, we regress LTC utilization first on individuals below age 60 and second on individuals above age 60.<sup>22</sup>

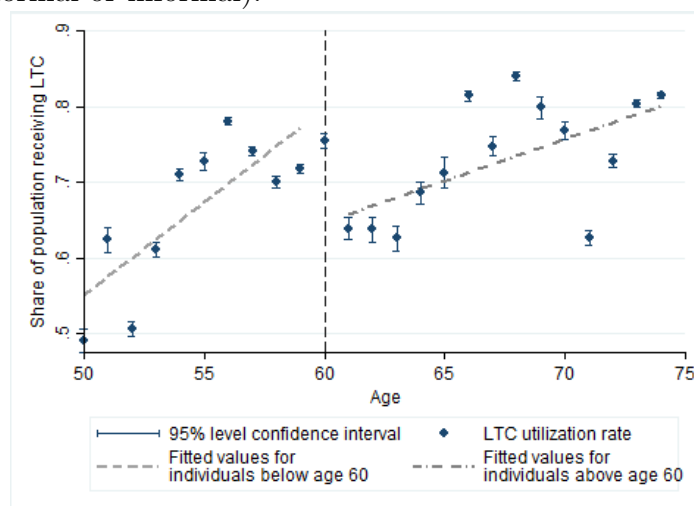
The probability to receive home care, either formal or informal, tends to increase with age. However, there seems to be a break in the trend at age 60 in all Figures. In addition, we notice a “negative jump” at 60 in the probability to receive informal care (Figure 4, Panel A): although the probability to receive assistance from relatives increases with age, individuals just above the age 60 threshold are less likely to receive informal care than individuals just below the threshold. We do not observe a positive jump in the probability to receive formal home care at age 60 (Figure 4, Panel B).

*[Figures 3 to 5 to be found on pages 14 to 16]*

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<sup>22</sup>The fitted lines are obtained by taking into account survey weights. We exclude age 60 when fitting the line on individuals 60<sup>+</sup>, to account for the possibility that effective access to dependence schemes may take some time.

Figure 3: Care utilization around the discontinuity: Proportion of individuals receiving some home care (formal or informal).



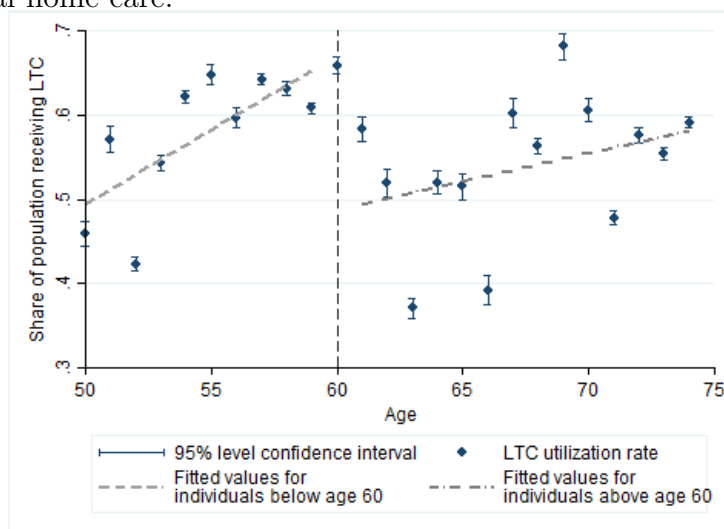
SAMPLE: French population aged 50 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N=3,121 individuals).

NOTES: Dots represent average care utilization rate by civil age and include varying numbers of individuals. Linear trends in age are fitted using individual observations (either below or above age 60) and survey weights.

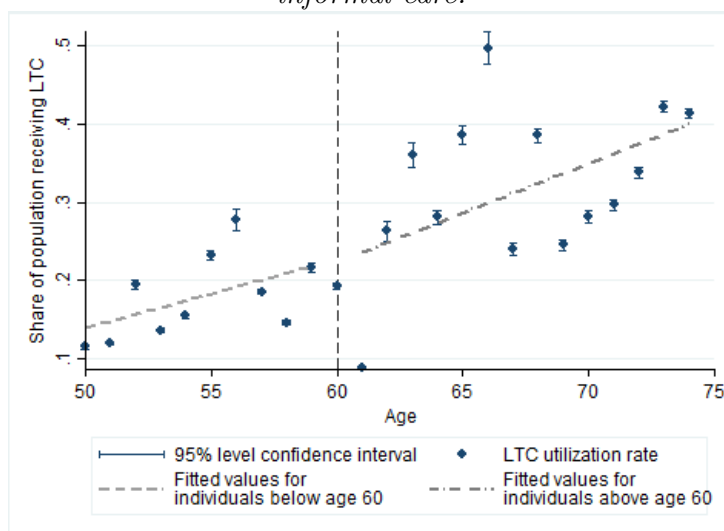
SOURCE: Insee–Drees, HSM 2008.



Figure 4: Care utilization around the discontinuity: Proportion of individuals receiving informal or formal home care.



*Panel A (top): Share of individuals receiving informal care.*



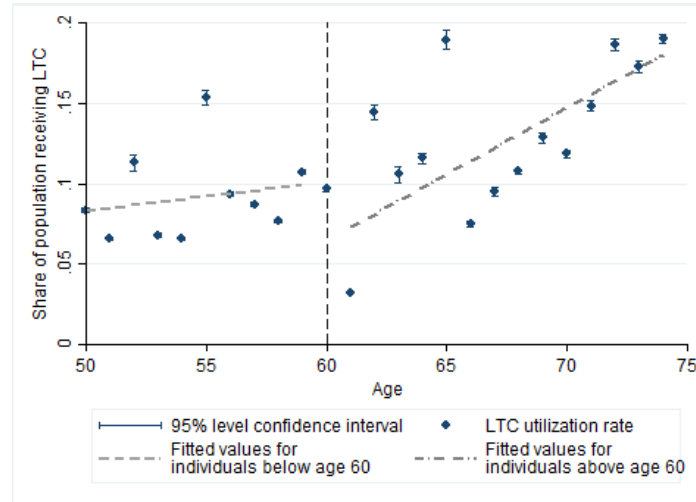
*Panel B (bottom): Share of individuals receiving formal care.*

NOTES: SAMPLE: French population aged 50 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,121 individuals).

NOTES: Dots represent average care utilization rate by civil age and include varying numbers of individuals. Linear trends in age are fitted using individual observations (either below or above age 60) and survey weights.

SOURCE: Insee-Drees, HSM 2008.

Figure 5: Care utilization around the discontinuity: Proportion of individuals receiving both formal and informal home care.



SAMPLE: French population aged 50 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,121 individuals).

NOTES: Dots represent average care utilization rate by civil age and include varying numbers of individuals. Linear trends in age are fitted using individual observations (either below or above age 60) and survey weights.

SOURCE: Insee–Drees, HSM 2008.

Systematic differences in population-average LTC utilization rates by age should be interpreted with caution: they may hide systematic differences in the individual determinants of LTC utilization across the age distribution.

### 3.4 Socio-demographic and family characteristics

HSM provides a rich set of individual characteristics likely to correlate with both age and care settings. Based on previous literature, the covariates we retain are of three types: health and disability variables, socio-demographic characteristics (including gender) and family resources.

Severity of disability is likely to affect the demand for paid home care services and the propensity of relatives to provide some assistance. We compute a dummy equal to 1 if the individual has ADL restrictions, the number of ADL and the number of IADL the individual has difficulties to perform alone. More precisely, following [Arnault \(2015\)](#), we distinguish between non-cognitive and cognitive IADL and compute two separate indexes. Are considered as “cognitive IADL” using a telephone, completing routine administrative processes, taking medication<sup>23</sup> and finding route. This allows to control more accurately for differences in the type of disabilities on both sides of the age 60 threshold, as [Dos Santos & Makdessi \(2010\)](#) have shown that severe cognitive limitations are rare before 60 but becomes much more frequent for individuals aged 60 to 79.

Although the various ADL and IADL may not induce the same need for compensation, the total numbers of restrictions in ADL and of restrictions in IADL is likely to provide a good indicator of the severity of an individual’s disability.<sup>24</sup> To better account for potential heterogeneity in care needs, we control also for physical, sensory and cognitive functional limitations ([Cambois & Robine 2003](#)). Lastly, we include a dummy equal to 1 if the individual has absolute restrictions in one of the 3 “essential” ADL: feeding oneself when the food is ready, going to the restroom, and sitting and getting up. As shown by epidemiological longitudinal studies, these ADLs tend to be chronologically the last ones to be affected in the disablement process ([Edjolo et al. 2016](#)). They induce an intensive demand for LTC services. We additionally take into account the self-assessed health status, coded in three levels and a dummy for having declared any chronic condition.

A second range of individual characteristics include the level of education and the monthly household income per consumption unit, as well as dummies for retirement and employment status. To take into account potential differences in the local supply of professional home care services, area of residence is included, coded in 5 categories.<sup>25</sup>

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<sup>23</sup>[Barberger-Gateau et al. \(1993\)](#) find that these 3 IADLs are strong predictors of one-year incident dementia. The IADL “having difficulties in taking a means of transportation” is also a predictor but since such difficulties may also arise due to physical limitations, we exclude them from our index of cognitive limitations.

<sup>24</sup>We do not consider the possibility of the possible endogeneity of restrictions in ADL and IADL. As pointed out by [Cambois & Robine \(2003\)](#), restrictions in everyday life activities may arise because of a misappropriate compensation of functional limitations. [Stabile et al. \(2006\)](#), [Rapp et al. \(2011\)](#), [Barnay & Juin \(2016\)](#) find that increased availability of (publicly-financed) home care has a positive effect on the physical and mental health, which may in turn affect activity restrictions.

<sup>25</sup>These 5 categories are: living in a rural area, living in a urban area with less than 20,000 inhabitants,

As handicap and dependence policies are implemented at the local level in France, we include a dummy for each department (*département*).<sup>26</sup> We also include a dummy for living overseas, as public schemes and the organization of professional LTC, as well as family and social norms, may differ from the situation in metropolitan France.

We then include some family characteristics that reflect the presence of potential caregivers and could explain differences in home care utilization. Having children is expected to increase the likelihood of receiving informal care; so is the proportion of daughters, as girls are more likely to assist their parents with day-to-day the activities (Horowitz 1985, Bonnet et al. 2013).<sup>27</sup> We also control for the fact of having any siblings alive, and we add a dummy equal to one if individual has at least one sister. Having a partner alive may increase informal care utilization while decreasing formal home care utilization.

Table II presents summary statistics on the individual and family characteristics of the two sub-populations of interest. Among the 60+, we find a higher proportion of women than in the subgroup aged less than 60, which is consistent with the lower life expectancy of men. While functional limitations are barely more prevalent in the eldest sub-population, the number of IADL individuals have difficulty to perform increases with age. Surprisingly, the share of individuals with ADL restrictions is higher among individuals aged less than 60. To interpret this fact, remember that we retain in our sample only individuals with IADL and ADL restrictions (living in the community). The higher prevalence of ADL restrictions among the youngest group would certainly not hold in the general population. It is probably due to the fact that the individuals with more severe health conditions and disability levels are less likely to age in place or have a reduced life-expectancy.<sup>28</sup> As

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living in a urban area with more than 20,000 inhabitants and less then 100,000, living in a urban area with more than 100,000 inhabitants but not in Paris, living in Paris.

<sup>26</sup>Field observations (Billaud et al. 2012) and a quantitative survey on local governments (*Enquête Territoire*, LEDa-LEGOS & CES (2012)) surveyed French metropolitan *Conseils départementaux* in 2012 to collect information on the implementation of the APA policy on their territory. These studies have shown that access to APA, evaluation of needs and computation of the co-payment vary from one department to the other. Although the main parameters of the APA subsidy are defined at the national level, local governments retain substantial leeway in its attribution and calculus, affecting the insurance and distributive properties of the policy (Bourreau-Dubois & Gramain 2014, Bourreau-Dubois et al. 2015). Similarly, practices of assessment and complementary fundings for PCH may vary from a department to another. Moreover, regulation of home care services is also organized at the local level, and local authorities' decisions have a direct influence on the price level of the available services (Hege et al. 2014). As a consequence, department of residence is likely not only to influence formal home care utilization, but also to affect the effective differences between handicap and dependence schemes.

<sup>27</sup>Note that the gender of children may not play at the extensive margin: Fontaine (2010) shows that daughters provide on average more hours of care to their elderly parents, but represent just a little more than half of caregivers. Our definition of assistance in the activities of daily living include punctual help with home improvements and administrative tasks that sons are more likely to perform, while daughters provide more personal care and regular domestic work (Pennec 2009).

<sup>28</sup>Given that our data are cross-sectional, this counter-intuitive pattern may also reflect the lower mortality from chronic conditions and disabling diseases observed in younger generations due to medical

expected, the share of individuals with absolute restrictions in one of the 3 essential ADL is very low in our sample: most individuals with such a low functional status are supposedly living in a specialized institution.

Education levels reflect generational effects: the French born in the 1950s were more likely to complete primary and secondary education than those born ten or fifteen years earlier. Income distribution is more concentrated among the 60–74 years-old: this is consistent with the fact that most individuals after 60 receive pension benefits, which are less unequally distributed than salaries and social allowances in the active age population (Insee et al. 2013).<sup>29</sup> No marked difference shows up in the area of residence — except for the fact that oversea departments tend to be older.

In terms of family characteristics, the two sub-populations are similar: about 2/3 of individuals have a partner alive, and more than 85% have at least a child alive. Individuals who are less than 60 have yet a higher probability to have brothers and sisters alive.

*[Table II to be found on the following page]*

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progress.

<sup>29</sup>Educational attainment and income may also have been influenced by individual disability, especially in the 50–59 years-old group, for which disability is more likely to have affected the labor market participation.

Table II: Population descriptive statistics.

	Individuals less than 60 [1]	Individuals 60 and older [2]	Difference $60^+ - 60^-$ [3]
Average age	54.7	67.7	+12.9***
Woman	61.2%	70.1%	+8.9***
<i>Self-declared health status</i>			
Health status: bad	55.6%	51.1%	-4.5 <sup>n.s.</sup>
Health status: average	30.2%	35.8%	+5.6*
Health status: good	14.1%	13.2%	-0.9 <sup>n.s.</sup>
Has a chronic condition	87.4%	89.5%	+2.1 <sup>n.s.</sup>
<i>Functional limitations and activity restrictions</i>			
Has physical functional limitations	81.3%	87.0%	+5.7*
Has sensory functional limitations	46.6%	49.4%	+2.8 <sup>n.s.</sup>
Has cognitive functional limitations	51.2%	54.1%	+2.9 <sup>n.s.</sup>
Has ADL restrictions	37.2%	32.7%	-4.5*
Has absolute restrictions in 1 of the 3 key ADLs	2.6%	3.1%	+0.5 <sup>n.s.</sup>
Average number of non-cognitive IADL	1.9	2.3	+0.3***
Average number of cognitive IADL	0.6	0.7	+0.1**
Average number of ADL restrictions	0.9	0.8	-0.1 <sup>n.s.</sup>
<i>Education level</i>			
No degree	34.0%	37.2%	+3.2 <sup>n.s.</sup>
Primary education degree	21.7%	32.9%	+11.2***
Secondary education degree	37.7%	21.4%	-16.3***
College or university degree	6.6%	8.4%	+1.8 <sup>n.s.</sup>
<i>Monthly household income (per c.u.)</i>			
Income quartile 1 (poorest)	24.9%	18.5%	-6.4**
Income quartile 2	20.9%	28.3%	+7.4***
Income quartile 3	23.6%	26.4%	-2.8 <sup>n.s.</sup>
Income quartile 4 (richest)	30.4%	26.8%	-3.6 <sup>n.s.</sup>
<i>Work status</i>			
Is employed	25.9%	2.8%	-23.1***
Is retired	5.7%	84.0%	+78.2***
<i>Area of residence</i>			
Lives in a rural area	25.0%	23.9%	-0.1 <sup>n.s.</sup>
Lives in a small urban area	18.7%	17.9%	-0.8 <sup>n.s.</sup>
Lives in a medium urban area	12.4%	14.7%	+2.3 <sup>n.s.</sup>
Lives in a large urban area	30.4%	30.5%	0.1 <sup>n.s.</sup>
Lives in Paris	13.5%	13.1%	-0.4 <sup>n.s.</sup>
Lives oversea	2.7%	3.6%	+0.9 <sup>n.s.</sup>
<i>Family characteristics</i>			
Has a partner	65.4%	61.8%	-3.5 <sup>n.s.</sup>
Has at least a child alive	85.6%	86.6%	+1.0 <sup>n.s.</sup>
Number of children	2.3	2.5	+0.2 <sup>n.s.</sup>
Proportion of girls	40.7%	42.4%	+1.6 <sup>n.s.</sup>
Has any brother or sister alive	91.8%	80.4%	-11.4***
Has a sister alive	76.2%	65.1%	-11.0***
N (sample)	1,393	1,728	-

NOTES: For statistics displayed in percentages in Columns [1] and [2], the differences in Column [3] are expressed in percentage points. Statistics computed on the baseline sample (3,121 individuals), using survey weights. <sup>n.s.</sup>  $p \geq 0.10$ , \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The Student test of differences between the two sub-populations takes into account the sampling design.

### 3.5 Individual information on LTC benefits

One shortcoming of HSM is that information on LTC benefits is of poor quality. Considering the entire population of individuals aged 60 and older, the number of individuals reporting APA benefit is estimated to be 330,000, twice less than what administrative records show. Underreporting of PCH benefits is also observed, while the survey indicates slightly more ACTP beneficiaries than administrative records do (Appendix A.1). As we may not exclude that the institutional threshold at age 60 also affects the probability to misreport LTC benefits, we will not attempt to relate self-reported declaration of LTC benefits with LTC utilization.

## 4 Empirical strategy

### 4.1 Empirical specification

#### Home care utilization

As a starting point, we disregard the distinction between formal and informal care. We define  $Y_i^*$  a continuous variable of home care use for individual  $i$ , including both professional care and the care provided by relatives. We assume that  $Y_i^*$  is a linear function of some individual characteristics  $Z_i$ , of the institutional environment and of an idiosyncratic factor  $u_i$ , according to the following Equation:

$$Y_i^* = \alpha + \beta.60_i^+ + Z_i'\theta + u_i \quad (1)$$

where  $60_i^+$  is a dummy equal to one if individual  $i$  is aged 60 and older and  $\alpha$  is a constant. Conditional on an unconfoundedness assumption and the model being well-specified, coefficient  $\beta$  in Equation (1) captures the impact of belonging to the perimeter of dependence policies rather than of handicap schemes. If  $\beta$  were positive, this would mean that the institutional barrier in LTC policies causes the dependent elderly to be more likely to receive home care than the handicapped adults.

## Formal and informal care utilization

If informal care utilization and formal care consumption result from simultaneous decisions,<sup>30</sup> estimating Equation (1) by a Probit with formal (alternatively, informal) care utilization as the dependent variable will give incorrect standard errors. To achieve correct inference given our nonlinear econometric model, it is necessary to estimate the impact of the institutional age threshold on formal and informal care utilization in a simultaneous equation setting. We estimate the following model:<sup>31</sup>

$$\begin{cases} Y_I^* = \alpha_I + \beta_I.60^+ + Z'\theta_I + u_I \\ Y_F^* = \alpha_F + \beta_F.60^+ + Z'\theta_F + u_F \end{cases} \quad (2)$$

Coefficients have the same interpretation as in Equation (1) but are now equation-specific; they are thus indexed by  $I$  (respectively by  $F$ ) in the equation of determination of informal (resp. formal) care utilization. The coefficient of correlation between the error terms  $u_I$  and  $u_F$ , denoted  $\rho$ , can differ from zero: unobserved determinants of informal care and formal care use may correlate.

## 4.2 Identification assumption

For our estimate of  $\beta$  (resp.  $\beta_j$ ,  $j = I, F$ ) to be consistent, we have to assume that  $E[u|Z, 60^+]$  (resp.  $E[u_j|Z, 60^+]$ ,  $j = I, F$ ) is constant. This is the most standard assumption of unconfoundedness: it imposes that there is no endogeneity bias, no reverse causality and no omitted variable.

Concerns about endogeneity and reverse causality of our dummy of interest,  $60^+$ , are easy to dismiss, as civil age is arguably exogenous. Omitted variable bias is a more serious threat to identification here. In the set of covariates  $Z$ , we include the individual characteristics presented in Table II as well as departmental fixed effects.

We may yet wonder whether there are some unobserved determinants of LTC use correlating with age. Household wealth and housing assets, for example, are not observed, while they correlate with age in the general population (Insee 2016). Preferences for LTC may also vary with age or be generational. To decrease the risk of omitted variable bias, we allow LTC use to depend on age independently from the institutional age threshold in LTC schemes. Empirically, we include age effects, through a linear trend in our baseline

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<sup>30</sup>To model the provision of informal care and professional care services utilization, previous literature has made use of family decision models, with two different conceptual choices: either a unique family utility function is assumed (Stern 1995, Stabile et al. 2006); or it is supposed that the disabled individual and her relatives have different, potentially diverging preferences (Pezzin & Schone 1999, Van Houtven & Norton 2004, Bolin et al. 2008). The second approach has been shown to be more consistent with empirical observations (Pezzin & Schone 1999).

<sup>31</sup>We drop the subscript  $i$  to make notations easier.



specifications. To give more flexibility to the model, we allow the trend in age to be different before and after the threshold of age 60. In practical terms, the set of covariates  $Z_i$  we include in the model writes as:

$$Z_i = \left( (Age_i - 60), 60_i^+ \cdot (Age_i - 60), X_i \right)$$

where  $X_i$  is the set of covariates other than age. If LTC use truly depends on age (in a linear way) conditional on the observable characteristics  $X_i$ , our specification will ensure that we do not confound the effect of the institutional threshold at age 60 with that of age itself.

### 4.3 Estimation method

#### Observational scheme

Since our variables of formal and informal care use are binary, we have the following observational scheme, for  $y = Y, Y_I, Y_F$ :

$$y = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{else} \end{cases}$$

We estimate Equation (1) by Maximum Likelihood running a univariate probit, assuming  $u$  follows a normal distribution with zero conditional mean. Similarly, System (2) is estimated by a bivariate probit, with the assumption that  $(u_I, u_F)$  follows a bivariate normal distribution. To ease the interpretation of results, we provide the average partial effects rather than the raw coefficients from the Probit.

#### Unweighted *versus* weighted regressions

The debate about the role of sampling weights in uncovering causal relationships is a longstanding one (Angrist & Pischke 2009) and is all the more relevant here as the cross-sectional variation in survey weights in HSM is high. When the theoretical grounds for running weighted regressions are not clearly applying, Solon et al. (2015) advise to report both weighted and unweighted estimates and discuss their potential differences.<sup>32</sup> In all specifications we have tested, standard errors are extremely high when we take

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<sup>32</sup>Solon et al. (2015) discusses three reasons why an applied economist would run weighted regressions. First, weights may allow to correct for heteroscedasticity; in practice yet, the increase in precision thereby achieved highly depends on the structure of the error term. Second, weights may correct for endogenous sampling — an issue that we do not face while using HSM data. Finally, in the case of heterogeneous effects, weighted regression may help to identify unbiased average partial effects. In the general case though, it will not make up for not modeling adequately heterogeneity of effects.

into account the survey sampling design; this may reflect the unaccounted for clustered structure of the error terms (Dickens 1990). In particular, clustering on age, as we believe is warranted given our model, cannot be achieved when we take into account the weights and the stratified structure of the sample.<sup>33</sup> We thus choose to report only estimates from the unweighted regressions, bearing in mind that they are consistent only if there is no unmodeled heterogeneity. When deriving the average partial or marginal effects, we plug back in the survey weights, in order to obtain the *population* average effects and not the *sample* average effects.

## 5 Results

### 5.1 Baseline results

Table III presents the results from univariate probit estimations of Equation (1).<sup>34</sup> Specification (1) regresses the probability of receiving any care (be it informal or formal care) on the dummy “being 60 and older” and all covariates but age. The coefficient is positive and significantly different from zero at the 5% level. When adding a linear age trend, in Column (2), the coefficient decreases and statistical significance vanishes. We find a similar result when allowing the age trend in LTC utilization to be different before and after age 60 (Column (3)).

*[Table III to be found on the following page.]*

Akaike’s information criterion (AIC) and Bayesian information criterion (BIC) are reported (Akaike 1998, Schwarz 1978). Both AIC and BIC indicate that the best fit of the model to the data is obtained when an age effect is included with different slopes on both sides of the discontinuity (Column (3)).<sup>35</sup> This is our preferred specification.<sup>36</sup>

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<sup>33</sup>In Stata, we add the prefix `svy` to the `probit` or `biprobit` regression commands; the prefix does not support the option `vce(cluster varname)`.

<sup>34</sup>The sample used in estimations of Table III is slightly smaller than our baseline sample: it contains 3,100 individuals instead of 3,121. This is because within a few departments, either all observations are receiving care, or all individuals receive no assistance at home. Such a pattern is mainly due to the sampling design of the survey: in order to minimize collection costs, not all the departments were equally intensively surveyed. As this technical selection appears to be essentially random, we chose to run our estimations on the entire sample of 3,121 individuals when estimating System (2) to maximize the precision of our results, and to use the sub-sample of 3,100 individuals when estimating Equation (1).

<sup>35</sup>As these information criteria relates negatively to the log-likelihood, a smaller AIC (alternatively, a smaller BIC) points out to a better model. These statistics balance the gain in likelihood with the increase in the number of parameters to be estimated: when an additional control adds very little in terms of likelihood, AIC and BIC decrease. By construction, AIC gives less penalty to additional controls.

<sup>36</sup>We have also tested specifications including quadratic and cubic age effects. The fit of the model increases only slightly when we include higher order polynomial terms in age. The coefficient of the 60<sup>+</sup> dummy remains positive but practically negligible. Statistical precision decreases dramatically, as age polynomials strongly correlate with the 60<sup>+</sup> dummy.

Table III: Home care utilization: Estimation results.

	<i>Outcome: <math>P(Y = 1)</math></i>					
	(1)	(2)	(3)	(4)	(5)	(6)
60 <sup>+</sup>	0.033** (0.015)	0.003 (0.020)	0.015 (0.019)	0.030* (0.015)	-0.008 (0.021)	-0.001 (0.018)
(Age - 60)		0.003 (0.002)	-0.002 (0.003)		0.003 (0.002)	-0.002 (0.003)
60 <sup>+</sup> .(Age - 60)			0.006* (0.004)			0.007* (0.004)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sample (ages included)	50–74	50–74	50–74	50–74 w/o age 60	50–74 w/o age 60	50–74 w/o age 60
Observations	3100	3100	3100	2964	2964	2964
Clusters	25	25	25	24	24	24
<i>AIC</i>	2434.0	2432.3	2430.3	2309.9	2308.1	2305.6
<i>BIC</i>	2579.0	2577.3	2575.3	2447.8	2445.9	2443.4

NOTES: Standard errors in parentheses, clustered on age; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . Population-average partial effects (APE) for binary variables are computed using the finite-difference method. Average marginal effects (AME) for continuous variables are computed using the delta method. Unweighted estimations by a Probit model, data from HSM 2008. Specifications include department fixed effects. 21 individuals had to be withdrawn from the baseline sample, as no within-department variations in the outcome variable was observed for these observations.

Columns (4) to (6) of Table III replicates Columns (1) to (3) on the sample excluding individuals who are aged 60 at the time of the survey. Applying for and being granted LTC benefits may take time: time to get aware of one's eligibility to the program, time to gather information and prepare an application, and time for the administration to process the application and implement the transfer or subsidy.<sup>37</sup> The effects of the change in accessible public schemes may not be detectable when individuals turn 60, but only later on. We thus check the robustness of our results to the exclusion of those individuals who are located just at the institutional discontinuity. The results are qualitatively similar: when we do not control by age itself, being 60 or more is associated with a higher probability to receive home care, but this effect vanishes when we control (linearly) for age.

Given the very small and statistically non-significant coefficient we find for the 60<sup>+</sup> dummy, we cannot reject that the age threshold in LTC policies has no effect on the probability of receiving some home care.

We now turn to the estimation of the bivariate model of Equation (2). Specifications (1) to (3) of Table IV are similar to the first three specifications of Table III, but we consider now several outcomes: we estimate the effect of being considered a dependent elderly rather than a handicapped adult on (i) the probability to receive informal care, (ii) the probability to use formal care, and (iii) the probability of joint utilization.

*[Table IV to be found on the following page.]*

As shown by Column (1), if we do not control by age itself, the model suggests that being a dependent elderly rather than a handicapped adult is associated with a lower probability to receive informal care and a — much — higher probability to receive formal home care. The magnitude of the effect on professional care is high (+11pp.) given that the population-average utilization rate of formal care is about 25%.

However, when we include age trends in LTC utilization, the point estimates decrease in absolute value and statistical precision diminishes. In our favorite specification (Column (3)), we find that being a dependent elderly rather than a handicapped adult is associated with a 3.6pp. higher probability to use formal care (statistically significant at the 10% level). The point estimate suggests a negative effect on the probability to be provided informal assistance with the activities of daily living (−2.9pp.), but the effect is not statistically significant at conventional levels. When we exclude those individuals just at the discontinuity (aged 60 in 2008), in Column (4), the negative effect on the informal care utilization rate becomes statistically significant. Overall, our estimates suggests that being 60 and older would cause the probability of receiving help from professionals to

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<sup>37</sup>In the case of APA, field observations show that several months may go by between the date an individual sends her application file and the moment she eventually receives notification of acceptance.

Table IV: Informal care and formal care utilization: Estimation results.

<i>Outcomes</i>	Average partial effect of being 60 <sup>+</sup>			
	(1)	(2)	(3)	(4)
$Pr(Y_I = 1)$	-0.054*** (0.016)	-0.036 (0.022)	-0.029 (0.022)	-0.046** (0.023)
$Pr(Y_F = 1)$	0.111*** (0.020)	0.037* (0.021)	0.036* (0.020)	0.037 (0.027)
$Pr(Y_I = 1, Y_F = 1)$	0.043*** (0.010)	0.010 (0.011)	0.012 (0.011)	0.007 (0.013)
$\rho$	-0.437*** (-8.62)	-0.438*** (-8.39)	-0.438*** (-8.39)	-0.428*** (-8.02)
Age effects	None	Linear; common slope	Linear; different slopes	Linear; different slopes
Other controls	Yes	Yes	Yes	Yes
Sample (ages included)	50–74	50–74	50–74	50–74 w/o age 60
Observations	3121	3121	3121	2985
Clusters	25	25	25	24
<i>AIC</i>	5923.5	5901.1	5900.7	5635.0
<i>BIC</i>	6074.6	6052.3	6051.8	5779.0

NOTES: Standard errors in parentheses, clustered on age; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . Population-average partial effects (APE) for binary variables are computed using finite-difference method. Unweighted estimations by a bivariate Probit model, data from HSM 2008. Specifications include department fixed effects.

increase and the odd to be assisted by relatives to decrease, leaving the utilization rate of home care unchanged.

The correlation between the error terms  $u_I$  and  $u_F$ ,  $\rho$ , is estimated to be negative, highly significant in statistical terms and practically important. This implies that the unobserved factors that increase the propensity to use professional home care services are negatively correlated with those factors that increase the propensity to receive informal care.

## 5.2 Results on covariates

Overall, results obtained on covariates are consistent with previous works on the determinants of home care utilization. They are displayed in Tables V and VI.

*[Tables V and VI to be found on the following pages.]*

Being a woman increases the propensity to use formal care, consistent with Katz et al. (2000). Declaring a good health status has, paradoxically, a positive effect on professional

care utilization, but this effect holds for a given functional status. Having ADL restrictions seems to decrease formal care utilization, but the probability to receive some professional care increases with the number of ADLs affected. The effect is opposite for informal care utilization. Having cognitive limitations increases professional care utilization.

The area of residence has only limited effects on care utilization rates, possibly because much of the territorial variation in care provision patterns is absorbed by the departmental dummies. These dummies (not reported in results tables) are jointly significant, confirming the existence of inter-departmental differences. Having a tertiary education increases the use of formal care, which may reflect different social norms towards paid domestic help. Belonging to the top income quartile also has a strong and statistically significant effect on the probability to use formal care. Being employed has an effect on informal care utilization (5% level), maybe because of the time constraints it imposes on caregivers or because individuals who are working in spite of their disability are less able to rely on family solidarity.

Consistently with past literature, informal care provision is positively associated with having daughters or sisters ([Bonsang 2009](#), [Horowitz 1985](#)), having a partner alive, or having a child or a parent co-residing. Interestingly, the effects of these same variables on the propensity to use formal care are usually of the opposite sign.

Table V: Informal care and formal care utilization as simultaneous decisions: Results on covariates (1/2)

<i>Outcome:</i>	Average partial or marginal effects		
	<i>Univariate Probit</i>	<i>Bivariate Probit</i>	
	Home care (1)	Informal care (2)	Formal care (3)
60 <sup>+</sup>	0.015 (0.019)	-0.029 (0.022)	0.036* (0.020)
Woman	0.007 (0.015)	0.008 (0.019)	0.051** (0.017)
Self-assessed health: bad	0.012 (0.013)	0.016 (0.019)	-0.014 (0.020)
Self-assessed health: fair	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
Self-assessed health: good	0.032 (0.026)	0.000 (0.034)	0.063** (0.030)
Has a chronic condition	0.043 (0.033)	0.057* (0.033)	-0.004 (0.029)
Has ADL restrictions	0.077** (0.027)	0.118*** (0.028)	-0.028 (0.022)
Has restrictions with most essential ADLs	-0.126 (0.091)	-0.072 (0.059)	0.135** (0.043)
Has physical functional limitations	0.053** (0.027)	0.053* (0.028)	0.017 (0.029)
Has cognitive functional limitations	0.008 (0.018)	-0.018 (0.021)	0.043** (0.015)
Has sensory functional limitations	-0.028* (0.017)	-0.004 (0.017)	-0.003 (0.013)
Number of ADLs restrictions	-0.005 (0.012)	-0.015 (0.010)	0.007 (0.006)
Number of non-cognitive IADLs restrictions	0.098*** (0.007)	0.077*** (0.006)	0.055*** (0.005)
Number of cognitive IADLs restrictions	0.020** (0.008)	0.015 (0.012)	0.002 (0.009)
Lives in a rural area	-0.010 (0.025)	0.030 (0.026)	0.014 (0.017)
Lives in a small urban area	-0.015 (0.039)	-0.013 (0.036)	-0.016 (0.031)
Lives in a medium-size urban area	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
Lives in a large urban area	-0.006 (0.029)	0.040 (0.026)	-0.044** (0.021)
Lives in the Paris region	-0.021 (0.092)	-0.058 (0.103)	0.059 (0.078)
<i>End of covariates in following table</i>			

Table VI: Informal care and formal care utilization as simultaneous decisions: Results on covariates (2/2)

	Average partial or marginal effects		
	<i>Univariate Probit</i>	<i>Bivariate Probit</i>	
<i>Outcome:</i>	Home care	Informal care	Formal care
	(1)	(2)	(3)
<i>Beginning of covariates in previous table</i>			
Diploma: none	-0.005 (0.020)	0.010 (0.019)	-0.025 (0.020)
Diploma: primary education	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
Diploma: secondary education	-0.021 (0.023)	-0.013 (0.025)	0.021 (0.023)
Diploma: higher education	0.067** (0.027)	-0.034 (0.033)	0.160*** (0.034)
Income quartile: 1 <sup>st</sup> (poorest)	0.040* (0.022)	0.023 (0.019)	0.001 (0.018)
Income quartile: 2 <sup>nd</sup>	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
Income quartile: 3 <sup>rd</sup>	0.004 (0.014)	0.020 (0.014)	-0.005 (0.015)
Income quartile: 4 <sup>th</sup> (richest)	0.050** (0.021)	0.012 (0.022)	0.090*** (0.017)
Works	-0.031 (0.034)	-0.045 (0.035)	-0.032 (0.030)
Has a partner	0.110*** (0.021)	0.244*** (0.018)	-0.147*** (0.011)
Has children alive	-0.092*** (0.020)	-0.055** (0.025)	-0.036 (0.027)
Number of children alive	0.011** (0.005)	0.018** (0.006)	-0.006 (0.006)
Proportion of daughters among children	0.000 (0.022)	0.048** (0.023)	-0.062*** (0.018)
Has any brother or sister	-0.013 (0.028)	0.009 (0.029)	-0.007 (0.026)
Has a sister alive	0.016 (0.025)	0.057** (0.024)	-0.034* (0.019)
$\rho$	—	-0.438*** (-8.39)	
Age effects	Linear, different trends		
Observations	3121	3036	
Clusters	25	25	
<i>AIC</i>	2430.3	5900.7	
<i>BIC</i>	2575	6051.8	

NOTES: Standard errors in parentheses, clustered on age; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . Average partial effects (APE) for binary variables are computed using finite-difference method. Average marginal effects (AME) for continuous variables are computed using delta method. Estimation by a univariate or bivariate Probit model, data from HSM 2008. The specification includes departmental fixed effects (F-test of joint significance:  $p < 0.01$ ).



### 5.3 Heterogeneity analysis

We test whether the effects of the institutional age thresholds differ by gender and disability level. In Table VII, Column (1) replicates our preferred specification from the baseline univariate Probit and bivariate Probit estimations. Column (2) (resp. Column (3)) replicates the analysis on the sub-sample of women (resp. men). Column (4) (resp. Column (5)) run the same estimations on the sub-sample of individuals with ADL restrictions (resp. with no ADL restriction).<sup>38</sup>

*[Table VII to be found on the following page.]*

Men are found to be more likely to receive some home care when they are dependent elderly (Panel A of Table VII, Column (3)). The probability to receive informal home care is about 6pp. higher for men when they are 60 and older; in addition, those are 7pp. more likely to be helped by professionals (Panel B). On the contrary, women seem much less affected by the age 60 threshold: the bivariate probit estimation (Panel B, Column (2)) suggests that being a dependent woman decreases the probability to receive informal home care relative to a handicapped woman, but the univariate probit does not find any significant effect of the age 60 threshold on the probability to receive any home care.<sup>39</sup>

When testing heterogeneity by disability level, we find that the probability to receive some assistance in the activities of daily living is higher for individuals aged 60 and older among the sub-population with ADL restrictions (i-e with severe disability) (Column (4), Panel A). The probabilities of receiving care from relatives and from professional caregivers increase substantially (+6pp and +8pp). On the contrary, among individuals with a more moderate disability level (IADL restrictions only), falling into the perimeter of dependence policies decreases the probability to receive professional assistance. These results suggest that becoming eligible for APA — as individuals with ADL restrictions are expected to be when they are 60 or more — increases the access to professional care for individuals with severe disability.

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<sup>38</sup>Running sub-sample estimations rather than adding an interaction term to the baseline specification induces a loss of statistical power. However, the inclusion of interaction terms in probit models raise estimation issues (Ai & Norton 2003). In addition, running sub-sample regressions allows to better take into account potential heterogeneity in the effects of the covariates.

<sup>39</sup>Had we not controlled for age effects, our estimates might have captured generational effects — for example, a woman born in the 1930s may have been more reluctant to have a professional worker coming at her house than a woman born in the 1950s.

Table VII: Informal care and formal care utilization:: Heterogeneity of effects by gender and disability level.

	Average partial effect of being 60 <sup>+</sup>				
	<i>All</i>	<i>Women</i>	<i>Men</i>	<i>ADL restrictions</i>	<i>No ADL restrictions</i>
	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Univariate probit estimation</i>					
$Pr(Y_I = 1 \text{ or } Y_F = 1)$	0.015 (0.019)	-0.010 (0.025)	0.103** (0.035)	0.094** (0.029)	-0.032 (0.031)
Observations	3100	1955	997	1145	1761
Clusters	25	25	25	25	25
<i>AIC</i>	2430.3	1540.3	777.5	620.5	1679.4
<i>BIC</i>	2575.3	1674.1	895.2	741.5	1810.8
<i>Panel B: Bivariate probit estimation</i>					
$Pr(Y_I = 1)$	-0.029 (0.022)	-0.075** (0.033)	0.062** (0.024)	0.063** (0.031)	-0.091** (0.036)
$Pr(Y_F = 1)$	0.036* (0.020)	0.027 (0.035)	0.071** (0.033)	0.082** (0.033)	-0.011 (0.043)
$Pr(Y_I = 1, Y_F = 1)$	0.012 (0.011)	-0.008 (0.017)	0.050** (0.019)	0.081** (0.027)	-0.027 (0.020)
Observations	3121	2001	1120	1337	1784
Clusters	25	25	25	25	25
<i>AIC</i>	5900.7	3806.2	1804.0	2149.2	3464.0
<i>BIC</i>	6051.8	3946.3	1929.5	2279.2	3601.2
Age effects	Linear, different slopes				
Other controls	Yes				

NOTES: Standard errors in parentheses, clustered on age; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . Population-average partial effects (APE) for binary variables are computed using finite-difference method. Unweighted estimations by a univariate probit (Panel A) or a bivariate Probit model (Panel B), data from HSM 2008. Specifications include department fixed effects. The sample sizes of Columns (2) and (3) (resp. (4) and (5)) do not sum up to the size of the entire sample (Column (1)): in some sub-samples, there is no variation in the outcome variable within a department, due to the sampling design. Observations from those departments are dropped from the estimation.

## 6 Dicussion

### 6.1 Robustness of the identification strategy

As discussed in Section 4.2, we include linear controls for age on each side of the age 60 threshold to capture some unobservable trends in home care use that would correlate with age.

The idea behind the inclusion of age effects bears resemblance with the identification philosophy of the Regression Discontinuity Design (RDD) approach (Lee & Lemieux 2010). As the institutional threshold at age 60 provides an exogenous source of variation in benefit coverage around that age, an RDD approach would offer the potential for an identification based on a quasi-experimental setting. Identification would rely on the relatively weak assumption that home care use is a smooth function of age, continuous at age 60. Using a parametric implementation (Lee et al. 2004), we would be able to estimate the effect of the age 60 threshold by regressing our outcomes on the 60+ dummy while controlling for age through polynomial terms. In such a setting, the inclusion of control variables other than age would essentially affects statistical precision.

There are yet several reasons to doubt that an “authentic” RDD approach would, in our context, sustain the level of proof it normally ensures. Firstly, RDD identification is all the more credible as the number of observations near the threshold is high. Our survey data leave use with a relatively small sample size. In addition, the number of individuals in the sample who are at the right of age 60 is particularly low (Figure 1.D.1, Appendix A.4).<sup>40</sup> To obtain sufficient statistical precision, we would need to include in the estimation sample individuals relatively far away from the threshold, thus increasing the risk of bias in the estimator of  $\beta$  (Imbens & Lemieux 2008). Secondly, given that the treatment status is entirely determined by age, clustering on age is warranted. Low statistical precision is further accentuated by the fact that age is measured in years and not in months. Thirdly, RDD identification requires that no other institutional discontinuity potentially affecting the use of LTC takes place right at age 60. Individuals aged 60 in 2008 had their minimum retirement age precisely at age 60 and the probability to retire in the general population exhibits a spike at this age (Blanchet & Mahieu 2004). Although we rule out several channels through which retirement could affect LTC use in our population of interest,<sup>41</sup> the fact that age 60 is conventionally seen as the kick-off of “old-age” in France may have an effect of the use of LTC and on the involvement of the relatives, above and beyond LTC policies.

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<sup>40</sup>This is due both to the complex design of the survey and to the demographic structure of the French population: the cohorts aged 63 to 68 in 2008 were born during the WWII (Figure 1.D.2, Appendix A.4).

<sup>41</sup>For the full discussion, see Appendix A.5.

Although it leaves us with a stronger unconfoundedness assumption, we have deemed the classical regression approach to be more robust given the data limitations and the institutional context. This implies that, even though we include age effects in the list of controls, we do not claim that our identification strategy is as compelling as a quasi-experimental, RDD-type identification would be.

We have tested whether our estimates are robust to the inclusion of non-linear trends in age and to the restriction of our sample to individuals closer to age 60. The signs of the point estimates do not change when we include quadratic and cubic polynomials in age as covariates, although the precision becomes much lower (as we add controls that are highly correlated with our dummy of interest). When we replicate our estimations on the samples of individuals aged 50 to 69, or even 55 to 64, results become inconclusive: given the much reduced number of observations, standard errors increase substantially.<sup>42</sup>

## 6.2 Interpretation of the results

Our results suggest that belonging to the institutional perimeter of dependence policies, as opposed to standing below the threshold of age 60, tends to increase formal care utilization and decrease the probability to be helped by relatives, for individuals who do not live in a specialized institution on a permanent basis. Due to relatively small sample sizes, statistical precision is low, making it difficult to quantify the effects on formal care and informal care utilization propensities. Yet, one salient feature is that effects are heterogeneous: on average, men and individuals with ADL restrictions appear *more* likely to benefit from informal care when they are elderly dependent. Only individuals with ADL restrictions (on top of IADL restrictions) have a higher utilization rate of professional home care when they are dependent elderly.

One interpretation is that, on average, the elderly with moderate to severe activity restrictions are more likely to receive APA than they would be to receive PCH, were they younger than 60.<sup>43</sup> The fact that APA allows individuals 60 and older with ADL restrictions to benefit from some subsidized domestic help might contribute to the observed increase in formal care utilization among individuals with ADL restrictions. It may in-

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<sup>42</sup>Results are available on demand. Restricting the sample in terms of the age range reduces the number of clusters, which may threaten the validity of inference as we cluster our standard errors on age.

<sup>43</sup>Such an interpretation seems consistent with earlier results presented in [Tenand \(2016\)](#). Exploiting HSM information on self-reported benefits, we found that the probability to report benefiting from home care subsidies is practically and statistically significantly higher among individuals aged 60 and older, even when we control for functional limitations, activity restrictions, socio-demographic characteristics and family resources. If the self-reported LTC beneficiaries were a random draw from the true population of LTC beneficiaries, then these results would suggest that the institutional at age 60 makes individuals in the perimeter of dependence policies *more* likely to benefit from a public scheme. Yet, again, we cannot rule out that under-reporting of LTC benefits correlates with the features of LTC schemes we are interested in.

deed be the case that individuals who are reluctant to being provided *personal care* by professional caregivers accept more easily professional *domestic help*. As PCH cannot be used to pay for domestic help, individuals below age 60 have to rely on their family for house chores, unless they pay out-of-pocket the full price for professional domestic help or can benefit from means-tested domestic help provided by the departments.

We tested this assumption by replicating our probit estimation on six different outcomes, indicating whether individuals received (i) domestic help, (ii) monitoring, or (iii) personal care, provided either by professionals or by relatives.<sup>4445</sup> Focusing on individuals with ADL restrictions, we find a positive point estimate for the effect of the age 60 threshold on the probability to receive professional domestic help (+3.7pp), but it is not statistically significant at the 10% level. On the contrary, the probability to be provided with domestic help by relatives increases by 8.4pp. The probability to be provided monitoring by either relatives or professionals does not change. When we look at the rate of personal care utilization, we find that being a dependent elderly increases the probability to be provided such care by professionals (+8pp,  $p < 0.05$ ).

Although it contradicts our earlier assumption, this last effect may reflect another difference in the schemes accessible to disabled individuals depending on their age. Indeed, another type of care providers may intervene with disabled individuals: the “At-Home Nursing Care Services” (*Services de soins infirmiers à domicile*, SSIAD). These services have an ambiguous status: they are financed on the public health care insurance budget and are meant to provide individuals with chronic conditions with at-home nursing care. Yet certain caregivers of SSIADs are also given the task to provide patients with personal care; under that regard, SSIADs can be considered as part of the disability-compensating policies. Until 2004, SSIADs were accessible only for individuals 60 and older; this officially changed then, but it took time for the services to actually open “slots” for the handicapped adults.<sup>46</sup> The fact that an individual 60 or older experiences a lower constraint on the supply of care by SSIADs may explain why the use of professional personal care is higher after 60. In addition, our estimates suggest that the effect of the age 60 threshold on personal care use is higher for those with income higher than the top income quartile, i.e. for individuals with a non-negligible co-payment on APA. As SSIADs are paid by the national health insurance, they basically come at a zero out-of-pocket cost for the patients, whatever their income, provided their GP has issued a prescription for at-home personal care. The relative cost of SSIAD is therefore lower for richer individuals, who are provided an incentive to substitute APA-subsidized care for SSIAD services.

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<sup>44</sup>Appendix A.3 provides the description of these categories.

<sup>45</sup>We ran univariate probits for each of the six outcomes.

<sup>46</sup>In 2008, when the survey was conducted, less than 4,000 slots were available to the handicapped adults, while 93,000 dependent elderly were able to be served by SSIADs (Bertrand 2010, Drees 2016).

Our estimates also suggest that, for women, there is some crowding-out of informal care provision by (a slightly increased) formal home care utilization after age 60. This is consistent with [Fontaine \(2012\)](#) who uses the HSM sample of individuals aged 60 and older and finds that publicly-funded formal home care provided to the 60+ has a small crowding-out effect on informal care provision.<sup>47</sup> When focusing on men, our estimates rather suggest some form of complementarity between informal care and (unskilled) formal care.

Note that, contrary to [Fontaine \(2012\)](#) who study the volumes of care, we only look at the extensive margin of home care provision. The fact that our outcomes are care utilization *rates* and not volumes is an important point to bear in mind when drawing implications from our results. It is well possible that we would observe different patterns, were we to study the intensive margin. Indeed, the co-payment schedule associated with PCH is on average more generous than the cost-sharing rule of APA. Recent works using French data have confirmed that the consumption of formal care is price-elastic not only at the extensive margin ([Arrighi et al. 2015](#)), but also at the intensive margin ([Bourreau-Dubois et al. 2014](#), [Hege 2016](#), [Roquebert & Tenand 2017](#)). Differences in cost-sharing rules and amounts of care to be subsidized may affect the volume of publicly-funded professional care consumed; in turn, this may lead the relatives of dependent elderly and handicapped adults to adjust the assistance with ADL and IADL they provide.

### 6.3 Data limitations

Despite its attractive features, the HSM survey presents some limitations for the purpose of our study. Our identification strategy hinges on the absence of omitted variable bias. We have included a set of covariates relating to family composition and characteristics but they may be insufficient to capture the full relevant heterogeneity in family structures. HSM contains rich additional information on the respondents' relatives (e.g. place of residence<sup>48</sup> or marital status of children, age of relatives); yet this information is

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<sup>47</sup>Activities performed by caregivers are also found to change in reaction to increased formal care consumption subsidized by APA: relatives perform less household chores and personal care ([Fontaine 2012](#)).

<sup>48</sup>From a theoretical point of view, when relatives live closer, informal care can be provided at a lesser cost ([Hoerger et al. 1996](#)). Empirically, [Stern \(1995\)](#) and [Charles & Sevak \(2005\)](#) have shown that geographical distance from children is an important determinant of informal care provision to the elderly; this variable may also have an (indirect) effect on formal home care utilization. Moreover, co-residence is likely to correlate with home care public subsidies: using US panel data, [Hoerger et al. \(1996\)](#) show that Medicaid home health care subsidies increase the probability for a dependent elderly to live independently, relative to living in an inter-generational household. Omitting relatives' residence from the controls may thus bias the estimates. On the other hand, residence of relatives may well be endogenous to informal and formal care utilization: a relative may choose to live close to her parent in order to provide assistance more frequently if she observes her parent is feeling tired or low. Even in the case the individual receives the services of professional caregivers only, relatives may decide to live close, or not to move away, in

available only for individuals who declared they do not need assistance in the activities of daily living. The proportion of such individuals being significantly lower in our sub-sample of individuals aged 50–59 than in the older sub-sample, we chose not to exclude these individuals from our sample of interest. As the perception of the need for assistance may be influenced by the public schemes an individual has access to, and therefore by the age 60 threshold, we suspect that the sample selection would have been endogeneous, had we kept only individuals with self-assessed needs of assistance.

The absence of a longitudinal dimension comes with several limitations. First, it makes it necessary to rule out cohort effects for identification. Second, it prevents from including individual fixed effects in the specifications, which would reduce the risk of omitted variable bias. Third, it makes it practically impossible to identify and take into account the specific case of the “aging handicapped” (*personnes handicapées vieillissantes*). Individuals who were granted a handicap benefit (PCH or ACTP) before they turned 60 can choose to remain in the regime of the “handicap policies” or to shift to the dependence policies. Given this derogation, the dummy for being 60 and older indicates whether the individual has access to the dependence schemes, but does not necessarily mean that the individual has no access to the handicap schemes. The impossibility to identify the “aging handicapped” may lead to under-estimate the impact of the differences between the two schemes; yet, given that less than 20% (15%) of ACTP (PCH) beneficiaries were 60 or older in 2008 (Drees 2008a), the under-estimation should be limited.<sup>49</sup>

Finally, the absence of a follow-up wave does not allow us to take into account differential institutionalization rates, which would translate into differential sample selection on both sides of age 60. Yet the age 60 threshold itself may affect the probability to live in the community.

## 6.4 Differential institutionalization rates?

Existing studies, based on US data for the most, mainly suggest that home care subsidies impact institutionalization patterns. Ettner (1994), Pezzin et al. (1996) and Guo et al. (2015) find a significant, negative impact of more generous public home care

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order to assist the impaired individual with paperwork or exert some surveillance. Many articles on LTC arrangements have chosen to work on a sample of elderly living alone (see Bonsang (2009) and Arnault (2015)), thereby avoiding the endogeneity issue raised by the co-residence status. Some empirical results suggest that the endogeneity bias is limited (Bolin et al. 2008, Charles & Sevak 2005, Stern 1995).

<sup>49</sup>Given the low quality of data on LTC benefits in surveys in general, and in HSM in particular (cf. Appendix A.1), relying on whether an individual who is less than 60 declares receiving PCH or ACTP is not a reliable way of identifying the “aging handicapped” in the sample. The section of the questionnaire documenting the chronic conditions and major health events include questions about the year in which the health issue emerged or the health event happened. However, such questions do not provide information precise enough to infer the age of the onset of functional limitations and activity restrictions.



programs on the probability to enter a nursing home.<sup>50</sup> Differences in reimbursement rates for elderly nursing homes and for handicapped adults specialized institutions could also induce differential selection, as looser Medicaid eligibility rules and greater reimbursement for nursing home care were shown to increase institutionalization rates (Hoerger et al. 1996). As pointed out by Weber (2011) and Ramos-Gorand & Rapegno (2016), in France, out-of-pocket payments in elderly dependent nursing homes (*EPHAD*) are on average far higher than the amounts paid by residents of handicap centers.<sup>51</sup>

Differential financial incentives to institutionalization may be counterbalanced by the characteristics of the supply. Availability of beds for handicapped adults and dependent elderly needs not be the same, as suppliers may adjust to the differences in LTC schemes and in national and local regulations. Ramos-Gorand & Rapegno (2016) document that nursing homes are more homogeneously distributed on the territory than handicap centers, mainly because the latter are less numerous while tending to be larger. Institutions for the handicapped tend to welcome specific sub-populations, as each handicap center needs to receive a certification to host individuals with a given type of disabilities. There is no such requirement for nursing homes, although a substantial share of EHPADs declare having refused to host patients with dementia or requiring intensive medical care (Ramos-Gorand & Rapegno 2016). Overall, depending on one's type of disability, health status and area of residence, access to an institution may be more or less difficult when being a dependent adult rather than a handicapped adult.

HSM was conducted together with a companion survey, HSI, which collected information on individuals living in an institution permanently. Because of differing methodologies and questionnaires, merging the two surveys is not possible. However, a small dataset with basic individual information on individuals surveyed in HSI and on those interviewed in HSM is available. It contains age, sex, self-assessed health (coded in 5 levels), a dummy for chronic disease, as well as a categorical variable on functional limitations.

Figure 6 represents the proportion of the French population living in an institution by civil age. Linear fits of the relationship between institutionalization and age suggest that the trend changes after age 60: while the institutionalization rate tends to decrease for individuals in their 50s, it increases after age 60. In addition, if we exclude individuals right at age 60, we observe a positive jump in the institutionalization rate just after 60.

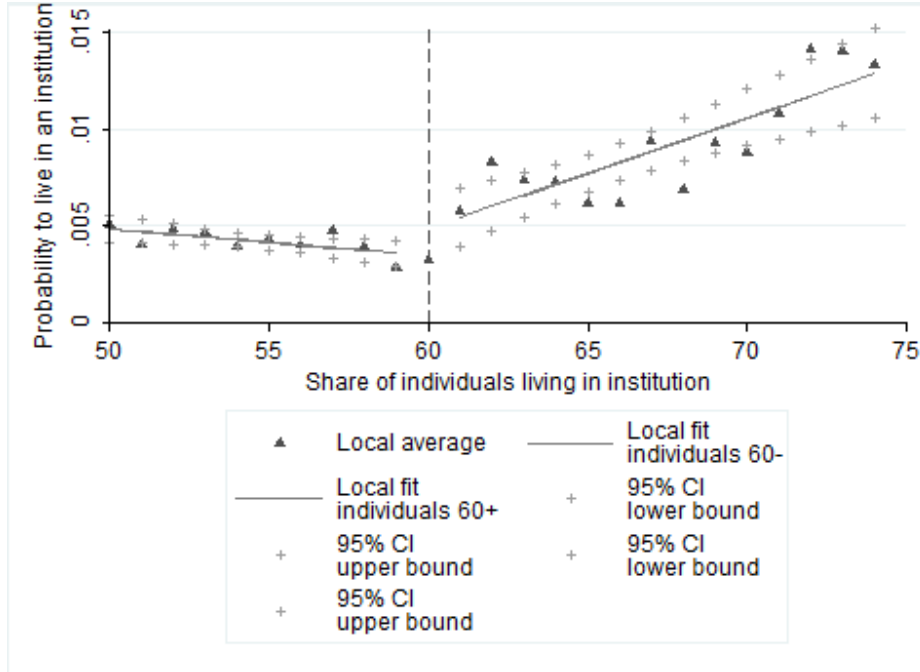
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<sup>50</sup>Earlier works by Hoerger et al. (1996) and Christianson (1988) concluded to the absence of such an effect (for individuals aged 65 or more). The approach of Ettner (1994) and Pezzin et al. (1996) is however more credible since these papers model living arrangements jointly with formal and informal care provision.

<sup>51</sup>Most of the fees in handicap centers are covered by the national Health Insurance or social benefits non recoverable on succession. On the contrary, social financial support accessible to the dependent elderly to pay for board and lodging can be deducted from their succession, and a co-payment is asked on the fees covering institutional care provision (Ramos-Gorand & Rapegno 2016).



Figure 6: Probability of living in an institution, by civil age.



SAMPLE: Sample of the French population aged 50 to 74 in 2008 (N = 12,784 individuals). Institutionalization rates per age and linear fits are computed by taking into account survey weights.

SOURCE: Insee–Drees, HSM–HSI 2008/2009 matched survey.

To formally identify the effect of the age 60 threshold in LTC policies on the probability to live in an institution, we implement a RDD strategy. Given the limited list of control variables available, it is unlikely that the coefficient obtained from a simple multivariate regression of living arrangement (being institutionalized or not) on the dummy “being 60+” will provide an unbiased estimate of the effect of the institutional threshold in LTC policies. Selecting individuals aged 50 to 74 in the matched HSM–HSI dataset, we obtain a sample of 12,784 individuals. We consider the sample size around the age 60 threshold to be reasonable enough to derive convincing evidence from a RDD strategy.<sup>52</sup> Following [Lee et al. \(2004\)](#), we implement a parametric approach based on the following specification:

$$I_i^* = \alpha' + \beta'60_i^+ + \sum_{j=1}^J \delta'_j \cdot (Age - 60)^j + \sum_{j=1}^J \mu'_j \cdot 60^+ \cdot (Age - 60)^j + Z_i' \theta' + u_i' \quad (3)$$

where  $I_i^*$  is a latent variable measuring the propensity of individual  $i$  to live in insti-

<sup>52</sup>Moreover, differential sample selection on the two sides of the age threshold is not a threat to RDD identification anymore, as we work on a sample representative of the entire French population. In addition, the potential confounding effect of retirement is not a concern when the outcome is institutionalization: individuals who may enter a specialized institution are unlikely to be on the labor market (a further discussion and formal tests can be found in [Appendix A.6.](#))

tution on a permanent basis. Given that we observe a binary outcome (the individual is recorded as living either in institution or in an ordinary setting), Equation (3) is estimated by a univariate probit.

With a parametric approach, RDD identification hinges on the functional form of age effects that is assumed. Empirically, we select the degree  $J$  of the polynomial terms in age by comparing the information criteria (AIC and BIC) obtained with linear, quadratic or cubic age effects. As the RDD essentially compares population averages of the outcome variable just below and just above the threshold in the forcing variable, it is important to take into account survey weights when estimating the model.

The best fit of the model (both AIC and BIC are minimized) is obtained when including cubic trend in age ( $J = 3$  in Equation (3)). Probit estimates in Table 1.F.1 (Appendix A.6) show that being 60 and older increases the probability to live in an institution by around 0.4 percentage points. The effect is statistically significant at the 1% level; in practical term, it is fairly high, as the population institutionalization rate in the French 50–74 years-old population is of 0.6%.

We assess the robustness of our result in two ways. Firstly, we exclude individuals who are 60, again considering that it may take time for individuals to change or benefit from newly accessible LTC schemes. Secondly, we exclude individuals who are 70 or more, to check that our estimates are not driven by individuals far away from the discontinuity. As presented in Table 1.F.2 (Appendix A.6), the positive effect of being a dependent elderly on the probability to live at home keeps holding.<sup>53</sup>

The construction of HSM and HSI samples is key to interpreting the estimated pattern. In the HS surveys, the population living in the community includes all individuals who go back home at least *once a year*. Thus, it includes the patients of centers for the handicapped that may welcome their patients overnight during the week, but tend to allow or even encourage families to host their relatives during the weekend. On the contrary, nursing homes accessible to dependent elderly are generally conceived as permanent residences, and daycare facilities for the elderly were still scarce at the time of the survey.<sup>54</sup> The positive coefficient we estimate thus partly reflects the definition of “living in the community” retained in the survey sampling design.

Interestingly, the differential selection of the dependent elderly *versus* the handicapped adults in the HS surveys should not be regarded as a mere sampling bias. The fact that

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<sup>53</sup>This effect is also found when we restrict the sample to individuals who have some functional limitations. The results are available on demand. In our baseline specification, we prefer not to do any sample selection, as the only variable on functional limitation provided in the HSM–HSI matched dataset is fairly crude.

<sup>54</sup>Instructions given to interviewers explicitly mention nursing homes as an example of an institutional living setting and explain that individuals living in centers for handicapped persons should be considered as living in an ordinary house.

the 60+ are more likely to be considered as living in an institution than individuals below 60 stems from the very institutional distinction made between dependency and handicap programs we are interested in.

To fully assess disability compensation and potential horizontal inequity, it would be relevant to know whether individuals included in the HSM sample are actually receiving formal care from professional workers in handicap centers. As we lack such information, the effect of the institutional age discontinuities we have found on formal home care utilization rate should be read along with the fact that the individuals below 60 in our estimation sample are also more likely to receive some unobserved professional LTC.

## 7 Conclusion

This paper attempted to answer the following question: when you have difficulties in performing alone the activities of daily living, does it make a difference for you to be considered a “dependent elderly” rather than a “handicapped adult” by the French Welfare system? Our results suggest the answer is yes. Among individuals who live in an ordinary setting on a permanent basis, the “dependent elderly” are more likely to receive professional home care and less likely to be provided assistance with the activities of daily living by their relatives. We thus provide evidence that two sub-groups of the population with arguably equal “needs” for LTC are less likely to receive formal care due to their age. This situation contrasts with the position of the European Court of Justice, according to which age per se is not a legitimate criterion to define entitlements to disability-compensation.

Our second set of results, derived from an RDD strategy, provides original and robust evidence that the probability to be recorded as living in an institution positively jumps at age 60. On the face of it, our estimates suggest that dependence schemes are more effective in allowing disabled individuals to access formal LTC services, either at home or in institutions. Interpreting our results in terms of horizontal inequity should be made with caution for two reasons. First, we find evidence of substantial heterogeneity of effects with respect to the disability level and gender. Second, interpreting our results as evidence that the handicapped are put at disadvantage is made difficult by the fact that the French Disability and Health Survey did not survey all types of LTC services being used. The formal LTC services provided by professional workers inside the institutions in which handicapped adults can stay for the day or the week (while those aged 60 and older can hardly access those types of care without living in a nursing home on a permanent basis) do not show up anywhere in the collected data. It is thus possible that our estimates signal the substitution of formal *home* care to professional care provided

*in an institution.* Presumably, our results partly capture the fact that the survey data collection was influenced by the architecture of LTC policies.

While this loophole in the survey is itself a consequence of the age threshold in LTC policies we investigated into, it translates into a limitation for our empirical analysis. Several lessons can be gleaned for future survey data collection on disability and health. First, the sampling design should be made robust to institutional differences in the treatment of various sub-groups. In particular, the definition of living arrangements should be made as little dependent on the specific features of LTC policies as possible. Second, the content of the survey (e.g. which types of care are being asked about) should be comprehensive enough to ensure that there is no hole in the dimensions the survey aims at documenting (e.g. care arrangements). Third, questions about the types of care received should be made so that different payers (e.g. health insurance *versus* LTC schemes) can be identified. As this is challenging for respondents to report correct information when they receive multiple subsidies, one promising way to go is to push forward the matching of surveys with administrative records of social transfers and health care claims. This will also be a way to overcome the reporting bias survey data on incomes and transfers surveys are plagued with. Next, over-sampling individuals around age discontinuities would be a cost-efficient way to increase statistical power while allowing robust identification methods (e.g. RDD) to be implemented. Finally, variation in sampling probabilities with age would also be a way to smooth out the effects of demographic booms and busts on sampling sizes, which can undermine some powerful identification strategies.

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## A Appendices

### A.1 LTC schemes in France: additional information and quality of self-reported benefits

#### A.1.1 Legislation

The institutional landscape of handicap and dependence compensating public schemes is quite complex in France. This Appendix aims at providing the key features of each scheme. As explained in Section 2, those schemes fall into two official categories: *handicap* subsidies on one hand, *dependence* or old-age subsidies on the other. Table 1.A.1 on page 51 presents the main handicap and dependence schemes for individuals living in the community:

- *Allocation compensatrice pour tierce-personne* (ACTP);
- *Prestation de compensation du handicap* (PCH);
- *Allocation personnalisée d'autonomie* (APA);
- *Prestation sociale d'aide ménagère aux personnes handicapées* (means-tested domestic help to handicapped individuals);
- *Prestation sociale d'aide ménagère aux personnes âgées* (means-tested domestic help to the elderly);
- *Prestation d'aide ménagère aux personnes âgées des caisses de retraite* (domestic help to the elderly provided by pension funds).

These different transfers are mutually exclusive. Only means-tested domestic help to the handicapped may be granted as a complement to PCH.

In this presentation, we deal exclusively with the component of these schemes that subsidizes human care utilization. Depending on the scheme considered, departments, Local Houses for Handicapped Persons (MDPH) or general practitioners proceed to an assessment of needs of applicants. For all schemes but ACTP, a maximum number of hours eligible to the subsidy,  $\bar{h}_i$ , is defined for each recipient  $i$ . For APA and PCH, the maximum amount of transfer for individual  $i$ ,  $A_i$ , is defined as  $A_i = \bar{h}_i \times t$ , where  $t$  is the tariff of reimbursement. In the case of APA, this tariff is set at the local level, by *Conseils départementaux* and varies with the type of caregiver (employed over-the-counter or through home care services). In the general case, the price charged by the care provider exceeds the tariff of reimbursement.

In the case of APA, if  $A_i$  exceeds the dependence group (GIR)-specific ceiling,  $\bar{h}_i$  is reduced accordingly. Usually, amount  $A_i$  is directly transferred to PCH recipients after

deduction of the co-payment, while for APA, the subsidy is usually paid on an hourly basis, directly to the home care provider. For ACTP, the amount of transfer is defined according to individual needs in terms of human care, but no control of effective spending is made.

ACTP, PCH and APA can also be used to pay relatives providing care with the activities of daily living, under some strict conditions. For individuals receiving PCH, relatives other than children, parents and partner can be employed as over-the-counter workers. The salary paid is eligible to the social security contributions and income tax rebates applied to over-the-counter home care employees; in addition, PCH beneficiaries may then receive a subsidy on the hourly price paid to their relative. Children, parents and partners who provide care on a regular basis can receive a salary only if they are not retired or full-time employed, and if the PCH recipient requires constant surveillance. For lowest degrees of disability, caregivers can receive an hourly compensation; however, the rate is very low (€3.67 per hour, while the French hourly net minimum wage is €7.51). To lower the opportunity cost of informal caregiving for close relatives, the indemnity is increased to €5.51 when the caregiver has to stop her professional activity to assist her disabled relative. In any case, the monthly indemnity is capped at 940 euros per month (about €200 less than the monthly net minimum salary).<sup>55</sup>

For individuals receiving APA, the transfer may be used to employ a relative as a family caregiver, except for one's partner. The reimbursement tariff,  $TR$ , which is applied to compute amount  $A_i$ , is the same as for regular over-the-counter home care providers.

In the case of APA and PCH, employing a relative as a family caregiver reduces the number of hours of formal care eligible to a subsidy, since the maximum number of subsidized hours allocated through the assessment of needs include both informal and formal care hours.

On the contrary, domestic help subsidies from departments or pension funds cannot be used to compensate a family caregiver. Means-tested domestic help given by departments is even conditional on not having any close relative able to perform domestic tasks for the individual ("subsidiarity principle").

On the supply side, home care services are regulated by local authorities. As regulations of home care services provided to the handicapped and to the elderly dependent differ, regulated prices of the services offered to the two sub-populations can differ as well. However, centrally available individual-level statistical information on both reimbursement tariffs and home care services' prices is poor, making it impossible to assess out-of-pocket payment differentials between handicapped and dependent beneficiaries.

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<sup>55</sup>In this Section, all values are of 2015.

Table 1.A.1: Long-term care schemes for individuals living in the community

Transfer	Age eligibility	Disability criteria	Type of transfer	Means-tested	Amount and ceilings	Co-payment rate
ACTP	Under 60 OR 60 or older, with disabilities present since before 60 <sup>th</sup> birthday	80% incapacity rate, with needs of assistance with ADL and IADL (evaluation by National Health Insurance workers)	Monetary transfer	Yes (income below €9,605 for singles)	Number of hours granted × hourly reimbursement price. Minimum of €441, maximum €882	No
PCH	Under 60 OR 60 or older, with disabilities present since before 60 <sup>th</sup> birthday	Absolute restriction in one essential activity or two major restrictions in two essential activities (evaluation by Departmental Handicap Houses (MDPH))	In-kind transfer	No	Number of hours granted × hourly reimbursement price. Non-binding limit of 6.05 hours a day.	20% for income (from assets) above €25,978, 0% otherwise
Domestic help for the handicapped (departments)	Under 60, with needs of assistance with domestic chores and no relative around able to provide it	80% incapacity rate and unable to work (evaluation by Local Handicap Houses (MDPH) and departments)	In-kind transfer	Yes (income below €9,605 for singles)	Number of hours of assistance granted times hourly reimbursement price, up to 40 hours (for singles)	5%
APA	60 and over, with needs of assistance with ADL and IADL	Dependence groups (GIR) 1 to 4 (evaluation by departments)	In-kind transfer	No	Number of hours granted × hourly reimbursement price, with ceilings ranging from €563 for GIR 4 to €1,313 for GIR 1 (about 4 hours a day at max.)	From 0% (income below €8,870) to 90% (income above €35,342)
Domestic help for the dependent (departments)	65 or older (60 or older in some departments and if unable to work)	Needs of assistance with domestic chores and no relative around able to provide it (evaluation by departments)	In-kind transfer	No	Number of hours granted × hourly reimbursement price, up to 30 hours (for singles)	5%
Domestic help for the dependent (pension funds)	65 or older (60 or older in some departments and if unable to work)	Needs of assistance with domestic chores (evaluation by departments)	In-kind transfer	No	Number of hours granted × hourly reimbursement price, up to €3,000 per year	From 10% (income below €9,605) to 73% (income above €18,336)

NOTES: Transfers amounts and ceilings are expressed in euros per month, unless otherwise mentioned. All figures are of 2015. Income conditions are expressed in terms of net annual income for a single. These conditions are adjusted when the applicant lives in a couple. In the case of PCH, the resources taken into account mainly consist of income derived from assets: labor income, pension benefits, social insurance and protection benefits are excluded. The co-payment rate schedule for pension-funds' domestic help is specific to each fund. Here, the schedule of the general fund (Cnav) is reported.

### A.1.2 Information on LTC benefits around the age 60 threshold: HSM limitations

In 2008, at the time the HSM survey was conducted, about 850,000 million individuals living in the community benefited from the LTC benefits managed by the Departmental Councils. The majority of recipients (80%) were aged 60 and older.<sup>56</sup>

Table 1.A.2: Declarations of handicap and dependence benefits in HSM 2008: Comparison with administrative records.

	<b>PCH beneficiaries</b>	<b>ACTP beneficiaries</b>	<b>APA beneficiaries</b>
<i>Population below 60</i>			
Estimation using HSM (2008)	13,000 [7, 000; 18, 000]	59,000 [45, 000; 73, 000]	22,000 [2, 300; 43, 000]
Administrative records (2008)	63,766	66,850	0
<i>Population 60 and more</i>			
Estimation using HSM (2008)	3,000 [1, 000; 6, 000]	27,000 [18, 000; 37, 000]	327,000 [293, 000; 362, 000]
Administrative records (2008)	11,488	17,808	671,000

NOTES: Administrative records (Drees 2008a). Only beneficiaries living in the community are retained in the computation. Estimations using HSM data take into account survey weights; the 5% level confidence-intervals are displayed in brackets.

Table 1.A.2 compares the number of beneficiaries of each LTC scheme as estimated using the answers to HSM survey with the administrative records. Self-reported information on LTC benefits is poor in HSM; this drawback of the survey was also documented by Eghbal-Téhérani & Makdessi (2011) in the case of APA. Based on the answers to the survey, we would under-estimate by two the number of APA beneficiaries (327,000 against 671,000 beneficiaries). This is also true for PCH benefits, although not for ACTP. The poor quality of the variables relating to benefits in HSM is also suggested by the very high number of respondents who refused to answer the question or declared that they did not know (in our baseline sample, the number of such respondents is about as high as the number of individuals who declared benefiting from such a benefit).

Focusing on the administrative figures, we note that PCH was a smaller scheme than ACTP in terms of number of beneficiaries. This is no longer the case: in 2014, ACTP beneficiaries represented 19% of combined ACPT and PCH beneficiaries. This is due to the fact that ACTP benefit was no longer granted after 2005, although surviving beneficiaries are allowed to stay in the scheme. On the contrary, the PCH scheme grew larger: between 2008 and 2014, the number of beneficiaries has been multiplied by 3.

An attempt to get round the reporting errors on LTC benefits is to use the questions

<sup>56</sup>Table 1.A.1 in Section 2 provides similar figures for year 2014.

about potential applications to the schemes. In HSM, respondents were asked whether they applied for APA and what was the most recent decision made by the Departmental Council regarding the application. Using these additional questions, we obtain 1,078 individuals in the survey who are supposedly receiving the APA benefit at home.<sup>57</sup> The assumption is that individuals who were granted the APA at some point will keep receiving it until they die or enter a nursing home. The alleged APA beneficiaries (aged 60 and older) represent 513,000 individuals in the French population; a figure now reasonably close to the one provided by administrative records, although still lower. Nonetheless, we deemed the quality of this information not reliable enough to make our identification strategy rely on it.

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<sup>57</sup>In an ongoing study on out-of-pocket payments on *health care* incurred by the disabled, a team from Irdes (Anne Penneau, Sylvain Pichetti and Maude Espagnacq) uses this question to identify who receives APA or PCH benefits in the survey.

## A.2 Sampling design and sample selection

### A.2.1 Sampling design

HSM sample was drawn using the results of a preliminary survey, *Enquête Vie quotidienne et santé* (VQS). VQS collected basic information on the demographics and health conditions of over 200,000 households in 2007.<sup>58</sup> Respondents were grouped in 4 different categories based on their health and disability condition. This ancillary survey was used to form the sampling frame of HSM: the 4 disability groups of VQS were interacted with the French departments or regions to produce 45 different strata. The sample was stratified to over-sample individuals with low functional levels and those living in some specific regions. This results in a relatively high dispersion of survey weights, with a ratio D9/D1 equals to 40 in the entire HSM sample (Bouvier 2011).

At the level of the HSM survey, the primary sampling unit is the individual — although there might be several individuals from the same household in the final sample. To derive correct inference, we specify to our statistical software (STATA) that the sample follows a single-stage design with stratification.<sup>59</sup>

### A.2.2 Sample selection

After having deleted all individuals who are aged less than 50 or 75 and older and individuals with no restriction in any ADL or IADL, we are left with 3,132 individuals in our sample, representing about 1.8 million individuals. 11 individuals have to be dropped because of missing information on health status and income.

Table 1.B.1: Sample selection (baseline sample from HSM)

	Sample size	Share of previous sample	Population size	Share of previous population
Population aged 50–74	10,672	–	M16.8	–
Keeping individuals with IADL or ADL restriction	3,132	29.3%	M1.8	10.9%
Keeping individuals with full information on covariates	3,121	99.6%	M1.8	≈ 100%

<sup>58</sup>More information on the design of HSM (in French) can be found at <http://www.drees.sante.gouv.fr/les-enquetes-handicap-sante,4267.html>.

<sup>59</sup>We specify: `svyset ident_ind [pweight = poids_hsm], strata(stratehs)`, where `ident_ind` is the individual identifier, `poids_hsm` the survey weight and `stratehs` the stratum.



### A.3 Construction of home care utilization variables

HSM provides rich data on the caregivers declared by the survey respondents. Our outcome variables of formal and informal home care utilization were thus constructed using information available at the caregiver level. For each caregiver of a given respondent, we know either the profession (in the case she is a formal caregiver) or the family tie with the respondent (for an informal caregiver), as well as the types of tasks performed in assistance to the respondent.

#### A.3.1 Informal care

In the HSM questionnaire (module G, “family environment and help”), a specific question is asked to identify any potential relative or friend providing care to the respondent in an informal way. If the respondent declares any, she is then asked to provide a list of all her friends or relatives helping her. Then, for each of her informal caregivers, the respondent is asked to report the type of tasks her informal caregiver assists her with. The two questions are detailed in Table 1.C.1.

Table 1.C.1: Informal caregivers in HSM survey

Original question (in French)	English translation
<i>1) Screening of informal caregivers</i>	
“Y-a-t-il des personnes (famille, amis, . . . ) non professionnelles qui vous aident régulièrement pour accomplir certaines tâches de la vie quotidienne (ménage, repas, toilette, présence, . . . ), ou qui vous aident financièrement, ou matériellement ou bien encore qui vous apportent un soutien moral en raison d’un problème de santé ou d’un handicap, et y compris les personnes qui vivent avec vous ?”	Are there any non-professional persons (family, friends,...) who are helping you to perform some tasks of daily living (house chores, meals, toilette, presence) on a regular basis, or who help you financially, or materially, or that provides you with moral support because of a health condition or a handicap, including those persons living with you?”.
<i>2) Type of assistance provided by informal caregivers</i>	
“[prénom de l’aidant informel] vous aide-t-il (elle) pour: <ul style="list-style-type: none"> <li>• les tâches de la vie quotidienne comme l’aide à la toilette, à l’habillage, l’aide aux tâches ménagères, . . . ;</li> <li>• par une aide financière ou matérielle ;</li> <li>• en vous apportant un soutien moral.”</li> </ul> (les réponses multiples étant autorisées)	“[name of the informal caregiver] helps you: <ul style="list-style-type: none"> <li>• with the tasks of daily living, like assistance with bathing, with dressing, help with house chores, ...;</li> <li>• with a financial or material assistance;</li> <li>• by providing you with some moral support.”</li> </ul> (multiple answers are allowed)

SOURCES: HSM 2008 questionnaire. Author’s own translation.

Thus, for every respondent in the survey, we are able to know whether a person who is not a professional caregiver assists her with the activities of daily living. In our analysis, an individual is considered as *receiving informal care* (the informal home care utilization dummy,  $Y_I$ , equals one) if she declares one or more non-professional caregiver(s) who are providing at least assistance with the tasks of daily living. An individual with no caregiver at all, or with no caregiver providing assistance with the activities of daily living, will be considered as not receiving any informal care ( $Y_I = 0$ ). In our sample of 3,121 individuals, 2,106 (67.5%) are coded as receiving informal care ( $Y_F = 1$ ).

### A.3.2 Formal care

In HSM survey, each individual is asked about her difficulties in performing the activities of daily living (ADL and IADL), and about the utilization of human or technical assistance to perform these activities (module F, “activity restrictions”). When a respondent declares resorting to the services of a professional worker to perform at least one ADL or IADL, she is considered in the survey as “receiving some professional assistance”. She is then asked to establish the list of all the professional workers who are providing her with care at her house.

The respondent is asked about the profession of each formal caregiver she has declared. As shown in Table 1.C.2, several categories were proposed to respondents. The delimitation between the different categories may be quite difficult to draw (e.g., categories 2 and 3 overlap), and it is likely that some respondents were not aware of the exact occupation of their formal caregivers. Respondents were also offered the possibility to fill the profession in clear, with their answers being coded back to the pre-defined categories of professions.

For the purpose of our analysis, it is important to distinguish between those professional workers who provide *care* (i-e, assistance with the activities of daily living) and the professional workers providing some type of medical or paramedical *cure*. In France, handicap and dependence schemes are distinct from the Health insurance system. Individuals with disabilities may receive some health care at their house: diabetic individuals would receive the regular visit of a nurse, an elderly with chronic bronchitis may call home a physiotherapist, etc. Nurses may also intervene at home to assist disabled individuals with personal care activities.<sup>60</sup> Although in such a case they provide assistance with the activities of daily living, nursing services are not considered as home care workers, and thus cannot be subsidized through LTC schemes in France.

In order to separate cure from care, we follow Gramain (2011). Some of the professional

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<sup>60</sup>In France, there are two regimes under which nurses can provide care at the home of their patients: they can be either community nurses (infirmiers libéraux) or work in a at-home nursing service (*Service de soins infirmiers à domicile*, SSIAD).

categories for formal caregivers that could be reported in HSM unambiguously refer to the non-medical sector; however, some categories may include both home care workers and health care workers. We thus exploit additional information contained in HSM on the type of tasks every formal caregiver assists a respondent with, through the second question reported in Table 1.C.2.

We code an individual as “receiving *cure*” if at least one of her professional caregivers is assisting her with *personal care* activities (grooming or dressing), with going to the doctor or by taking care of health problems. We code the individual back to “not receiving cure” when all caregivers performing such tasks for a given respondent belong to the categories of domestic help workers or home care services, as these workers are legally not allowed to perform health care tasks. Our implicit assumption then is that the beneficiaries identify correctly these caregivers as non-medical workers. In a second step, we use information on the frequency of intervention to construct a dummy equal to one if the individual receives *frequent cure* at home. We consider that a given caregiver provides frequent cure when she comes more than once a day, 5 times a week or 22 times a month.<sup>61</sup> If an individual receives the frequent visit of a professional assisting her with personal care activities and medical visits, but does not receive any assistance to perform other activities of daily living (like moving around or doing house chores), it is most likely that she has a health condition requesting the frequent intervention of a nurse, but no disabilities whose impacts on daily life would need to be compensated for. We then consider that the professional assistance received by a respondent is *cure only* if the respondent receives the assistance of at least one frequent cure provider, without receiving any other form of assistance with the activities of daily living.

In addition, the data provide also a way to deal partially with the fact that some individuals may declare caregiving relatives with a job in the field of medicine or long-term care as *formal* caregivers, while we should regard them as *informal* caregivers. Close relatives can be paid for providing care to a disabled elderly only under specific rules and following a specific schedule. Among the so-declared professional caregivers whose profession is declared in clear by a respondent, we find individuals who are said to be “friends or relatives” of the respondent. We code back those caregivers (only 4 of them in the population of interest) as informal caregivers.<sup>62</sup> We end up with 887 individuals

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<sup>61</sup>In addition, we assume that the caregivers whose frequency of intervention was not reported are not frequent curers: had it been the case, we believe the respondent would have been able to give a response on the frequency of visit of the caregiver.

<sup>62</sup>In practice, a friend who is a home care worker may well be employed as a regular formal caregiver and subsidized as such through home care subsidy schemes. Conversely, some informal caregivers with professional medical or paramedical skills may have been declared as professional caregivers without the respondent mentioning their family or friendship ties. We believe these situations are rare enough not to affect our results.

(28.4%) who receive formal home care ( $Y_F = 1$ ) in our sample.<sup>63</sup>

Table 1.C.2: Formal caregivers in HSM survey

Original question (in French)	English translation
<i>1) Professions of formal caregivers in HSM survey</i>	
<p>“De qui s’agit-il ?</p> <ol style="list-style-type: none"> <li>1. un (une) infirmière, un service de soins infirmiers ;</li> <li>2. un(e) aide-soignant(e) ;</li> <li>3. un autre professionnel paramédical (aide-soignante, ergothérapeute, kinésithérapeute, orthophoniste,...) ;</li> <li>4. une aide à domicile, une aide ménagère, une auxiliaire de vie, garde à domicile, service de portage ;</li> <li>5. un intervenant social (assistante sociale, éducateur spécialisé,...) ;</li> <li>6. un psychologue, psychomotricien,... ;</li> <li>7. autres.”</li> </ol>	<p>“Who is she?:</p> <ol style="list-style-type: none"> <li>1. a nurse, a nursing care service;</li> <li>2. an auxiliary nurse;</li> <li>3. another paramedical professional (auxiliary nurse, occupational therapist, physiotherapist, speech therapist,...);</li> <li>4. a home care worker, a domestic help worker, a home care assistant, an at-home delivery service;</li> <li>5. a social worker (social caseworker, specialized teacher,...);</li> <li>6. a psychologist, psycho-motricity specialist,...;</li> <li>7. others.”</li> </ol>
<i>2) Types of tasks performed by formal caregivers in HSM survey</i>	
<p>“Vous aide-t-il...</p> <ol style="list-style-type: none"> <li>1. pour les soins personnels (toilette, habillage, repas) ;</li> <li>2. pour les tâches ménagères (faire le ménage, préparer les repas) ;</li> <li>3. pour gérer votre budget, s’occuper des papiers et des démarches administratives ;</li> <li>4. pour assurer une présence, une compagnie ;</li> <li>5. en vérifiant ce que vous faites ;</li> <li>6. pour aller voir le médecin, s’occuper de vos problèmes de santé ;</li> <li>7. pour faire les courses, acheter les médicaments ;</li> <li>8. dans d’autres activités (lecture pour les aveugles, traduction pour les sourds...).”</li> </ol>	<p>“Does she help you...?:</p> <ol style="list-style-type: none"> <li>1. with personal care activities (grooming, dressing, meals);</li> <li>2. with house chores (cleaning up, preparing meals);</li> <li>3. to manage your budget, take care of paperwork and administrative procedures;</li> <li>4. to ensure a presence, some company;</li> <li>5. by checking what you do;</li> <li>6. to go and visit the doctor, by taking care of your health problems;</li> <li>7. by doing the shopping, buying your drugs;</li> <li>8. with other activities (reading for the blind, translating for the deaf...).”</li> </ol>

SOURCES: HSM 2008 questionnaire. Author’s own translation.

<sup>63</sup>We checked that this number was not excessively sensitive to the definition used to define a “frequent” intervention.

### A.3.3 Types of care received

The different schemes do not necessarily subsidize the same types of care, we create three categories to reflect the tasks performed by professional and informal caregivers. We use the questions that were asked about professional caregivers and those informal caregivers who provide an assistance with the activities of daily living.

- An individual is said to receive informal (formal) *personal care* if at least one informal (formal) caregiver helps her grooming, dressing or eating;
- An individual is said to receive informal (formal) *domestic help* if at least one informal (formal) caregiver helps her by doing house chores, preparing meals, shopping, buying medicines, filling administrative forms and managing her finances;
- An individual is said to receive informal (formal) *monitoring* if at least one informal (formal) caregiver intervenes to monitor what she does or provides her with a supporting presence.

Table 1.C.3: Home care in HSM survey: Types of assistance provided by formal or informal caregivers.

Original question (in French)	English translation
<i>1) Personal care</i>	
Pour les soins personnels (toilette, habillage, repas)	For personal care (grooming, dressing, eating)
<i>2) Domestic help</i>	
Pour les tâches ménagères (faire le ménage, préparer les repas)	For house chores (clean the house, prepare the meals)
Pour gérer votre budget, s'occuper des papiers et des démarches administratives	To manage your finances, take care of administrative procedures
Pour faire les courses, acheter les médicaments	To do the shopping, buy medications
<i>3) Monitoring</i>	
Pour assurer une présence, une compagnie	To provide you with a supportive presence
En vérifiant ce que vous faites	By monitoring what you do
Pour aller voir le médecin, s'occuper de vos problèmes de santé	To go and visit the doctor, take care of your health issues
<i>Unclassified</i>	
Dans d'autres activités (lecture pour les aveugles, traduction pour les sourds...)	In other activities (reading for the blind, translation for the deaf...)

SOURCES: HSM 2008 questionnaire. Author's own translation.

### A.3.4 Data limitations on care received

The lack of precision of the regime within which professional caregivers intervene (home care *versus* medical care) imposes some limitations to the empirical analysis and caution in the interpretation of some results.

First, it is difficult to isolate those individuals who receive assistance in the activities of daily living activities exclusively from nurses. Think about the case of a nurse coming every day at the individual's house to help her grooming. If the individual does not receive any other form of professional assistance with ADL or IADL, she will be considered in our analysis as *not receiving* disability-compensating assistance. If we are interested in the care that can be subsidized by disability-compensating schemes such as APA and PCH, this seems a sound way of constructing our dependent variable of formal care utilization. Nonetheless, in our empirical strategy, we might still need some information about the availability or consumption of potential substitutes. Personal care delivered by private nurses or at home nursing services (SSIADs) may indeed partially substitute for some formal home care. Failure to account for such substitutions may be all the more a concern as supply from SSIADs for the handicapped adults was still substantially rationed in 2008, while these services have been available for the 60+ for long (cf. Section 6.2).

Substitution of nursing care for formal home care is relatively more likely for individuals who do not have access to home care subsidies or who incur a high co-payment rate on subsidized formal home care: as nursing care is paid for by the Health Insurance system, out-of-pocket payments on this type of care are generally low. Such a difference in out-pocket-costs thus provide a financial incentive to patients and their general practitioners to claim at-home nursing care rather than home care for assistance with personal care. As shown by [Ramos-Gorand \(2015\)](#), there are substantial differences across departments in the supply of SSIADs, community nurses and home care services. Our dummy variables may partly capture these systematic differences and thus should decrease, though not erase, the potential bias in the 60+ coefficient due to the care provided by at-home nursing services being unobserved.

Yet an alternative way to interpret our results is to consider that the systematic differences in the supply and demand of at-home nursing services between the handicapped adults and the dependent elderly, holding individual characteristics constant, are also part of the age 60 barrier. Although SSIADs are formally part of the health care system, their missions connect them to long-term care policies. In this approach, we should read our estimates of the 60+ dummy as the effect of the age threshold in disability-compensating policies at large.

A second limitation due to the lack of precision on the professional care received is that it makes it impossible to *quantify* the volume of formal home care, distinctly from

the volume of medical care received at home by an individual. These two issues limit our empirical strategy. As we restrict our analysis to home care utilization rates, our results are valid at the extensive margin, but provide no information on the influence of the age 60 barrier on home care consumption at the intensive margin.

In 2018, the French Ministry of Health will release a national survey on Capacities, Helps and Resources (CARE). The survey will be matched with administrative data (APA and PCH records, national health insurance claims, etc.). It should thus contain richer information on the types of care received by disabled individuals, the benefits received and their out-of-pocket payments. Unfortunately, only individuals aged 60 and older will be surveyed. The institutional barrier at 60 has also effects on the data available on the population, as administrative and survey data collection tend to be done separately for the handicapped adults and for the dependent elderly (Colvez & Villebrun 2003).

## A.4 Density of the age distribution around the threshold

Although there is little scope for civil age manipulation in a national survey, we investigate the existence of any discontinuity in the density of age. This is a critical aspect of an RRD identification, as discontinuities in the running variable may undermine statistical precision or undermine identification altogether.

Figures 1.D.1 and 1.D.2 respectively display the *sample* and the *population* size by age of community-dwelling individuals aged 50 to 74 in 2008, with restrictions in the activities of daily living. Similarly, Figures 1.D.3 and 1.D.4 respectively represent the *sample* and the *population* size by age of the entire population aged 50 to 74 in 2008/2009.

The age distribution in the two *samples* (Figures 1.D.1 and 1.D.3) exhibits large variations. In particular, we notice a drop of the sample size between age 59 and age 60, and a “missing mass” at ages 65 to 67. *Population* size in both Figure 1.D.2 and 1.D.4 exhibits a spike at age 59, and a marked drop at age 67. Some explanation for these discontinuities dates back to World War II: individuals aged 67 in 2008 were born in 1941, a year in which the number of births fell dramatically in France. On the contrary, individuals aged 59 in 2008 were born in 1949, in the wave of the baby-boom. But the baby-boom had actually started 3 years earlier: the age pyramid of the French population at the time of the survey actually exhibits a sharp decrease in the population size between individuals born in 1946 (aged 62 or 61 in HSM, depending on their exact birthday) and individuals born in 1945 (aged 63 or 62 in the survey).<sup>64</sup> We actually observe a decrease in the population size around those ages. We can difficulty explain the spike at age 59, which might be possibly accounted for by some sampling design imprecision. However, what is important for a RDD identification strategy is that any discontinuity in the age density is exogenous to the outcomes of interest. We believe this is a reasonable assumption here.

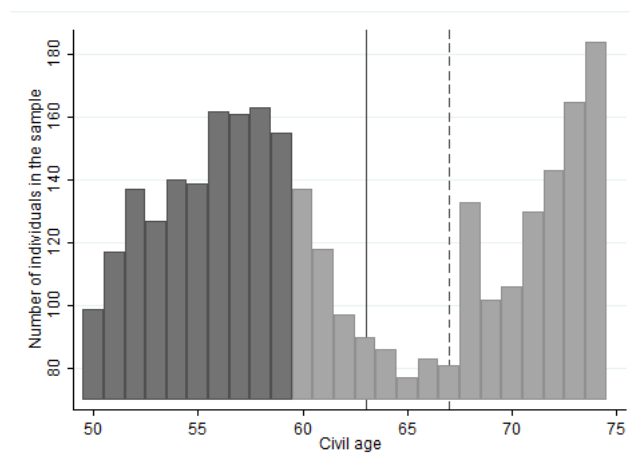
HSM being cross-sectional, we have to rule out cohort effects in our identification strategy. The “WWII cohorts” may appear specific *a priori*; in terms of retirement decisions though, the cohorts born before, during and just after WWII have similar behaviors. Ruling out cohort effects in terms of care arrangements may not be such a strong assumption then.

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<sup>64</sup>The French legal population by age is provided by Insee: <http://www.insee.fr/fr/ppp/bases-de-donnees/donnees-detaillees/bilan-demo/pyramide/pyramide.htm?lang=fr&champ=fe>.



Figure 1.D.1: Sample size in the community sample of interest, by civil age

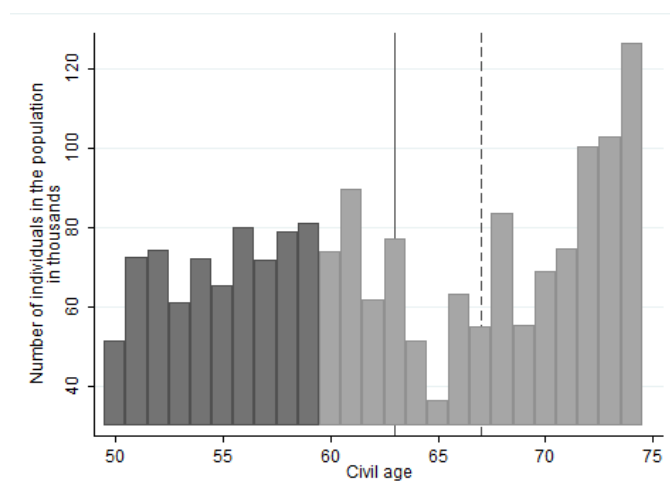


SAMPLE: Sample of the French population aged 50 to 74 in 2008, living in the community, with restrictions in the activities of daily living (N = 3,121 individuals).

SOURCE: Insee–Drees, HSM 2008.

NOTES: The dashed and solid lines respectively signal the cohorts affected by beginning of the baby-boom and by the drop in the number of births due to World War II.

Figure 1.D.2: Population size corresponding to the community sample of interest, by civil age

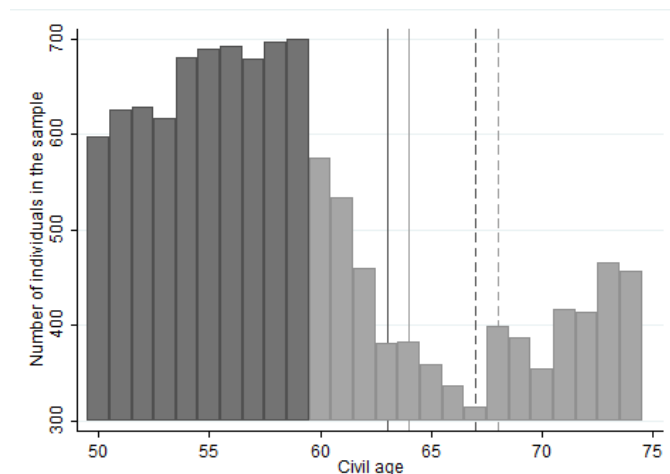


SAMPLE: Sample of the French population aged 50 to 74 in 2008, living in the community, with restrictions in the activities of daily living (N = 3,121 individuals). Population size computed using survey weights.

SOURCE: Insee–Drees, HSM 2008.

NOTES: The dashed and solid lines respectively signal the cohorts affected by beginning of the baby-boom and by the drop in the number of births due to World War II.

Figure 1.D.3: Sample size in the matched institution/community survey, by civil age

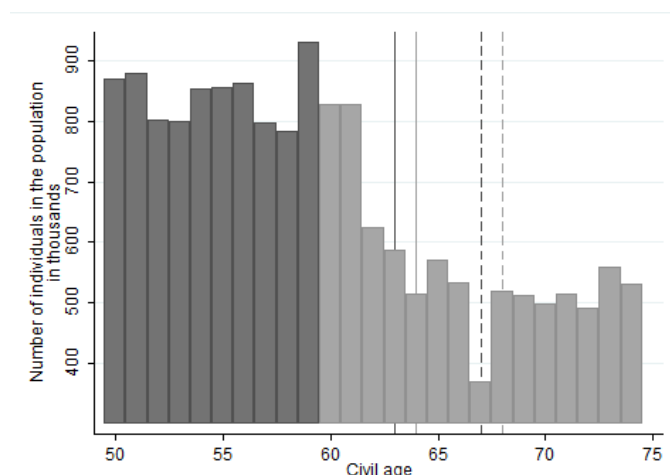


SAMPLE: Representative sample of the French population aged 50 to 74 in 2008 (N = 12,784 individuals).

SOURCE: Insee–Drees, HSM–HSI 2008/2009 matched sample.

NOTES: The dashed and solid lines respectively signal the cohorts affected by beginning of the baby-boom and by the drop in the number of births due to World War II.

Figure 1.D.4: Population size in the matched institution/community survey, by civil age



SAMPLE: Representative sample of the French population aged 50 to 74 in 2008 (N = 12,784 individuals). Population size computed using survey weights.

SOURCE: Insee–Drees, HSM–HSI 2008/2009 matched sample.

NOTES: The dashed and solid lines respectively signal the cohorts affected by beginning of the baby-boom and by the drop in the number of births due to World War II.

## A.5 Density of some control variables

### A.5.1 Functional status around the age 60 threshold

In what follows, we display the conditional expectation of some covariates likely to have an important effect on home care arrangements, as a function of age. This may help to detect a potential differential selection of our population of interest before and after age 60, the existence of which is critical for the interpretation of our results.<sup>65</sup>

As differential utilization rates around the age threshold may arise because of differential epidemiological conditions, we study the evolution of the prevalence of restrictions in ADL and IADL around age 60. Figure 1.E.1 displays the average number of ADL individuals have difficulties to perform alone by civil age groups. We depicts linear fits of the observations on each side of age 60 to give a visual impression of what the potential discontinuity in the prevalence of ADL restrictions at age 60 may be (if the prevalence of ADL restrictions indeed evolves linearly with age).

The number of ADL restrictions increases with age on both sides of the institutional discontinuity of age 60, but Figure 1.E.1 suggests that this number decreases discontinuously at age 60. This finding holds even when controlling for quadratic age effects (Table 1.E.1): both Columns (1) and (2) find the coefficient of the 60<sup>+</sup> dummy to be negative and statistically significant in the regression of the number of ADL restrictions on our dummy of interest and linear or quadratic age effects.

As documented empirically, retirement, which usually happens between 60 and 65 in France (cf. Appendix A.5), may also have adverse consequences on physical and mental health (Dave et al. 2006, Godard 2014). However, it is unlikely that these effects are sufficiently strong to translate into ADL restrictions: we would rather expect IADL restrictions and self-assessed health status to be affected. Yet we cannot detect any such discontinuity neither in the number of cognitive and non-cognitive IADL restrictions nor in the share of individuals declaring being in bad health (Table 1.E.1, Columns (3) to (8)).

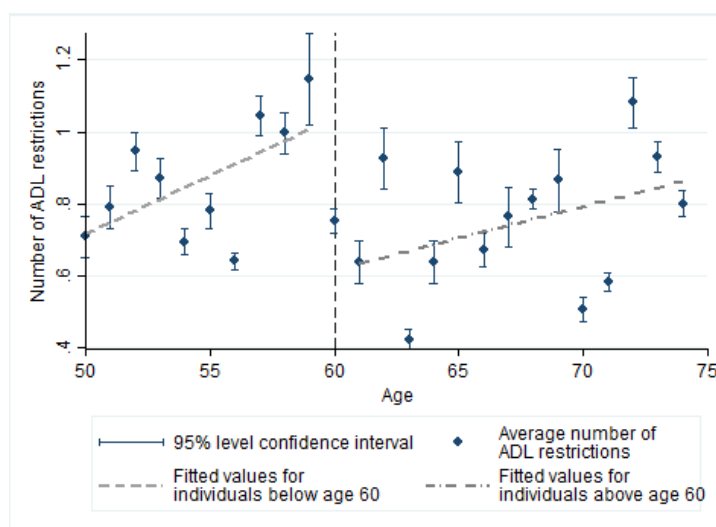
Another assumption is that the discontinuous drop in the number of ADL restrictions at age 60 *within the population living in an ordinary setting* reflects the differential selection of the HSM sample on each side of the institutional discontinuity of age 60: as shown

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<sup>65</sup>The results from this section were also used to assess the robustness of the RDD identification strategy (Imbens & Lemieux 2008), which we have finally not retained. If some covariates exhibit a discontinuity right at the age threshold we are interested in, this may be suggestive of the covariates not being exogenous to the treatment. It may also signal that some unobserved factors correlating with the covariates, and potentially with the outcomes of interest, change discontinuously at the age threshold. If this is the case, the effect of the institutional difference between dependence and handicap schemes may be confounded with the effect of another unobserved change happening at age 60. As reminded by Imbens & Lemieux (2008) though, “a discontinuity in the conditional expectation of the covariates does not necessarily invalidate the [RDD] approach.” (p. 18).

in Section 6.4 and Appendix A.6, the probability to be recorded as living in an institution on a permanent basis increases discontinuously at age 60. When focusing on individuals who live in an ordinary setting on a permanent basis, we “lose” relatively more individuals with severe activity restrictions on the right-hand side of the discontinuity than on the left-hand side, as those are more likely to live in an institution.

Figure 1.E.1: Severity of disability around age 60: Average number of ADL individuals have difficulties to perform, by civil age



SAMPLE: French individuals aged 50 to 74, living in the community and having difficulties to perform alone at least one ADL or IADL (3,121 individuals).

SOURCE: Insee–Drees, HSM 2008.

NOTES: Dots represent average number of ADL by civil age and include varying numbers of individuals. Linear fits are obtained using individual observations and survey weights.

Table 1.E.1: Robustness checks: Functional limitations and health around age 60.

	Dependent variable:							
	<i>ADL restrictions</i>		<i>Non-cognitive IADL restrictions</i>		<i>Cognitive IADL restrictions</i>		<i>Bad or very bad health</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
60 <sup>+</sup>	-0.122** (0.052)	-0.178** (0.078)	0.009 (0.054)	0.079 (0.077)	-0.029 (0.060)	-0.025 (0.089)	-0.098 (0.061)	-0.127 (0.090)
Age effects	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
Observations	3121	3121	3121	3121	3121	3121	3121	3121

NOTES: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . Population-average partial effects (APE) for binary variables are computed using the finite-difference method. Weighted estimations by a Probit model. Data from HSM 2008. The outcome “ADL restrictions” corresponds to the number of ADL the individual has restrictions with; the outcome “non-cognitive IADL restrictions” (resp. “cognitive IADL restrictions”) corresponds to the number of non-cognitive (resp. cognitive) IADL the individual has restrictions with.

### A.5.2 The age 60 threshold in the retirement legislation

The ages of 60 and 65 are common ages for retirement for French people;<sup>66</sup> age 60 (and to a lower extent, age 65) is associated with a positive “jump” in the probability of retirement. This pattern has been documented in the French general population (Blanchet & Mahieu 2004), but is also visible on our sample. Figures 1.E.3 and 1.E.2 show that the probability to work decreases substantially with age before age 60 and gets close to zero after age 67. There is however no marked jump at age 60. On the contrary, the probability to be retired increases abruptly at that age, from less than 20% to about 70%. This dual pattern implies that most individuals in our population of interest had withdrawn from the labor market ahead of reaching the minimum retirement age (less than 20% of individuals aged between 55 and 59 were employed). This can be explained by the specificity of our population of interest: it is difficult for individuals with IADL or ADL restrictions to remain active on the labor market until they can claim pension benefits.

One first reason why the jump in the probability to be retired may influence the optimal mix between formal care and informal care utilization is that household resources may change discontinuously at age 60, as a consequence of the change in employment and retirement status. Columns (5) and (6) of Table 1.E.2 show that this does not happen in our population of interest: when regressing equivalized household income on the 60<sup>+</sup> dummy and (linear or quadratic) age effects, we cannot reject that being just older than 60 rather than being just below the institutional threshold has no effect on income.

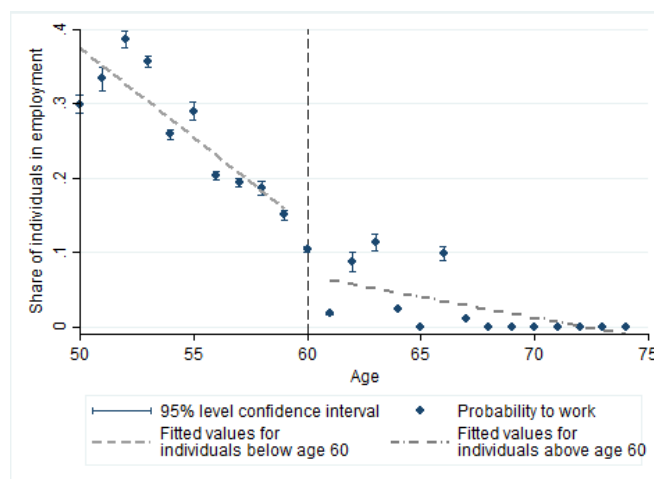
It might still be the case one’s own retirement and retirement of one’s partner may induce significant changes in time allocation, and could well influence home care utilization rates. Recent evidence on French data suggests that own retirement increases home production (including cooking, doing household chores, caring for adults and children). Fitting a simultaneous equations model with both spouses’ retirement decisions and hours dedicated to household chores, Stancanelli & Van Soest (2012) additionally find that partner’s retirement tend to decrease men’s home production (but to increase hours spent by women on house chores. Overall, household home production remains stable when the wife retires while it increases when the husband does so. Assuming these effects — which were estimated on a sample *excluding* individuals that could not participate into the labor market because of disabilities — extend to our population of interest, they would not go against our results. If anything, the effect of own retirement and of one’s partner’s retirement on formal care utilization would be negative.<sup>67</sup>

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<sup>66</sup>Individuals aged 60 to 67 in HSM survey were born between 1948 and 1955. Given progressive changes in retirement rules, their minimum retirement age was set between 60 and 62, and the full retirement age for these cohorts spread from age 65 to age 67 (Rabaté & Rochut 2017).

<sup>67</sup>In our different specifications, the dummy variable for being retired adds no explanatory power to

Figure 1.E.2: Work status around the age 60 threshold: Proportion of individuals working, by civil age

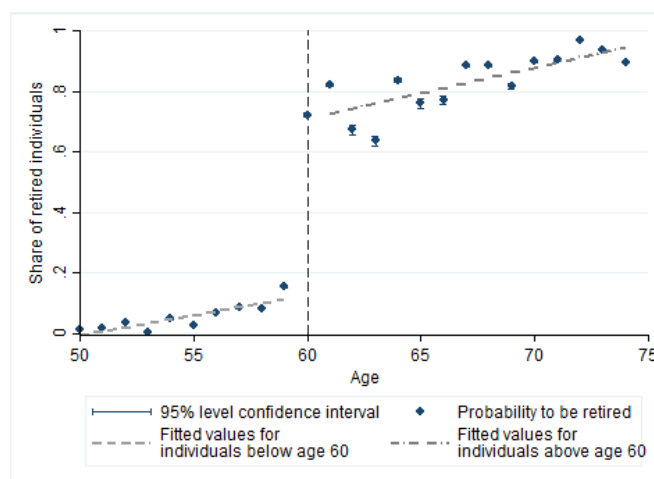


SAMPLE: French individuals aged 50 to 74, living in the community and having difficulties to perform alone at least one ADL or IADL (3,121 individuals).

SOURCE: Insee–Drees, HSM 2008.

NOTES: Dots represent average number of ADL by civil age and include varying numbers of individuals. Linear fits are obtained using individual observations and survey weights.

Figure 1.E.3: Retirement status around the age 60 threshold: Proportion of retired individuals, by civil age.



SAMPLE: French individuals aged 50 to 74, living in the community and having difficulties to perform alone at least one ADL or IADL (3,121 individuals).

SOURCE: Insee–Drees, HSM 2008.

NOTES: Dots represent average number of non-cognitive IADL by civil age and include varying numbers of individuals. Linear fits are obtained using individual observations and survey weights.

the model when we already control for the employment status.

Table 1.E.2: Robustness checks: Work, retirement and income around age 60.

	Dependent variable:					
	<i>In employment</i>		<i>Retired</i>		<i>Equivalized income</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
60 <sup>+</sup>	-0.028 (0.037)	-0.048 (0.056)	0.459*** (0.068)	0.422*** (0.096)	-6.215 (84.135)	188.167 (125.929)
Age effects	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
Observations	3121	3121	3121	3121	3121	3121

NOTES: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . Population-average partial effects (APE) for binary variables are computed using the finite-difference method. Weighted estimations by a Probit model (Columns (1) to (4)) or by a linear regression model (Columns (5) and (6)). Data from HSM 2008. Equivalized income corresponds to the household equivalized income.

## A.6 Probability of living in an institution

### A.6.1 HSM–HSI matched sample

The HSM–HSI matched sample brings together the HSM sample (cf. Appendix A.2) and the sample of individuals included in the companion survey on the population living in an institutional setting, HSI.

The HSM–HSI matched dataset (N=39,035) is provided together with a weight variable to make the sample representative of the total French population in 2008 (64 million individuals). Although each of HSM and HSI samples were stratified, information about the strata is not reported in the matched sample. We could have imported this piece of information from each of HSM and HSI surveys and assumed that the sampling design followed a 2-stage design, the total sample being first stratified by living arrangements (strata 1: individuals living in the community; strata 2: individuals living in an institutional setting), and then stratified by either institution type (for HSI) or by regions and level (for HSM; cf. Appendix A.2). Yet we are uncertain that this would correctly reflect the sampling design.<sup>68</sup> For this reason, we have preferred not to use any information about the survey structure but the survey weights when computing descriptive statistics and running the weighted estimations presented in the following subsections.<sup>69</sup>

To analyze the impact of the age 60 threshold on the probability to be recorded as living in an institution setting, we keep all individuals aged 50 to 74 at the time of the survey with no missing information on covariates<sup>70</sup> (12,784 individuals, representing 17 million individuals).

### A.6.2 Impact of the age 60 threshold on the probability to live in an institution

Tables 1.F.1 and 1.F.2 present the results from regressions run on the entire sample of individuals aged 50–74. We checked that the results are robust to running the regressions on the sample of individuals with severe functional limitations only (those who are most likely to enter a specialized institution).

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<sup>68</sup>The sampling for HSI itself actually followed a 2-stage design: some institutions were drawn in a first stage, and then some individuals were drawn from the selected institutions in the second stage

<sup>69</sup>We believe this leads to over-estimate the standard errors as the survey strata, which we do not take into account, were designed to increase statistical precision.

<sup>70</sup>52 individuals (0.4% of the sample of interest) are discarded because of missing values.



Table 1.F.1: Probability of living in an institution around age 60.

	Dependent variable: Lives in an institution				
	(1)	(2)	(3)	(4)	(5)
60 <sup>+</sup>	0.004*** (0.001)	0.002** (0.001)	0.003** (0.001)	0.005** (0.002)	0.005** (0.002)
(Age - 60)		-0.000** (0.000)	-0.001* (0.000)	-0.003** (0.001)	-0.002 (0.001)
60 <sup>+</sup> .(Age - 60)		0.001*** (0.000)	0.001** (0.000)	0.004** (0.001)	0.003** (0.001)
(Age - 60) <sup>2</sup>			0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
60 <sup>+</sup> .(Age - 60) <sup>2</sup>			-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)
(Age - 60) <sup>3</sup>				0.000* (0.000)	0.000 (0.000)
60 <sup>+</sup> .(Age - 60) <sup>3</sup>				-0.000 (0.000)	-0.000 (0.000)
Woman					-0.001** (0.000)
Has a chronic disease					-0.001 (0.001)
Self-assessed health: very bad					-0.003** (0.001)
Self-assessed health: bad					-0.003*** (0.001)
Self-assessed health: fair					<i>Ref.</i>
Self-assessed health: good					0.002*** (0.001)
Self-assessed health: very good					-0.000 (0.001)
No limitations					<i>Ref.</i>
Mild limitations					0.009*** (0.001)
Strong limitations					0.042*** (0.004)
Constant	-2.637*** (0.018)	-2.706*** (0.045)	-2.763*** (0.066)	-2.897*** (0.058)	-3.207*** (0.073)
Age effects	None	Linear	Quadratic	Cubic	Cubic
Observations	12784	12784	12784	12784	12784
<i>AIC</i>	1.272e+06	1.264e+06	1.264e+06	1.263e+06	1.151e+06
<i>BIC</i>	1.272e+06	1.264e+06	1.264e+06	1.264e+06	1.152e+06

NOTES: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . The specification of age effects allows for different trends before and after age 60. Population-average partial effects (APE) for binary variables are computed using the finite-difference method. Weighted estimations by a Probit model. Data from HSM-HSI 2008–2009.

### A.6.3 Robustness checks

#### Estimation on alternative samples

Table 1.F.2: Robustness checks: Probability of living in an institution around age 60 — alternative windows.

	Dependent variable: Lives in an institution					
	(1)	(2)	(3)	(4)	(5)	(6)
60 <sup>+</sup>	0.003** (0.002)	0.005*** (0.001)	0.005** (0.002)	0.004** (0.002)	0.008*** (0.002)	0.003** (0.001)
Age effects	Quadratic	Quadratic	Quadratic	Cubic	Cubic	Cubic
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Window (ages included)	50–74	50–74 w/o age 60	50–69 w/o age 60	50–74	50–74 w/o age 60	50–69 w/o age 60
Observations	12784	12211	10116	12784	12211	10116
<i>AIC</i>	1.152e+06	1.120e+06	807186	1.151e+06	1.120e+06	806595
<i>BIC</i>	1.152e+06	1.120e+06	807287	1.152e+06	1.120e+06	806710

NOTES: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . The specification of age effects allows for different trends before and after age 60. Population-average partial effects (APE) for binary variables are computed using the finite-difference method. Weighted estimations by a Probit model. Data from HSM–HSI 2008–2009.

#### Health and functional status around the age 60 threshold

As discussed in Appendix A.4, discontinuities in the density of covariates right at age 60 may weaken the RDD approach, if it suggests that other institutional change potentially affecting the institutionalization rate may take place at age 60. In this Appendix, we test whether we can detect any discontinuity in three key covariates: (1) having severe functional limitations, (2) having a chronic condition, and (3) having a bad or very bad self-assessed health. Such a test is achieved by regressing each of these covariates on the 60<sup>+</sup> dummy and on (linear or quadratic) age effects (Lee & Lemieux 2010).

As suggested by Columns (1) and (5), the probability to suffer from severe functional limitations and of having a bad health status exhibits a discontinuity right at age 60. The point estimates are negative, statistically significant at the 5% level when we control linearly for age; statistical significance vanishes when we control for age in a quadratic way. Given that our sample is representative of the entire French population, and that the probability to retire exhibits a spike at age 60, what these estimates may pick up is a positive effect of retirement on functional status and health. When running the same regressions on the sub-sample of individuals with severe functional limitations (those who may effectively enter a specialized institution), we do not find any discontinuity in

functional and health status at age 60. This finding supports the robustness of the RDD identification of the effect of the age 60 threshold on living arrangements.

Table 1.F.3: Robustness checks: Functional limitations and health around age 60 in the entire population (HSM–HSI).

	Dependent variable:					
	<i>Severe functional limitations</i>		<i>Chronic condition</i>		<i>Bad or very bad health</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
60 <sup>+</sup>	-0.036** (0.014)	-0.012 (0.021)	-0.021 (0.029)	-0.040 (0.045)	-0.043** (0.015)	-0.034 (0.023)
Age effects	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
Observations	12784	12784	12784	12784	12784	12784

NOTES: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.01$ . The specification of age effects allows for different trends before and after age 60. Population-average partial effects (APE) for binary variables are computed using the finite-difference method. Weighted estimations by a Probit model. Data from HSM–HSI 2008–2009.