Being *dependent* rather than *disabled* in France: does the institutional barrier at 60 affect care arrangements?[*]

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Abstract

In developed countries, individuals having difficulties to perform the activities of daily living may benefit from public home care subsidies. France distinguishes between *disability* schemes, accessible to individuals below 60, and *dependence* schemes, for individuals 60 or more. We exploit the exogenous variation in benefit coverage created by the institutional threshold to assess the impact of home care programs on care utilization rates by community-dwelling individuals. Using the French Health and Disability Survey on Households (HSM 2008), we implement a sharp Regression Discontinuity Design strategy. Being a "dependent elderly" rather than a "disabled adult" increases the probability to receive home care, seemingly by increasing non–medical formal care utilization. No effects on informal care are found. We also provide evidence that home care programs affect living arrangements, as individuals above 60 are more likely to be recorded as living in an institution. The architecture of home care subsidies affects the way individuals' day–to–day difficulties are being compensated. Such findings raise both efficiency and equity concerns.

JEL Classification: C30, I12, J14, J18.

Keywords: long–term care, public policies, regression discontinuity design, probit.

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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 impairments. 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 impairments, most countries offer specific cash or in–kind transfers to help individuals paying for assistance in their daily life. Such transfers aim at covering part of the *expenditure costs* of disability, which can be loosely defined as the extra expenditures incurred by a person with impairments to reach the situation of an individual similar in all regards but with no impairments (Stapleton et al. 2008).

About 1.8 million individuals (3.6% of the adult population) benefited from one such transfer in France in 2012, for a total spending of 13 billion euros. One striking feature of French public schemes is that the compensation of expenditures costs varies with the age of individuals. A person aged less than 60 with restrictions in the activities of daily living will be considered as "disabled", while she will be classified as a "dependent elderly" if she is 60 or more. The administrative threshold of age 60 creates two groups for public action: belonging to one sub-population rather than to the other has consequences in terms of eligibility to long–term care subsidies and of their generosity.

In 2005, a law was passed[1] in response to the new conception of disability endorsed by the World Health Organization (International Classification of Functioning, Disability and Health, or ICF) and to the numerous voices calling for a universal right to disability compensation.[2] The 2005 law announced the convergence of disability and dependence schemes, but unification has not been implemented so far, partly because of the public finance crisis. Still, it has fostered the debate around the "barrier of age 60" (Weber 2011). However, little is known about the effects it induces. Because of lack of appropriate data, few statistical studies include both the "disabled 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 the current system causes an "elderly dependent" to be compensated differently from a "disabled adult" with similar needs.[3]

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[1] *Loi n°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.*

[2] See for example Bonnet (2004) and Frinault (2005).

[3] 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. However, since such criteria have not been put forward yet, we will consider here that compensating adult disability

As a first step, we propose to estimate the impact of the institutional threshold at age 60 on the care arrangements around 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 (the regime of the elderly dependent) rather than within another (the regime of the disabled adults). The bulk of extra expenditures–compensating transfers subsidizes human care, provided by professional workers, and impaired individuals often receive the assistance of relatives that come either as a substitute or a complement to formal care. Our outcomes of interest thus include both formal care and informal care utilization.

We use the 2008 French Disability and Health Survey on Households (HSM) to get a sample of 3,036 individuals aged 50 to 74 years-old with activity restrictions. A bivariate probit allows us to account for the binary nature of our outcomes and for the simultaneity of the decisions of formal care utilization and informal care provision. We implement a sharp Regression Discontinuity Design strategy to distinguish between nonlinear effects of unobserved factors correlating with age and the impact of the institutional threshold at age 60. We additionnally control for a rich set of socio–demographic and family characteristics that may affect home care utilization.

We find that, between 60 and 65, the probability to receive some home care increases, without changes in epidemiological conditions and in other factors influencing home care utilization accounting for this increase. Increase in professional home care utilization seems to explain this pattern. On the contrary, no effects on informal care provision are found, suggesting that substitution effects of formal care to informal care are negligible. These results suggest that entering the public policy perimeter of the "elderly" increases the access to professional home care services. These effects hold conditional on living in the community. Using a small sample matching community–dwelling individuals with institutionalized persons, we find that the age 60 threshold also affects the probability to be recorded as living in an institution.

Our paper contributes to the existing literature in two ways. First, it adds to the developing literature on the impacts of the institutional features of long-term care schemes on care arrangements, by documenting within–country disparities induced by the architecture of French compensation policies. Second, our article exploits an exogenous source of variation in individual benefits (an arbitrary institutional rule) to assess the impact of home care subsidies on care utilization rates in France. So far, robust within-country studies, which do not need to rely on the assumption that individuals do not self–select into home

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and elderly dependence at different levels is *a priori* not a fair system.

care programs based on unobservable characteristics, were conducted on North-American countries, mainly using data from the 1980s. Given the substantial impacts institutional contexts are found to have on long–term care utilization patterns, it is important to assess whether such findings are robust across time and countries. To our knowledge, past works on France had to rely on stronger identification assumptions and were restricted either to the elderly population or to disabled adults. Our paper thus provides original evidence that home care subsidies programs do indeed affect home care utilization in France.

2 INSTIUTIONAL CONTEXT

2.1 The different existing schemes

In France, national solidarity towards individuals with impairments is part of the Welfare State. In 1975, a law gave "disabled persons" an official recognition, and granted all individuals who cannot self-support because of their impairments with a guarantee of minimum resources.[4] In addition, the law created the first public scheme intended to help individuals getting assistance with the activities of daily living they can not perform alone. Although eligibility rules were very restrictive, the *Allocation compensatrice pour tierce-personne* (ACTP) was the first institutional recognition of the needs of day-to-day human assistance induced by impairments. In parallel, the 1970s and 1980s saw the emergence of a medical conception of aging: the expression of of "dependent elderly" was coined by geriatricians who argued that elderly individuals' physical and cognitive decline makes them essentially "dependent" on others for their own survival (Delomier 1973). Combined with growing concerns over the sustainability of the welfare system, this conception gave rise to the creation of a public transfer specific to the dependent elderly in 1997. Since then, the threshold of age 60, which was chosen in reference to the minimum retirement age at the time, has been structuring public schemes aimed at compensating the extra expenditures induced by impairments, as displayed in Figure 1: for individuals below 60, *disability* policies apply, while individuals 60 or more belong to the realm of old-age and *dependence* schemes.[5]

In the years 2000s, both disability and dependence transfers were reformed, so as to benefit more individuals. In 2002, the *Allocation personnalisée d'autonomie* (APA) was

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[4]*Loi n°75-534 du 30 juin 1975 d'orientation en faveur des handicapés, JORF du 1er juillet 1975.*

[5]A more detailed history and institutional analysis of disability and dependence schemes can be found in Ennuyer (2013) and Bonnet (2004).

Figure 1: Extra-expenditures costs compensating schemes in France, for individuals living in the community: Age thresholds of ages 60 and 65.
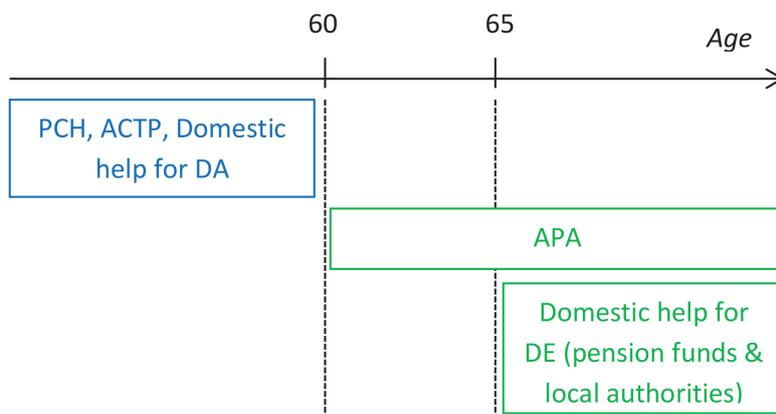
created as the new main elderly dependence scheme: accessible to all individuals with a certain degree of impairments, no matter their income, APA subsidizes home services that will make possible for individuals aged 60 or more who live in the community to "stay home".[6] Eligibility is defined in reference to a standardized scale designed to measure the degree of impairments: combining the restrictions in the Activities of Daily Living (ADL) and in the Instrumental Activities of Daily Living,[7] the *AGGIR* scale defines 6 groups

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[6]The idea that dependent elderly should be "maintained home" is a guideline of dependence policies in France as in most countries, for budgetary reasons but also because staying in the community is the option which is generally preferred by individuals and their families (Colombo et al. 2011). Nonetheless, APA exists also for individuals living in a nursing home, but does not work the same. As we are interested here in impairments-compensation schemes for dependent elderly living at home, we focus only on the transfers available to this population. Same remark applies to disability schemes, as distinct subsidies are available to individuals living in specialized institutions.

[7]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 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). In HSM survey, IADL include eleven items: doing domestic chores and light housework, shopping for groceries or clothes, preparing meals, taking medications, using the telephone, managing money and administrative routines, moving around inside and going out of the residence, using a means of transport.

of dependence, 4 of which granting eligibility to 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 evaluate what types of activities the beneficiary needs assistance with and at what frequency. A personalized amount of transfer is thus defined and an income-related copayment rate applies.

In 2006, a new benefit, the *Prestation de compensation du handicap* (PCH), was created to progressively replace ACTP.[8] PCH works similarly to APA, but copayment schedule and disability conditions for eligibility differ. Eligibility is granted if the individual cannot perform at all one or more 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. Individual must be aged less than 60, or show that her impairments are anterior to her 60th birthday.

Departments, which are the entities in charge of disability and dependence policies, may also grant means-testing social 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 give their retired affiliates aged 65 or more who do not meet the impairment condition to get access to APA a subsidy on home care services.

Table 1: Extra expenditures-compensating schemes for individuals living in the community: Spending and number of recipients in 2008.

	Total spending, in million euros	Number of recipients	Average benefit, per recipient, in euros per month
Total of disability transfers	1,014	147,992	571
Total of dependence transfers	3,319	722,234	383

SOURCE: Drees, *Enquête aide sociale départementale 2008.*
NOTES: Figures do not include domestic help provided by pension funds, nor specific transfers available to juveniles.

In 2008, about 850,000 individuals living in the community benefited from extra expenditures-compensating schemes allocated by local districts. The majority of recipients (80%) are aged 60 or more. APA is the most common transfer, with 670,000 beneficiaries. About 130,000 individuals aged less than 60 received either PCH or ACTP, in almost equal proportion. As shown by Table 1, more public money is spent on the dependent elderly than

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[8]ACTP has not been granted to new recipients since 2006, but still benefits surviving recipients.

on disabled adults, but the average benefit of recipients under 60 is 50% higher. Of course, this is only weak evidence of differences in schemes' generosity, given the important age and likely epidemiological differences between the two sub-populations.

2.2   Content of the schemes

APA can be used to finance punctual ergonomic redesigns of the housing or to pay for some technical assistance devices, but the bulk of transfers (90% for year 2008) is used to pay for professional home care services. This is less true for PCH, since specific credits, non fungible with those intended to human care subsidy, are open for technical assistance devices, housing adaptation, transportation, animal assistance or event exceptional purposes. On the other hand, PCH can not be used to pay for assistance in domestic cores: formal caregivers whose intervention is eligible for financial support must perform personal care activities. In 2012, 90% of PCH beneficiaries used part or all the transfer to subsidize human care, provided by professional workers or by family members (Espagnacq 2013). Indeed, under some conditions, ACTP, APA and PCH can be used to financially compensate informal caregivers.

When used to pay for professional care, all schemes except for ACTP work as a hourly subsidy on the price of care services: on each hour, the beneficiary must pay out-of-pocket the copayment rate times the reimbursement price set by the local district.[9] For APA, PCH and departments' or pension funds' domestic help, the maximum number of hours eligible to the subsidy is set at the moment of the needs assessment visit. For APA, this number must be consistent with the dependence group-specific ceiling, which is higher for individuals with more severe impairments. Ceilings also apply for domestic help subsidized by pension funds and means-testing domestic help schemes. On the contrary, there exist no ceiling for human care subsidized by PCH.

We will not dig further into the differences between the schemes.[10] The three important points to bear in mind are: first, there exist public subsidies to foster home care utilization by individuals with restrictions in activities of daily living; second, home care subsidies are not the same if you are 60 or over, or if you are under this age threshold; third, *a priori* assessment of the effects of this institutional distinction is hard to make, because of the many differences in eligibility rules, conditions and ceilings. Our paper proposes to use

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[9]Plus in some cases the difference between the producer price and the reimbursement tariff if the two differ. See Bourreau-Dubois et al. (2015) for more details.

[10]Further details can be found in Appendix A.1.

quantitative data to assess whether care arrangements around individuals with impairments are affected by the discontinuity of public policies at age 60. Our comparison of two sub-populations, not necessarily eligible to or recipient of a subsidy, allows to capture the aggregation of all different potential effects: the institutional difference between disability and dependence policies may induce individuals 60 or older to be more likely to be eligible to and to claim home care subsidies (or the reverse); then, conditional on receiving the subsidy, belonging to one sub-population rather to the other may induce differential care utilization because of differential generosity or content of the subsidy.

Before turning to a more detailed presentation of the empirical strategy, we survey the literature relating to our work and present our theoretical framework.

3 RELATED LITERATURE

Starting in the United States, several empirical papers have investigated the impact of home care public subsidies on formal care utilization by impaired elderly living in the community, and on a possible crowding-out effect on informal care provision. Using data from the Channeling Experiment,[11] Christianson (1988) find that formal care utilization increased for individuals living in the community, in response to the home care subsidies implemented by the experiment. Informal care provision by friends and neighbors is reduced, but family caregivers do not withdraw. With same data, Pezzin et al. (1996) find similarly small substitution effects of subsidized formal care to informal care, even when accounting for changes in living arrangements. Ettner (1994) uses different longitudinal data and equally find that Medicaid home care subsidies increase the use of formal care services for non-institutionalized elderly. She also finds evidence that the higher use of non-medical care leads to a decrease in informal care provision, an effect which is also found in Bonsang (2009) on European data (SHARE). Stabile et al. (2006) exploit the fact that home care policies are organized at the province level in Canada: pooling data from several waves of a survey, they find that individuals aged 55 and over who live in provinces with more generous home care programs are more likely to receive formal care, conditional on needing it. In a second dataset, in which use of non-publicly funded formal care is not recorded but proxied by education and income, they find that higher generosity is also associated with smaller informal care provision, suggesting again a substitution effect between formal and

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[11]The Channeling Experiment was designed in the early 1980s to evaluate the effects of publicly financed home care, on target population of individuals aged 65 and over.

informal care. Instead of cross-sectional variation, Viitanen (2007) exploit within-country variation from the European Community Household Panel to identify the impact of public long-term care expenditures (LTC) on the involvement of women aged 45 to 59 in informal eldercare. Higher expenditures decrease the provision of care by women not co-residing, but leave unaffected the probability of intergenerational household formation.

Recent papers have been directly interested in the effects of institutional differences in public home care settings. Motel-Klingebiel et al. (2005) test whether the form of the Welfare State has any impact on the relationship between informal and formal care provision, focusing on individuals aged 75 and over. Using data from various European countries and Israel, they observe that in countries where State support of care services is more developed, provision of publicly funded care tend to increase care provision by family members; in familistic welfare regimes, no such effect is found, but there is no evidence of crowding-out neither. Noting that the German and Dutch LTC insurance systems have differing eligibility and copayment rules, Bakx et al. (2015) decompose the between-country differences in home care utilization rates of individuals 50 or more and find that only a small part can be explained by between-country differences in covariates. Arguing that differences in regression coefficients capture the effects of institutional features, the authors conclude that the precise design of LTC insurance schemes has substantial impacts on care utilization as well as equity implications, as access to formal care for the poor appears more difficult in Germany than in the Netherlands.

In France, recent works have studied the impact of APA transfer on the care received by elderly living in the community. Petite & Weber (2006) use a representative sample of APA beneficiaries the year following the scheme's creation to compare care utilization to care arrangements existing before individuals received the subsidy. The data show that care provision by relatives does not decrease, but the nature of tasks changes, as formal caregivers perform more of the domestic chores. However, results may suffer from recall bias, and changes in restrictions in ADL and IADL cannot be controlled for. Using a study on individuals aged 65 or more with mild to moderate Alzheimer Disease (AD), Rapp (2011) compare non-medical formal care and informal care utilization of recipients and non-recipients of APA living at home. Public home care subsidies increase formal care utilization and its share in total hours of care provided, but informal care represents over 80% of total non-medical care provision for APA beneficiaries. However, the data contains information only on primary caregiver: more substitution effects could be found if other caregivers' participation were taken into account. Fontaine (2012) also compares care

arrangements for elderly receiving APA and for those who do not benefit from the transfer, but on a broader population. Using the Health and Disability Survey on Households (HSM) survey to get a sample of French individuals 60 and over living in the community having difficulties to perform ADL or IADL, the author uses propensity score matching to produce a control group of non-APA recipients which is similar to the group of APA recipients in terms of observable characteristics. Assuming there are no differences in terms of unobservable characteristics that would affect both the probability to get APA and care utilization, Fontaine (2012) finds that subsidized home care partly substitutes to privately-funded formal care, but also decreases informal care provision, with a higher impact for individuals with mild impairments. Effects do not vary with marital status, suggesting that socio-medical teams in charge of assessment of needs do not apply a subsidiarity principle (higher involvement of informal caregivers does not seem to play against subsidies entitlement). This echoes Bakx et al. (2015) results on the effect of spouse disability, who matters in the Netherlands - where it is taken into account to determine eligibility - but not in Germany - where spouse disability does not intervene in eligibility assessment.

To our knowledge, the effects of home care subsidies on long-term care utilization of disabled adults have been less investigated.[12] But the results obtained on the population 65 and over suggest an important effect of home care programs on professional care utilization by individuals who are restricted in daily life activities, with only a small crowding–out effect on informal care provision. Contrary to past studies done on France, we exploit an identification strategy that does not rely on the assumption that individuals randomly select into a given home care program. Our empirical specification stems from a simple microeconomic rationalization of informal care provision and formal care utilization, which is the object of the following Section.

4 THEORETICAL FRAMEWORK

For individuals with activity restrictions, receiving day–to–day assistance is likely to increase well-being, up to a certain point at least. From a theoretical point of view, following Van Houtven & Norton (2004) who extended Grossman (1972)'s demand-for-health model, formal care and informal care can be thought as two factors of production

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[12]Espagnacq (2013) actually compares home care utilization of ACTP and PCH beneficiaries aged less than 60, controlling for socio-demographic and disability characteristics. However, her analysis should be taken as essentially descriptive, as many omitted variables may enter into play.

of W, the health or well-being of an individual with impairments denoted D.[13] Denoting $\tilde{Y}_F$ and $\tilde{Y}_I$ the amount of formal care and informal care received by the individual, and θ a parameter of preferences that affect the relationship between home care use and well-being (preference for privacy, for being able to perform certain activities, etc.), we express:

$$W = W(\tilde{Y}_I, \tilde{Y}_F; D, \theta)$$

We take decisions regarding formal care consumption and informal care provision as the product of a non–cooperative game involving an individual with impairments and her relatives.[14] In this game, each player takes the others' decisions as given. The reaction function of individual i gives the level of formal care consumption $\tilde{Y}_F$ as a function of her impairments, of the informal care provided by relatives, $\tilde{Y}_I$, and by all other factors that affect directly the optimal level of professional care consumption. These effects may go through the individual utility function or through her budget and time constraints, among which we find public home care subsidies, denoted P. Denoting the residual factors X_F, we can express the best–response function of individual i:

$$\tilde{Y}_F = g^F(\tilde{Y}_I, X_F, P; D, \theta) \tag{1}$$

Consider now a relative, who is altruistic in the sense that the well–being of individual i or even directly i's utility level enter her own utility function. The relative decides upon provision of informal care by trading–off the time and resources allocated to caregiving activities with time allocated to labor market participation or other productive or leisure activities and own consumption, taking individual's i consumption of formal care as given. Expenditure cost–compensating public schemes may also have a direct impact on the the quantity of care provided by relatives, as APA and PCH may be used for financially compensating of an informal caregiver. Denoting X_I all the factors affecting directly informal care provision decision (by entering the objective function or the budget and time

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[13]Impairments D are considered as given in such a static framework.

[14]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 individual with impairments and her relatives have different, potentially diverging preferences (Pezzin & Schone 1999, Van Houtven & Norton 2004, Bolin et al. 2008, Holly et al. 2010). The second approach has been shown to be more consistent with empirical observations (Pezzin & Schone 1999).

constraints of the relative), we can express the reaction function of the relative as follows:

$$\tilde{Y}_I = g^I(\tilde{Y}_F, X_I, P; D, \theta) \tag{2}$$

The solution of the game corresponds to a Cournot-Nash equilibrium, in which informal care provision and formal care utilization are jointly determined. The optimum is represented by System 3, where Y_F^* and Y_I^* represent the equilibrium values of formal and informal care volume:

$$\begin{cases} Y_F^* = g^F(Y_I^*, X_F, P; D, \theta) \\ Y_I^* = g^I(Y_F^*, X_I, P; D, \theta) \end{cases} \tag{3}$$

Since our interest lies mainly in the effect of public home care subsidies, our model is voluntarily kept very simple, in order to include a broad range of situations. Remember our objective is to assess whether being a dependent elderly rather than a disabled adult makes a difference in terms of formal care and informal care utilization, all other things being equal.[15] We do not even need a model as structural as System 3, all the more as the estimation of a structural model, when the theoretical setting is loosely defined, is likely to yield fragile results (Arnault 2015).[16] A more robust approach, also more consistent with our research question, consists in looking at the reduced–form model:

$$\begin{cases} Y_F^* = h^F(X_F, X_I, P; D, \theta) \\ Y_I^* = h^I(X_F, X_I, P; D, \theta) \end{cases} \tag{4}$$

In this system, the effects of public schemes correspond to a combination of their direct impact on the decision to use formal care, for a given level of informal care provision, and of their indirect impact on informal care provision, mediated through the effect of relatives' care provision on the individual optimal consumption of formal care.

The subsequent section describes the data we use to empirically estimate System 4.

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[15]In particular, the functional form $W(.)$ is likely to depend on the living arrangement of the impaired individual (live independently, with relatives or in a nursing home). An extensive model of care utilization would endogeneize choices of living arrangements (Ettner 1994), as those would affect the reaction functions. However, because the data used are cross–sectional, we must consider living arrangements as given.

[16]Suppose we want to recover the structural effect of public home care subsidies, P, in Equation 2. The optimal level of informal care depends on the optimal level of formal care provision, which has thus to be instrumented in the estimation. The credibility of instruments relies on the validity of exclusion restrictions, that may contradict the underlying making process of either individual i or of her relatives. See Arnault (2015) for an insightful illustration.

5 DATA AND DESCRIPTIVE STATISTICS

5.1 HSM survey

We 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.[17] This dataset contains detailed information about the restrictions in the activities of daily living 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, we can compare the care arrangements in the sub-populations on the two sides of the age threshold.[18] Furthermore, individuals affected by disabilities and health problems were over-sampled in the design of the survey, enabling to work on disability and dependence questions with reasonable sample sizes.[19]

Despite its richness, information on impairments-compensating benefits is poor in HSM: considering the entire population of individuals aged 60 or more, the number of individuals declaring they receive APA is estimated to be 330,000, twice less than administrative records show. Underreporting of PCH benefits is also observed, while the survey indicates more ACTP beneficiaries than administrative records do. Thus, we will not attempt to relate self-reported declaration of long–term care benefits with home care utilization.

5.2 Sample selection

As we are interested in extra expenditures-compensating transfers, our population of interest includes all individuals that potentially entail extra expenditures to be able to perform the tasks of everyday life. We drop individuals that can perform alone the entire

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[17]The population living in specialized institutions (nursing and retirement homes) was studied by a companion survey, *Handicap-Santé Institutions* (HSI).

[18]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.

[19]HSM sample was drawn using the results of a preliminary survey, called *Vie quotidienne et santé* (VQS). VQS collected basic information on the demographics and health conditions of over 200,000 households. More information on the design of HSM can be found at http://www.drees.sante.gouv.fr/les-enquetes-handicap-sante,4267.html.

set of ADL and IADL with no difficulties. We retain only individuals aged 50 to 74 to study what happens around the age thresholds of 60 and, to a lesser extent, 65. From an epidemiological point of view, prevalence of impairments tend to increase for individuals in their fifties (Cambois et al. 2013), but the prevalence of severe situations of dependence markedly increases only after age 80, when severe cognitive limitations come along total incapacity to perform some basic physical activities (Dos Santos & Makdessi 2010). Individuals with restrictions in ADL or IADL represent 12.5% of the 16.8 millions people living at home aged 50 to 74. We end up with a sample of 3,036 individuals.[20]

5.3 Care arrangements

We focus on two types of home care potentially received by individuals with cognitive or physical impairments: paid domestic care provided by professional workers of the socio–medical sector, and care provided by relatives. Additionally, HSM provides information on the types of tasks performed by the different caregivers. Given our interest in extra expenditures–compensating schemes, 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. On the other hand, relatives who are declared as paid caregivers are also considered as providing informal care.

Regarding professional care, it is important to distinguish between *cure* and *care*: one 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 not relate to impairments–compensating schemes: in France, medical services are paid by public and private health insurances or out–of–pocket, and do not enter the perimeter of home care subsidies. Thus, an individual is said to receive formal *care* if she is assisted by a professional worker *with the activities of daily living*; she is considered as *not* receiving formal care if she receives *only* frequent *cure*,[21] with no informal nor 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, theoretically

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[20]The initial sample of individuals aged 50 to 74 unable to perform alone at least one ADL or IADL was made of 3,064 individuals. We dropped 28 individuals on which some information on care arrangements or on socio–demographic or family characteristics was missing. In terms of observed characteristics, individuals who were dropped do not differ significantly from the selected sample.

[21]For details on the way we defined "frequent cure", see Appendix A.1.

allowing to compute volumes of formal and informal care received per month. However, volume of care is often missing for informal caregivers in the survey.[22] 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.

Figures 2 and 3 display care arrangements as estimated for the two sub-populations of interest. The 50-59 years-old receive more often the help of their relatives than the 60-74 years-old (64% against 58%). On the contrary, receiving the services of a professional home caregivers (with or without informal assistance as a complement) is much more frequent among the 60-74 years-old (32% against 20%). Consistently, receiving only formal care and receiving both formal and informal care is a significantly more frequent situation for the 60-74 years-old than for the 50-59 years-old. Conversely, 54% of the 50-59 years-old get assistance only from their relatives, while it is the case of only 44% of the 60-74 years-old. Predominance of informal care is a feature of LTC also observed in other European countries and in North America (Fujisawa & Colombo 2009).

[Figures 2 and 3 to be found page 16]

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[22]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 all the more problematic for spouses and, more generally, co-residing relatives, for who the frontier between regular domestic work and assistance to an impaired 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.
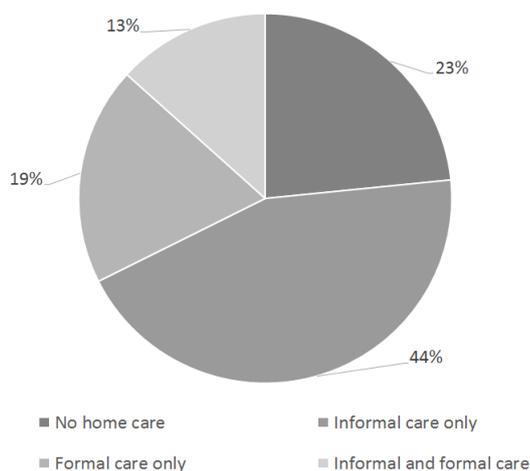
Figure 2: Care utilization among individuals with impairments, population aged 60-74.
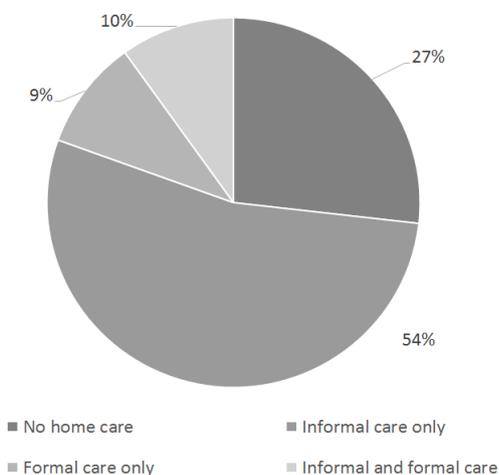
POPULATION: French population aged 50 to 59, having difficulties to perform alone one or more ADL or IADL and living in the community (sample of 1,347 individuals). Statistics were computed using survey weights.
SOURCE: Insee-Drees, HSM 2008.

Figure 3: Care utilization among individuals with impairments, population aged 50-59.

POPULATION: French population aged 60 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (sample of 1,689 individuals). Statistics are computed using survey weights.
SOURCE: Insee-Drees, HSM 2008.

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5.4 Socio-demographic and family characteristics

HSM provides a rich set of individual characteristics likely to correlate both with age and care arrangements. Based on previous literature, the covariates we retain are of three types: impairment variables, socio–demographic characteristics and family resources. Description of the full set of controls as well as the rationale for their inclusion can be found in Appendix A.5. The subsequent section describes our sample in terms of both the outcome variables and the covariates.

Table 2 presents summary statistics on the socio-demographic characteristics of the selected sample. In the sub-population aged 60 or more, 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. Education levels reflect a generational phenomenon: 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, but no marked difference shows up in the area of residence.

As displayed in Table 3, individuals in the oldest half of the sample have on average more children alive, but the proportion of girls is the same in the two groups. Co-residence with children is more frequent for individuals below 60, but individuals aged 60 to 74 have proportionally more often children living in the same town. With no surprise, older individuals tend to have older partners and siblings, who are less likely to assist them with the activities of daily living. Parents might be a source of help for the youngest individuals in the sample, but not for the bulk of individuals aged 60–74.

[Tables 2 and 3 to be found page 18 and page 19

Table 2: Sample descriptive statistics (1) – Socio–demographic characteristics

	Individuals less than 60 (1)	Individuals 60 or more (2)	Difference 60^+ - 60^- (3)
Woman	61.3%	66.8%	5.5***
Average age	54.9	67.7	+12.8***
Self-declared health status			
Health status: bad	63.7%	64.9%	+1.2
Health status: average	26.9%	27.8%	+0.9
Health status: good	9.4%	7.2%	-2.1**
Functional limitations and activity restrictions			
Has physical functional limitations	88.7%	94.8%	+6.1***
Has sensory functional limitations	47.1%	55.6%	+8.4***
Has cognitive functional limitations	55.5%	58.5%	+3.0*
Has IADL restrictions w/o ADL restrictions	59.9%	54.6%	-5.3***
Has ADL restrictions	40.1%	45.4%	+5.3***
Average nb of non–cognitive IADL	2.3	2.9	+0.6***
Average nb of cognitive IADL	0.6	0.9	+0.3***
Average nb of ADL restrictions	1.0	1.2	+0.2***
Education level			
No degree	36.1%	44.5%	+8.4***
Primary education degree	24.8%	30.4%	+5.6***
Secondary education degree	32.0%	18.9%	-13.1***
College or university degree	7.1%	6.2%	-0.9
Monthly household income (per c.u.)			
1st quartile	27.8%	22.9%	-4.9***
2nd quartile	21.9%	27.4%	+5.5***
3rd quartile	24.1%	25.6%	+1.5
4th quartile	26.1%	24.1%	-2.0
Work status			
Is employed	17.9%	1.8%	-16.1***
Is retired	5.6%	83.6%	78.0***
Area of residence			
Lives oversea	9.0%	12.9%	+3.9***
Lives in a rural area	20.3 %	21.2%	+0.9
Lives in a small urban area	16.6%	15.4%	-1.2
Lives in a medium urban area	15.4%	16.2%	+0.8
Lives in a large urban area	35.8%	35.3%	-0.5
Lives in Paris	11.9%	12.0%	+0.1
N	1,347	1,689	-

NOTES: For statistics displayed in percentages in Columns (1) and (2), the differences in Column (3) are expressed in percentage points. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Statistics computed on the baseline sample (3,036 individuals).

Table 3: Sample descriptive statistics (2) – Family resources

	Individuals less than 60	Individuals 60 or more	Difference 60^+ - 60^-
Children			
Having at least a child alive	82.5 %	85.5%	+3.0**
Number of children	2.2	2.6	+0.4***
Proportion of girls	40.6%	43.3%	+2.7**
Residence of closest child			
No child	17.5%	14.5%	-2.8**
Abroad	1.0%	1.1%	0.0
In France but not in the same city	31.8%	37.3%	+5.5***
In the same city	14.0%	28.8%	+14.8***
Co–residing	35.6%	18.3%	-17.3***
Siblings			
At least one sister or brother alive	90.4%	80.3%	-10.1***
One sister or more alive	75.8%	65.1%	-10.7**
Number of siblings	3.6	2.6	-1.0***
Average age of siblings	54.4	65.9	11.5**
Partner			
Has a partner alive	61.6%	59.4%	-2.2
Has a partner aged 75 or more	0.4%	10.7%	+10.3***
Has a co–residing partner	60.8%	58.8%	-2.0
Parents			
Mother or father still alive	52.4%	14.9%	-37.5***
Co–resides with parents	4.9%	1.5%	-3.4***
N	1,347	1,689	-

NOTES: For statistics displayed in percentages in Columns (1) and (2), the differences in Column (3) are expressed in percentage points. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Statistics computed on the baseline sample (3,036 individuals).

6 A REGRESSION DISCONTINUITY DESIGN

We now turn to the empirical specification we choose to estimate the reduced–form impact of the institutional difference in long–term care schemes on home care utilization. As the institutional threshold of age 60 provides an exogenous source of variation in benefit coverage around that age, we implement a Regression Discontinuity (RD) approach (Lee & Lemieux 2010). Treatment is defined as the fact of belonging to the perimeter of dependence policies. Thus, we may consider that the probability of being treated jumps from 0 to 100% right at age 60.[23]

In RD designs, first suggestive evidence that the outcomes of interest react to the treatment can be documented graphically, by representing the evolution of the outcome values around the cutoff point of the forcing variable.

## 6.1 Home care utilization around age 60

Figures 4 to 9 display average care utilization rate by civil age and fit flexible polynomials in age for individuals aged 50 to 59 and for individuals aged 60 to 74 separately. The probability to receive some home care somewhat increases after age 60 (Figure 4). Although there is no significant "jump" right at age 60, the probability to receive formal home care increases substantially from age 62 on, after a relative stability around 20% for individuals aged 50 to 61 (Figure 6). On the contrary, the share of individuals receiving assistance from their relatives remains remarkably stable around age 60 (Figure 5). Consistently, the probability to receive only formal care and a mix of formal and informal care seems to increase not at age 60 but rather between 62 and 65, while the probability to receive only informal care logically decreases around these ages (Figures 7 to 9).

*[Figures 4 to 9 to be found pages 21 to 23]*

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[23]We thus implement a Sharp RD approach. Had we some reliable information on actual benefits received, we could alternatively estimate a Fuzzy RD design, in which being 60 or more would have been an instrument for receiving home care benefits.

Figure 4: Care utilization around the discontinuity: proportion of individuals receiving formal or informal home care.
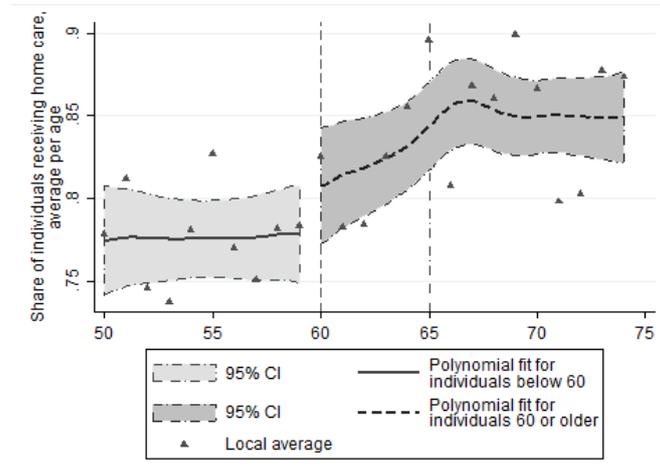
SAMPLE: French population aged 59 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,036 individuals). NOTES: Dots represent average care utilization rate by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.
SOURCE: Insee-Drees, HSM 2008.

Figure 5: Informal care utilization around the discontinuity: proportion of individuals receiving informal home care.
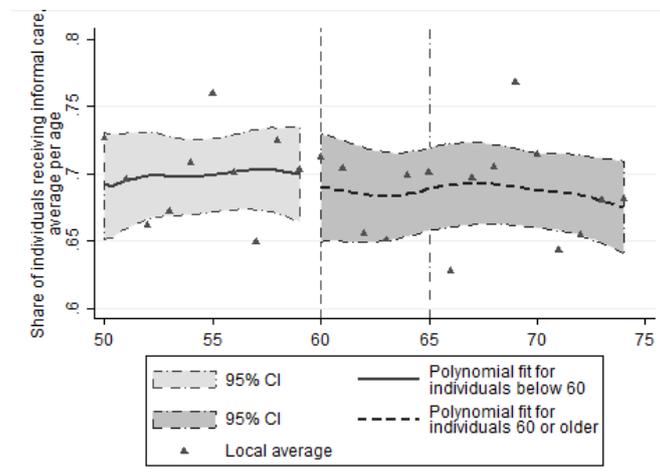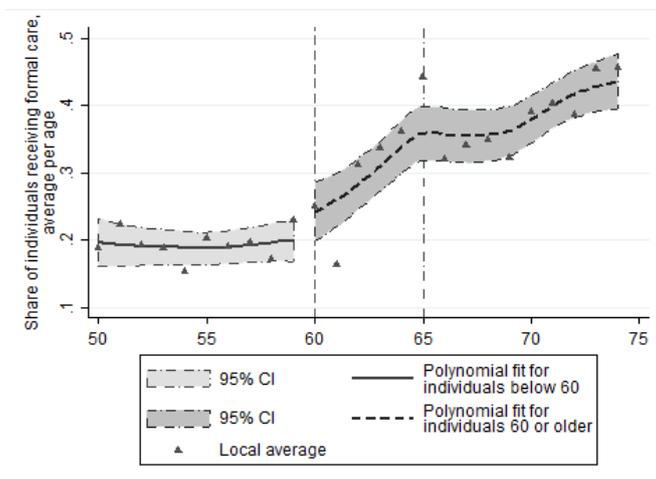

SAMPLE: French population aged 59 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,036 individuals).
NOTES: Dots represent average informal home care utilization rate by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.
SOURCE: Insee-Drees, HSM 2008.

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Figure 6: Informal care utilization around the discontinuity: proportion of individuals receiving formal home care.

SAMPLE: French population aged 59 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,036 individuals).
NOTES: Dots represent average formal home care utilization rate by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.
SOURCE: Insee-Drees, HSM 2008.

Figure 7: Informal care utilization around the discontinuity: proportion of individuals receiving only informal home care.
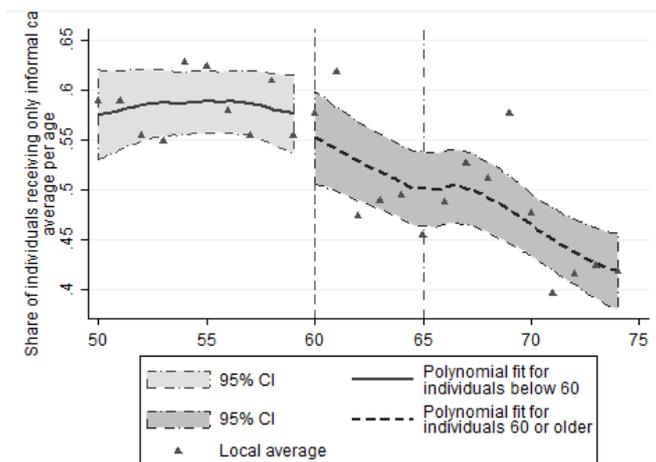

SAMPLE: French population aged 59 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,036 individuals).
NOTES: Dots represent average informal home care utilization rate (exclusive of formal care utilization) by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.
SOURCE: Insee-Drees, HSM 2008.

Figure 8: Informal care utilization around the discontinuity: proportion of individuals receiving only formal home care.
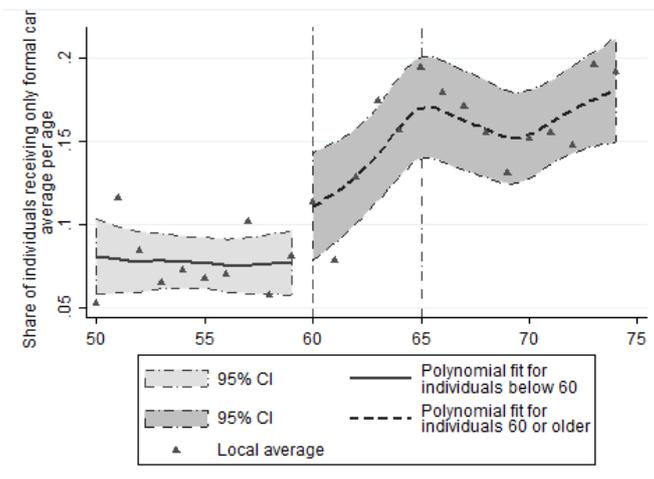

SAMPLE: French population aged 59 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,036 individuals).
NOTES: Dots represent average formal home care utilization rate (exclusive of informal care utilization) by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.
SOURCE: Insee-Drees, HSM 2008.

Figure 9: Informal care utilization around the discontinuity: proportion of individuals receiving both formal and informal home care.
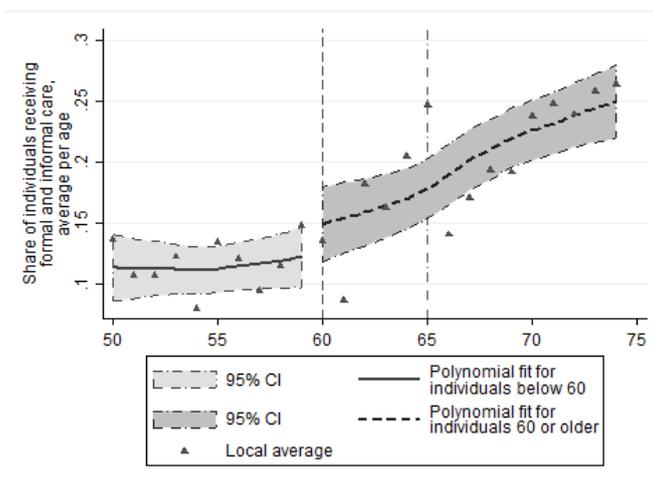

SAMPLE: French population aged 59 to 74, having difficulties to perform alone one or more ADL or IADL and living in the community (N = 3,036 individuals).
NOTES: Dots represent average mix (both formal and informal care) home care utilization rate by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.
SOURCE: Insee-Drees, HSM 2008.

6.2 Empirical specification

As a starting point, we disregard the formal/informal care distinction. We define Y^* a continuous variable of home care utilization, including both professional care and care provided by relatives. Conditional on an unconfoudedness assumption, coefficient β in Equation 5 will capture the impact of the institutional difference between dependence and disability public schemes in terms of care arrangements:

$$Y^* = \alpha + \beta.60^+ + \sum_{j=1}^{J} \delta_j.(Age - 60)^j + \sum_{j=1}^{J} \delta'_j.60^+.(Age - 60)^j + X'\gamma + u \tag{5}$$

where 60^+ is a dummy equal to one if the individual is aged 60 or more and α is a constant. Following Lee et al. (2004), we introduce polynomial terms in age (centered at 60) in order to capture nonlinear age effects accounting for different home care utilization rates before and after 60, that cannot be attributed to the age discontinuity in home care programs. Introducing interaction terms $60^+.(Age - 60)^k$ allows the relationship between age and the error term u to vary before and after the age discontinuity.

We add to the specification a set of control variables, X. In principle, covariates are not required for proper identification in RD settings. They can nonetheless reduce the bias induced by the inclusion of observations relatively far away from the discontinuity and increase precision (Imbens & Lemieux 2008).

If informal care utilization and formal care consumption result from simultaneous decisions, estimating Equation 5 with formal (alternatively, informal) care utilization as dependent variable will give incorrect standard errors. To achieve correct inference, it is necessary to estimate the impact of the institutional age threshold on formal and informal care utilization in a simultaneous equation setting. An empirical counterpart of the theoretical System 4 writes:

$$\begin{cases} Y_I^* = \alpha_I + \beta_I.60^+ + \sum_{j=1}^{J} \delta_{j,I}.(Age - 60)^j + \sum_{j=1}^{J} \delta'_{j,I}.60^+.(Age - 60)^j + X'\gamma_I + u_I \\ Y_F^* = \alpha_F + \beta_F.60^+ + \sum_{j=1}^{J} \delta_{j,F}.(Age - 60)^j + \sum_{j=1}^{J} \delta'_{j,F}.60^+.(Age - 60)^j + X'\gamma_F + u_F \end{cases} \tag{6}$$

Coefficients have the same interpretation as in Equation 5 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 ρ, can differ from zero, as unobserved individual and relatives' characteristics that influence the provision of informal care and formal care utilization may correlate.

The effect to be estimated is local (here, at the age 60 threshold) but extending the estimation sample below and above the discontinuity point is required to make inference and, as the sample used widens, increases precision. Including observations further away from the threshold is often seen as a "necessary evil" as it may generate bias in the estimate if the functional form is miss–specified. For this reason, it is crucial to test the sensitivity of the results to the functional form assumed for age effects. If age proxies unobserved terms affecting home care utilization (think about wealth or preferences) in a nonlinear way, assuming a linear age effect over the sample may generate an artificial discontinuity at the age threshold, and thus bias the estimate of interest. But as age strongly correlates with our main variable of interest (being 60 or more, or not), increasing the degrees of polynomial entails an efficiency cost. In order to maintain reasonable precision while minimizing the risk of miss–specification, the choice of the specification is based on the comparison of the fit of the models using different values for the polynomial orders J in Equation 5 and System 6.

6.3 Estimation method

Since our variables of formal and informal care utilization are binary, we estimate Equation 5 running a univariate probit, assuming u follows a normal distribution with zero conditional mean. Similarly, System 6 is estimated by a bivariate probit, with the following observational scheme, for $l = I, F$:

$$Y_l = \begin{cases} 1 & \text{if} \quad Y_l^* > 0 \\ 0 & \text{else} \end{cases} \tag{7}$$

and the assumption that (u_I, u_F) follows a bivariate normal distribution. To ease the interpretation of results, we compute the partial effects of being 60 or more on the probability to use a given type of care, using a first–difference method.[24] Standard errors are clustered at the survey stratum level, and are robust to heteroscedasticity.

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[24]First–difference method is more appropriate to compute partial effects of binary variables in non–linear models (Cameron & Trivedi 2005).

7 ESTIMATION RESULTS

7.1 Effects of the age 60 threshold

Table 4 presents the results from univariate probit estimations of Equation 5, run on the sample of interest.[25] Specification (1) simply regresses the probability to receive any care (be it informal or formal care) on the dummy "being 60 or more". The coefficient is positive and significantly different from zero. When adding a linear age trend, in Column (2), the coefficient remains positive but statistical significance vanishes. As we add higher polynomial terms, in Columns (3) to (5), precision decreases dramatically – and the point estimate associated with begin an "elderly" becomes negative.

Table 4: Home care utilization.

	Average partial effect of being 60^+					
Outcome	(1)	(2)	(3)	(4)	(5)	(6)
$P(Y_I = 1|Y_F = 1)$	0.065**	0.036	0.017	0.016	-0.020	0.042**
	(0.027)	(0.034)	(0.061)	(0.072)	(0.085)	(0.016)
Age effects	None	Linear	Quadratic	Cubic	Degree 4	None
Controls	No	No	No	No	No	Yes
Observations	3015	3015	3015	3015	3015	3015
AIC	2901.2	2902.0	2905.4	2908.7	2907.0	2309.9
BIC	2913.2	2926.0	2941.4	2956.8	2967.1	2568.4

NOTES: Standard errors in parentheses, clustered at the household level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. 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. Estimation by a Probit model. Estimations use data from HSM survey. Specifications include department fixed effects.

To discriminate between the different specifications, 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

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[25]The sample used in estimations of Table 4 is actually slightly smaller than our baseline sample: it contains 3,015 individuals instead of 3,036. 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 3,036 individuals when estimating System 6 to maximize the precision of our results, and to use the sub-sample of 3,015 individuals when estimating Equation 5.

no age polynomial term is included, in Column (1).[26] Specification (6) includes our set of control variables in the preferred specification. Precision increases, as well as the model fit. The estimate suggests that being beyond the age 60 institutional threshold is associated with an increase of about 4 percentage points in the probability to receive some home care.

We turn now to the estimation of the bivariate model. Specifications (1) to (5) of Table 5 are similar to the specifications of Table 4, but the outcomes of interest are now multiple: we estimate the effect of being a dependent elderly on (i) the probability to receive any informal care, (ii) the probability individuals use formal care, and (iii) the probability of joint utilization. AIC and BIC favor the Specification with only a linear trend in age. In Column (6), we additionally include the covariates to increase precision.

Table 5: Informal care and formal care utilization.

Outcomes	Average partial effect of being 60^+					
	(1)	(2)	(3)	(4)	(5)	(6)
$Pr(Y_I = 1)$	-0.003	-0.007	-0.017	0.026	-0.085	-0.020
	(0.017)	(0.051)	(0.075)	(0.121)	(0.100)	(0.035)
$Pr(Y_F = 1)$	0.165***	0.059**	0.011	-0.046	-0.048	0.036
	(0.023)	(0.026)	(0.029)	(0.036)	(0.082)	(0.028)
$Pr(Y_I = 1, Y_F = 1)$	0.101***	0.036	0.002	-0.021	-0.059	0.017
	(0.025)	(0.024)	(0.032)	(0.048)	(0.051)	(0.022)
ρ	-0.271***	-0.273***	-0.273***	-0.272***	-0.273***	-0.455***
	(-6.15)	(-5.75)	(-5.70)	(-5.67)	(-5.78)	(-10.22)
Age effects	None	Linear	Quadratic	Cubic	Degree 4	Linear
Controls	No	No	No	No	No	Yes
Observations	3036	3036	3036	3036	3036	3036
AIC	7217.1	7192.7	7199.1	7202.9	7207.5	5645.1
BIC	7247.2	7246.8	7277.4	7305.2	7333.9	5909.9

NOTES: Standard errors in parentheses, clustered at the household level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using finite-difference method. Estimation by a bivariate Probit model. Estimations use data from HSM survey. 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.

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[26]As these information criteria relates negatively to the log–likelihood, a smaller AIC (alternatively, a smaller BIC) points out to a better model. Basically, 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 control variables.

Focusing on our preferred Specifications, in Columns (2) and (6), point estimates first suggest that individuals 60 or more are more likely to receive formal care services (by 3 to 6 percentage points). Such an effect is relatively high, considering that only 20% of individuals aged 50 to 59 receive formal care in our sample. The estimator is statistically different from 0 at the 5% level when no controls are included. It is no longer the case when covariates are taken into account, as the point estimate decreases and standard errors slightly inflate.[27]

Second, our estimates indicate that the probability to receive informal care is not affected by the institutional discontinuity at age 60. When covariates are included, the estimated effect reaches -2 percentage points. Given the relatively weak precision, we can not reject the absence of any effect even at the 10% level. In terms of practical signifiance, this value is low, as about 70% of individuals aged 50 to 59 in our sample receive informal care.

Third, point estimates suggest a positive effect of being considered as dependent rather than disabled on the probability to receive both formal and informal care. When controls are included, the effect is estimated to be around +2 percentage points. Again, given the large standard errors, we cannot formally reject that the institutional threshold has no impact on the frequency of mixed care arrangements.

Estimation of ρ, the correlation between the error terms u_I and u_F, gives a negative coefficient, highly significant in statistical terms. 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. Magnitude (0.46 with covariates) and sign are consistent with non–medical home care and informal care being substitutes at the extensive margins (Bonsang 2009, Holly et al. 2010).

7.2 Results on covariates

Overall, results obtained on covariates are consistent with previous works on the determinants of home care utilization. To preserve space, estimated effects and their comments are reported in Appendix A.5.

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[27]The precision loss suggests that the covariates correlate relatively little with formal care utilization decision.

7.3 Tests on alternative thresholds

Given our research question, the local nature of RD estimates may be restrictive, for two reasons. First, receiving benefits from a newly accessible scheme takes 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 subsidy. 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.[28] The effects of the change in accessible public schemes may not be detectable when individuals turn 60, but only later on.

Second, there exists another institutional threshold at age 65, when individuals with mild impairments become eligible to domestic help subsidies. Many individuals with mild impairments, or impairments relatively difficult to have recognized, like cognitive troubles, may have to wait until age 65 to become eligible to Department Councils' or pension funds' social assistance programs.

Thus, we also test for a difference in care arrangements between the population of adult disabled and the dependent elderly by excluding individuals just after 60. We re-estimate Equation 5 and System 6 first by excluding individuals aged 60 or 61, considering that in these two years the newly "elderly" have only a virtual access to the dependence schemes. Second, we exclude altogether all individuals aged 60 to 64, to assess whether care arrangements just before 60 differ significantly from care arrangements just after age 65, so as to capture the impacts of both institutional thresholds of ages 60 and 65.

Table 6 presents the effect of being an elderly dependent rather than a disabled adult on the probability to receive home care, excluding individuals aged 60 or 61 in Columns (1a) and (6a), and individuals aged 60 to 64 in Columns (1b) and (6b). Columns (1) and (6) simply reproduce Columns (1) and (6) of Table 4. Whether we include controls (Columns (6), (6a) and (6b)) or not, the positive effect and its statistical significance are preserved across samples. It reaches +6 percentage points when we exclude all individuals within the two age thresholds of 60 and 65.

Similarly, Columns (2) and (6) of Table 7 reproduce Columns (2) and (6) of Table 5, while the other Columns present the estimates of the effects of being elder than 60 on the probability to use formal or informal care when excluding individuals in their early sixties.

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[28]In order to process an application to either PCH or APA when the applicant is living at home, District Councils (*Conseils départementaux*) must send a socio-medical team at the residence of the applicant in order to evaluate what the individual is able to do alone in her daily environment.

Again, point estimates suggest that the effects are similar across samples. The increase in the formal care utilization rate is robust to the exclusion of individuals aged 60 to 64, although the estimator is no longer statistically significant. Although the point estimates suggest a positive effect of being elder than 60 on the probability to receive a mix of formal and informal care, we cannot reject that this effect is zero. In terms of informal care provision, the point estimate changes signs in Column (6b) when including the covariates. Precision is very low: we cannot conclude whether a small crowding–out effect of informal care by formal care is taking place after age 65, or whether informal care provision is not affected by the institutional thresholds in long–term care schemes.

Table 6: Home care utilization around the institutional thresholds: Excluding individuals just after age 60.

	Average partial effect of being 60$^+$					
Outcome	(1)	(6)	(1a)	(6a)	(1b)	(6b)
$P(Y_I = 1\|Y_F = 1)$	0.065**	0.042**	0.072**	0.048**	0.080**	0.060**
	(0.027)	(0.016)	(0.026)	(0.018)	(0.027)	(0.022)
Age effects	None	None	None	None	None	None
Controls	No	Yes	No	Yes	No	Yes
Ages excluded	None	None	60–61	60–61	60–64	60–64
Observations	3015	3015	2765	2765	2578	2578
AIC	2901.2	2309.9	2653.5	2104.0	2469.9	1949.2
BIC	2913.2	2568.4	2665.4	2358.7	2481.6	2200.9

NOTES: Standard errors in parentheses, clustered at the household level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using finite-difference method. Estimations by a Probit model. Estimations use data from the HSM survey. Specifications include department fixed effects.

A word of caution is warranted here: the assumption we have to make in estimating Columns (2a), (6a), (2b) and (6b) of Table 7 is stronger than the classical assumption in RD designs. We indeed include a linear age effect fitted excluding either individuals aged 60 and 61, or altogether individuals aged 60 to 64. Reported coefficients estimate the effects of being an elderly dependent rather than a disabled adult only if there are no age effects between 60 and 64.[29] [30]

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[29]Estimations of Columns (1a), (6a), (1b) and (6b) in Table 6 does not raise the same issue, as the preferred specification for the home care utilization equation does not include aged effects.

[30]One way to proceed would be to use the linear age trend estimated on individuals aged 65 or more to predict the outcome of individuals aged 60 to 64, conditional on the covariates. The RD specification

Table 7: Formal and informal care utilization around the institutional thresholds: Excluding individuals just after age 60.

	Average partial effect of being 60$^+$					
Outcomes	(2)	(6)	(2a)	(6a)	(2b)	(6b)
$Pr(Y_I = 1)$	-0.007	-0.020	-0.022	-0.044	0.011	-0.054
	(0.051)	(0.035)	(0.044)	(0.030)	(0.057)	(0.042)
$Pr(Y_F = 1)$	0.059**	0.036	0.107**	0.074**	0.090**	0.064
	(0.026)	(0.028)	(0.039)	(0.034)	(0.045)	(0.044)
$Pr(Y_I = 1, Y_F = 1)$	0.036	0.017	0.062**	0.034	0.062	0.024
	(0.024)	(0.022)	(0.030)	(0.023)	(0.040)	(0.035)
ρ	-0.273***	-0.455***	-0.266***	-0.442***	-0.261***	-0.447***
	(-5.75)	(-10.22)	(-5.48)	(-8.23)	(-5.53)	(-11.04)
Age effects	Linear	Linear	Linear	Linear	Linear	Linear
Controls	No	Yes	No	Yes	No	Yes
Ages excluded	None	None	60–61	60–61	60–64	60–64
Observations	3036	3036	2789	2789	2527	2527
AIC	7192.7	5645.1	6642.0	5206.8	5982.7	4683.1
BIC	7246.8	5909.9	6695.4	5467.9	6035.2	4939.8

NOTES: Standard errors in parentheses, clustered at the household level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using finite-difference method. Estimation by a bivariate Probit model. Estimations use data from HSM survey. Specifications include department fixed effects.

8   DISCUSSION

8.1   Interpretation and robustness of the results

Our results suggest that belonging to the institutional perimeter of dependence policies rather than to disability policies increases formal care utilization. On the contrary, informal care utilization rate does not seem to be affected by the institutional threshold. Consistently, the probability to use any home care increases around the institutional discontinuities of ages 60 and 65. This effect is the more robust. Overall, precision is low, making it difficult to quantify the effects on formal care and informal care utilization propensities.

could then be estimated including all individuals but using predicted values of the outcome. Inference would then need to rely on bootstrapped standard errors.

Being considered as a dependent elderly, rather than being less than 60, seems to foster access to professional home care. The fact that APA allows individuals 60 or more even with mild impairments to benefit from some subsidized domestic help probably contributes much to the observed increase in formal care utilization. As PCH cannot be used to pay for domestic help, individuals aged 50 or less who need assistance with household chores but not necessarily with personal care activities have to rely on their family, unless they pay out–of–pocket the full price of professional domestic help. PCH can be supplemented with means–testing domestic help provided by the departments, but only for very low–income households. Access to domestic help subsidized by pension funds from age 65 on (or even age 60 in some cases) is also a possible explanation.

Our estimates are also suggestive of negligible crowding–out effects of care provided by relatives by formal care. This is consistent with the bulk of the literature on substitution effects between formal and informal care provision to the disabled elderly. This result, though, may seem at odd with Fontaine (2012). Using the HSM sample of individuals aged 60 or more, the author finds that publicly–funded formal home care to individuals aged 60 and over had a small but significant crowding–out effect on informal care provision. Activities performed by caregivers are also found to change in reaction to increased formal care utilization: relatives perform less household chores and personal care.

Beyond differences in the population of interest, the difference in the degree of substitution found in our paper and Fontaine (2012)'s may come from the fact that his results are obtained at the intensive margins. In the present paper, the outcomes are care utilization *rates* and not volumes. Globally, our results seem to suggest that dependence schemes allow more impaired individuals to benefit from subsidized professional home care, because eligibility rules to get access to one transfer are less restrictive than in disability schemes. However, it is possible that results on home care utilization at the intensive margin would be different. Indeed, the copayment schedule associated with PCH is on average more generous than the schedule associated with APA, and recent works using local French data have confirmed that the consumption of formal care is price–elastic at the intensive margin.(Bourreau-Dubois et al. 2014, Roquebert & Tenand 2016)

When interpreting the results, one should remain cautious about their robustness. RD designs are usually data–intensive, as they need many individuals near the threshold to provide robust estimates. As documented in Appendix A.3, the sample size is quite small around the age threshold of age 60, and especially around age 65. As this can be explained by the sampling design and cohort sizes, these variations in the sample size with age are not

a threat to identification. Nonetheless, they have a considerable cost in terms of precision.

Small sample sizes between ages 60 and 70 also make more difficult to conduct robustness analysis using alternative windows. Controlling for age effects in a parametric way, as we do it, makes the results sensitive to observations far away from the threshold (Imbens & Lemieux 2008). Although we find empirical support for linear age effects at most, we assess the robustness of our results to the chosen window. In Appendix A.6, we re–estimate our RD specifications restricting the sample around age 60. The positive effect of being elder than 60 proves fairly robust (Table A.6). However, the effects on formal and informal care utilization (Table A.7) are much less stable. Restricting the sample around age 60 is nonetheless problematic: first, sample size is small between 60 and 70; second, it ignores the existence of the second threshold of age 65.[31]

More generally, our RD approach relies on the assumption that, except for the change in long–term care policies, nothing affects our sample in a different way on both sides of the age thresholds.

8.2   Retirement time as a confounding factor?

The ages 60 to 65 are common ages for retirement for French people;[32] age 60 (and to a lower extent, age 65) corresponds also to a positive "jump" in the probability of retirement for individuals eligible to retire at this age. This pattern has been documented in the French general population (Blanchet & Mahieu 2004), but is also visible on our sample. Figures A.10 and A.9 (Appendix A.4) show that the probability to work fells by around 10 percentage points at age 60, while the probability to be retired increases abruptly, by around 50 percentage points.

One first reason why this 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. Figure A.11 (Appendix A.4) shows this does not happen in our sample.

Nonetheless, 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

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[31]An alternative way to test the robustness of our results while not restricting the window would be to fit the effect of age non–parametrically, using kernel methods.

[32]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.

(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 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 impairments – apply to our sample, 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, while partner's retirement would tend to increase informal care provision.[33]

8.3   Differential institutionalization rates?

The data used present some limitations for the purpose of our study. The absence of a longitudinal dimension in HSM makes necessary to rule out cohort effects for identification. Moreover, the absence of a follow–up wave does not allow us to take into account differential nursing or medical home entry rates. If the institutional thresholds of ages 60 and 65 affect the probability to live in the community, for given impairments, socio–demographic and family characteristics, then our results might be biased.

Existing studies, mainly conducted on US data, suggest that long–term care policies impact institutionalization patterns. Using respectively the US National Long-Term Care Survey and data from the Channeling Experiment, Ettner (1994) and Pezzin et al. (1996) find a significant, positive impact of more generous public home care programs on the probability to enter a nursing home.[34] Differences in reimbursement rates for elderly nursing homes and for disabled adults specialized institutions could also induce differential selection, as looser Medicaid eligibility rules and greater reimbursement for nursing home care increase institutionalization rates (Hoerger et al. 1996). On the supply side, rationing of beds for disabled adults and dependent elderly needs not be the same, as suppliers may react to public support schemes and to regulations. Building and renting a bed may

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[33]In our different specifications, the dummy variable for being retired adds no explanatory power to the model when we already control for the employment status, possibly partly because 60% of our HSM sample aged 65 or less is either inactive or unemployed.

[34]Earlier works by Hoerger et al. (1996) and Christianson (1988) had 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 they model living arrangements jointly with formal and informal home care provision.

be more different for disabled adults and dependent elderly, if legislative constraints and public subsidies differ in the two sub-populations.

As pointed out by Weber (2011), out–of–pocket payments in elderly dependent nursing homes (*EPHAD*) are on average far higher than the amounts paid by residents of disability centers.[35] HSM was conducted together with a companion survey, HSI, that collected information on individuals living in an institution on a permanent basis. 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-declared health status of individuals in 5 levels, a dummy for chronic disease, as well as a categorical variable on limitations because of a health condition.

Figure 10 represents the share of individuals in the HSM–HSI matched sample living in an institution per civil age. Flexible polynomial fits of the relationship between the institutionalization rate and age suggest that the trend changes after age 60. The "jump' is however not that salient on the graph, as the share of individuals in institution at age 60 is noticeably low. Again, we should consider the possibility that changing institutional regimes may take some time.

We can estimate the effect of age 60 threshold on the probability not to live in the community using a probit model. The best fit of the model (both AIC and BIC are minimized) is obtained when including only a linear trend in age, whether we include controls or not. As shown in Table A.8 in Appendix A.7, without any control, individuals aged 60 to 74 appear less likely to live in an institution than individuals aged 50 to 59. When we add available controls and age effects, we see that being 60 or more *increases* the probability to live in an institution by around 4 percentage points. Given the relatively large sample, we check our results are robust to the chosen window. As presented in Table A.9, the positive effect of being a dependent elderly on the probability to live at home, although statistical significance vanishes.

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 spending at least *one day a month* at home. Thus, it includes the patients of disability centers that, for most of them, welcome their patients overnight during the week but encourage families

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[35]Most of the fees in disability 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 can be deducted from succession, and a copayment is asked on the fees covering in–institution care provision. More details can be found in Weber (2011), pp. 18-22.

Figure 10: Probability of living in an institution, by civil age.
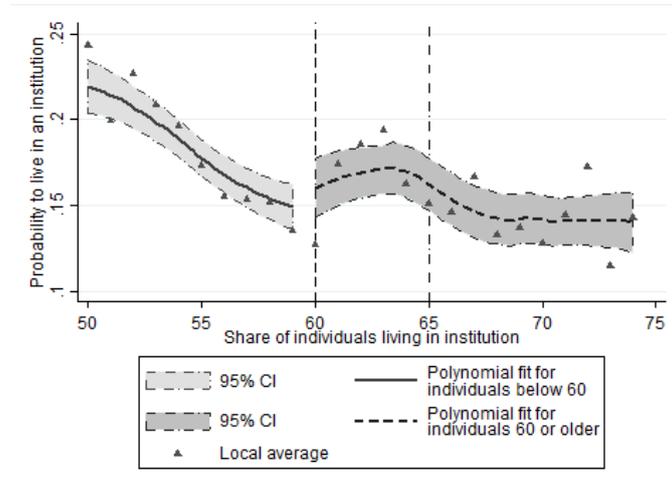
to host their relatives during the weekend. On the contrary, nursing homes accessible to
dependent elderly are generally conceived as permanent residences. The positive coefficient
we estimate thus partly reflects the definition of "living in the community" retained in the
survey sampling design. But the the fact that individuals over 60 are more likely to be
considered as living in an institution than individuals below 60, for the retained definition
of living home, is a consequence of the institutional distinction made between dependency
and disability programs within long–term care policies.

In that sense, the differential selection of the dependent elderly *versus* the disabled
adults in the HSM survey can be considered as en effect of the institutional barrier we
are interested in, whether individuals are more likely to be cared for in an institution or
whether they are more likely to be considered as such. In terms of disability–compensation,
it would be of interest to know to what extent individuals included in the HSM sample are
actually receiving formal care from professional workers in disability centers or other forms
of facilities. The effect of the institutional age discontinuities we have found on formal
home care utilization rate should be read along with the fact that individuals aged 60 in
our population of interest are also more likely to receive some form of professional care in
an institution.

9   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 "disabled adult" by the French Welfare system? Our results suggest the answer is yes. Estimates show that being 60 or more is associated with a significant increase in the probability to receive home care utilization. This pattern seems to be driven by an increase in formal care utilization after age 60. On the contrary, the probability to receive assistance in the activities of daily living by relatives does not seem to be affected by the institutional architecture of home–care schemes, neither directly nor through substitution by formal care.

By exploiting an exogenous source of variation in benefit coverage – arbitrary institutional rules –, our identification strategy is not undermined by selection on unobservable characteristics. This contrasts with the existing studies on the effects of French long–term care schemes, whose results are sensitive to systematic differences in unobserved determinants of benefits. In addition, we contribute to the literature documenting the empirical importance of the precise design of public policies on individual behaviors and well–being, in particular in the field of long–term care schemes. Although in an indirect way, our results are also in line with the international literature showing that the out–of–pocket price of formal care affects care arrangements.

Our identification strategy has some limitations, one being that we are not able to control for living arrangements with cross–sectional data. We were able to show that the institutional threshold of age 60 shows up also in the probability to live in an institution. Given the definition of "residing in an institution" used to construct the survey, individuals below age 60 recorded as "living in the community" may be more likely to receive formal care in a long–term care facility, which is unobserved in HSM data.

Given the low precision of our estimates, additional tests should be conducted to assess their robustness. Nonetheless, our results can be seen as first suggestive evidence that the institutional choice of France to maintain an age threshold to distinguish between different social rights has substantial implications on the way individuals' difficulties in daily life activities are being compensated on a day-to-day basis. They lead to question the efficiency of home care subsidies, as the primary goal of extra expenditures compensating schemes, as stated in France, is to guarantee effective access to a given amount of professional care to impaired individuals.

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A APPENDICES

A.1 Extra expenditures-compensating schemes in France

The institutional landscape of disability and dependence compensating public schemes is quite complex in France. This Appendix aims at providing the non-expert reader the key features of each scheme. As explained in Section 2, those schemes fall into two official categories: *disability* subsidies on one hand, *dependence* or old-age subsidies on the other. Table A.1 on page 44 presents the main disability 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-testing domestic help to disabled individuals);
- *Prestation sociale d'aide ménagère aux personnes âgées* (means-testing 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-testing domestic help to the disabled may be granted to low-income PCH recipients.

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 Disabled 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, $\overline{h}_i$, is defined for each recipient i. For APA and PCH, the maximum amount of transfer for individual i, A_i, is defined as $A_i = \overline{h}_i \times TR$, where TR is the tariff of reimbursement. 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 producer price exceeds the tariff of reimbursement.[36]

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

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[36]Analysis of the distributive properties of the formula can be found in Bourreau-Dubois et al. (2014, 2015).

of the copayment, 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 term of human care, but no control of effective spending is made.

ACTP, PCH and APA can also be used as an indemnity for relatives providing care with the activities of daily living. For individuals receiving PCH, relatives other than children, parents and partner can be employed as family caregivers. The salary paid is eligible to the social security contributions and income tax rebates applied to over-the-counter home care employees. 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 euros per hour, while the French hourly net minimum wage is 7.51 euros). To lower the opportunity cost of informal caregiving for close relatives, the indemnity is increased to 5.51 euros when the caregiver has to stop her professional activity to assist her disabled relative. In any case, the monthly indemnity is capped to 940 euros per month (about 200 euros less than the monthly net minimum salary);

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, note that 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-testing domestic help given by departments is even conditional on not having any close relative able to perform domestic tasks for the individual.

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

Table A.1: Extra expenditures-compensating public schemes: subsidy to professional care.

Transfer	Age eligibility	Disability criteria	Type of transfer	Means-testing	Amount and ceilings	Copayment rate
ACTP	Under 60 OR 60 or over, with impairments present since 60th 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 if individual has no kids)	Minimum of €441 euros, maximum €882	No
PCH	Under 60 OR 60 or over, with impairments present since 60th birthday	Absolute restriction in one essential activity or two major restrictions in two essential activities (evaluation by Local Disability Houses (MDPH))	Monetary transfer, with control of use	No	Number of hours of assistance granted times hourly reimbursement price	20% for income over €25,978, 0% otherwise
Domestic help for the disabled (departments)	Under 60, with needs of assistance with domestic cores and no relative around able to provide it	80% incapacity rate and unable to work (evaluation Local Disability Houses (MDPH) and departments)	In-kind transfer	Yes (income below 9,600 euros 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 of assistance granted times hourly reimbursement price, with ceilings ranging from €563 for GIR 4 to 1,313 euros for GIR 1	From 0% (income below €8,870) to 90% (income above €35,342)
Domestic help for the dependent (departments)	65 or over (60 or over in some departments and if unable to work)	Needs of assistance with domestic cores and no relative around able to provide it (evaluation by departments)	In-kind transfer	No	Number of hours of assistance granted times hourly reimbursement price, up to 30 hours (for singles)	5%
Domestic help for the dependent (pension funds)	65 or over (60 or over in some departments and if unable to work)	Needs of assistance with domestic cores (evaluation by departments)	In-kind transfer	No	Number of hours of assistance granted times hourly reimbursement price, up to 3,000 euros per year	From 10% (income below €9,605) to 73% (income over €18,336)

NOTES: Income conditions are expressed in terms of net annual income for a single. These conditions are adjusted when the applicant lives in a couple. Transfers amounts and ceilings are expressed in euros per month. All figures are of 2015. Copayment rate schedule for pension-funds' domestic help is specific to each fund. Here, the schedule of the general fund (Cnav) is given.

A.2   Construction of home care utilization variables

HSM provides rich data on the caregivers declared by the respondents to the survey. 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 to the survey, 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.

Informal care

In the HSM questionnaire (module G, "family environment and help"), a specific question is asked to spot 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 A.2.

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 variable, Y_I, equals one) if she declares one or more non-professional caregiver(s) who is 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 3,036 individuals, 2,101 (62.2%) are coded as receiving informal care ($Y_F = 1$).

Table A.2: Informal caregivers in HSM survey

Original question (in French)	English translation
1) Screening of informal caregivers	
"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 disability, including those persons living with you?".
2) Type of assistance provided by informal caregivers	
"[prénom de l'aidant informel] vous aide-t-il (elle) pour: • les tâches de la vie quotidienne comme l'aide à la toilette, à l'habillage, l'aide aux tâches ménagères, ... ; • par une aide financière ou matérielle ; • en vous apportant un soutien moral." (les réponses multiples étant autorisées)	"[name of the informal caregiver] helps you: • with the tasks of daily living, like assistance with bathing, with dressing, help with house chores, ...; • with a financial or material assistance; • by providing you with some moral support." (multiple answers are allowed)

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

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 (module G). As shown in Table A.3, 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 precise profession 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, disability and dependence schemes are distinct from the Health insurance system. Their objective is to foster the utilization of home care services whose purpose is to assist individuals with ADL and IADL. Individuals with impairments, however, may also consume 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,... Nursing services may also intervene at home to assist individuals with impairments with personal care activities. 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 long-term care schemes.

In order to separate cure from care, we follow Gramain (2011). Some of the professional categories for formal caregivers that could be reported in HSM unambiguously refer to the 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 A.3.

Table A.3: Formal caregivers in HSM survey

Original question (in French)	English translation
1) Professions of formal caregivers in HSM survey	
"De qui s'agit-il ? 1. un (une) infirmière, un service de soins infirmiers ; 2. un(e) aide-soignant(e) ; 3. un autre professionnel paramédical (aide-soignante, ergothérapeute, kinésithérapeute, orthophoniste,...) ; 4. une aide à domicile, une aide ménagère, une auxiliaire de vie, garde à domicile, service de portage ; 5. un intervenant social (assistante sociale, éducateur spécialisé,...) : 6. un psychologue, psychomotricien,... ; 7. autres."	"Who is she?: 1. a nurse, a nursing care service; 2. an auxiliary nurse; 3. another paramedical professional (auxiliary nurse, occupational therapist, physiotherapist, speech therapist,...); 4. a home care worker, a domestic help worker, a home care assistant, a at-home delivery service; 5. a social worker (social caseworker, specialized teacher,...); 6. a psychologist, psycho-motricity specialist,...; 7. others."
2) Types of tasks performed by formal caregivers in HSM survey	
"Vous aide-t-il... (plusieurs réponses possibles) 1. pour les soins personnels (toilette, habillage, repas) ; 2. pour les tâches ménagères (faire le ménage, préparer les repas) ; 3. pour gérer votre budget, s'occuper des papiers et des démarches administratives ; 4. pour assurer une présence, une compagnie ; 5. en vérifiant ce que vous faites ; 6. pour aller voir le médecin, s'occuper de vos problèmes de santé ; 7. pour faire les courses, acheter les médicaments ; 8. dans d'autres activités (lecture pour les aveugles, traduction pour les sourds...)."	"Does she help you...?: 1. with personal care activities (grooming, dressing, meals); 2. with house chores (cleaning up, preparing meals); 3. to manage your budget, take care of paperwork and administrative procedures; 4. to ensure a presence, some company; 5. by cheking what you do; 6. to go and visit the doctor, by taking care of your health problems; 7. by doing the shopping, buying your drugs; 8. with other activities (reading for the blind, translating for the deaf...)."

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

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. These workers are legally not allowed to perform health care tasks, and we believe the two categories are sufficiently explicit for respondents to be aware that they do not relate to the medical sector.

In a second step, we use information on the frequency of intervention to construct a dummy equal to one if individual receives *frequent cure* at home. We consider that a given caregiver provides frequent cure when she comes more than once a day, 4 times a week or 15 times a month. 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. 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 impairments 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 professional assistance for the activities of daily living.

In addition, the data provides 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. This is not completely satisfactory, as a home care worker friend may well be employed as a regular formal caregiver and subsidized as such within home care subsidy schemes. Conversely, some informal caregivers with professional skills in home care or medical fields may have been declared as professional caregivers without the respondent mentioning their family or friendship ties. We assume these kinds of situations are be rare enough not to affect our results.

We end up with 868 individuals (28.6%) who receive formal home *care* ($Y_F = 1$) in our sample. We checked that this number was not excessively sensitive to the definition used to define a "frequent" intervention.

The lack of precision of the regime within which professional caregivers intervene (home care *versus* medical care) imposes some limitations to the empirical analysis. 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 good 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 (*Services de soins infirmiers à domicile*, SSIAD) may indeed partially substitute for some formal home care. This may be especially the case for individuals who do not have access to home care subsidies or who incur a high copayment 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 may provide an incentive for beneficiaries and their general practitioner to substitute nursing care to formal home care. Ideally thus, we would take into account the assistance provided by nursing care (as a control or, more robustly, as an additional, simultaneous outcome variable) in our empirical strategy.

Secondly, the lack of precision 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 limits our empirical strategy in two ways. First, 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 addition, our estimated coefficients may suffer from an omitted variable bias, if personal care provision by nurses correlates with the age 60 barrier. This might be the case, in particular as at home nursing services were restricted to the elderly until 2004, when they were opened to disabled or chronically–ill individuals below 60. As of 2008, individuals aged 60 or more still were still allocated 95% of the capacities of at home

nursing services (Bertrand 2010). Although this over–representation may simply reflect the worst functional state of the elderly population, it is also possible that at the moment of HSM survey general practitioners would still tend to prescribe more often at home nursing services to their elderly patients than to the younger ones.

The French Ministry of Health is currently conducting 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 individuals with impairments, the benefits received and their out–of–pocket payments. Unfortunately, only individuals aged 60 or more will be surveyed. The institutional barrier at 60 has also effects on the data available on the disabled population, as administrative and survey data collection tend to be done separately for the disabled adults and for the dependent elderly.

A.3   Density of the running variable

Although there is little scope for civil age manipulation in a national survey, we investigate the existence of any discontinuity in the density of the running variable of our RD setting. Figures A.1 and A.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 A.3 and A.4 respectively represent the *sample* and the *population* size by age of individuals aged 50 to 74 in 2008.

The age distribution in the two samples exhibits large variations. In particular, we notice a drop of the sample size between age 59 and age 60, and a sort of "missing mass" at ages 65 to 67. Since HSM and HSI were stratified, with oversampling of specific populations, it is better to retrieve the age distribution in the population using the survey weights. Given that HSM and HSI were not conducted in the same year, we focus on the population living in the community. Considering that the population in institution represents a small share of the total population, we compare the age density of the community-living population, displayed in Figure A.4, with the French legal population by age.[37]
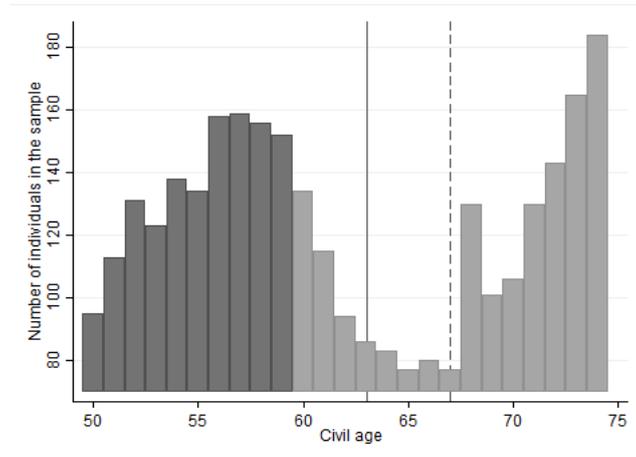
Population size exhibits a spike at age 59, and a marked drop at age 67. Some rationale for these discontinuities date from World War II: individuals aged 67 in 2008 were born in 1941, a year in which the number of births fell dramatically in France. On the contrary, individuals aged 59 in 2008 were 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). 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 our 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. The relatively small sample sizes around age 65 is nonetheless problematic, as it reduces the precision of local estimations around that age.

HSM being cross–sectional, we have to rule out cohort effects in our identification strategy. "WWII cohorts" may appear specific *a priori*. But in terms of retirement decisions for example, the cohorts born before, during and just after WWII have similar behaviors.

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[37]Legal populations are provided by Insee: http://www.insee.fr/fr/ppp/bases-de-donnees/donnees-detaillees/bilan-demo/pyramide/pyramide.htm?lang=fr&champ=fe.

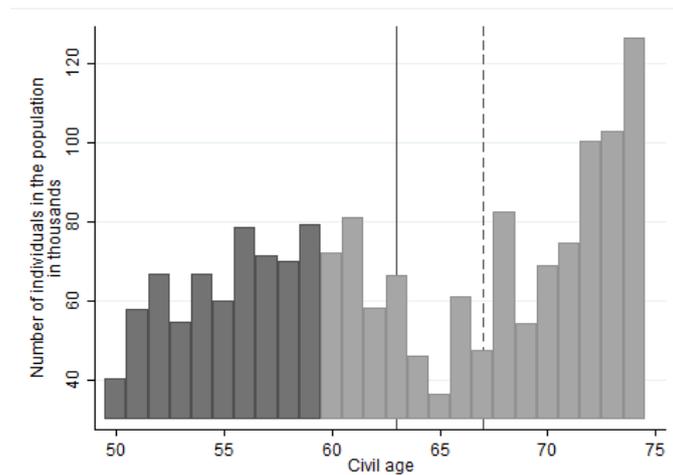Figure A.1: Sample size in the community sample of interest, per civil age

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 = 3,064 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 A.2: Population size corresponding to the community sample of interest, per 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 = 3,064 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.

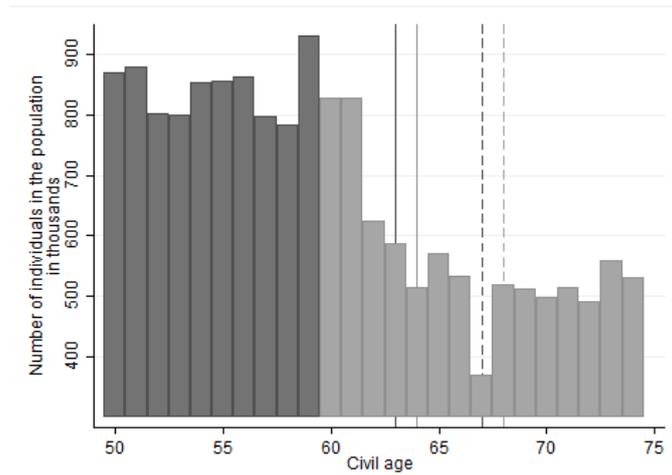Figure A.3: Sample size in the matched institution/community survey, per civil age
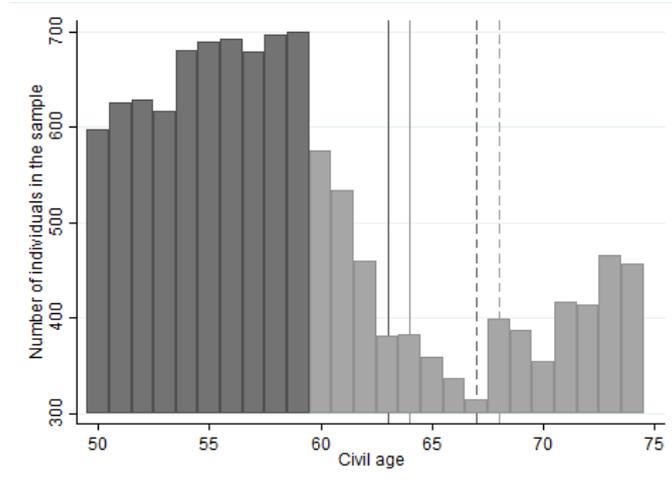
SAMPLE: Representative sample of the French population aged 50 to 74 in 2008 (N = 12,836 individuals).
SOURCE: Insee–Drees, HSM–HSI 2008/2009 matched sample.
NOTES: The dashed and solid lines respectively signal the cohorts affected by beginning of the baby–boom and by the drop in the number of births due to World War II.

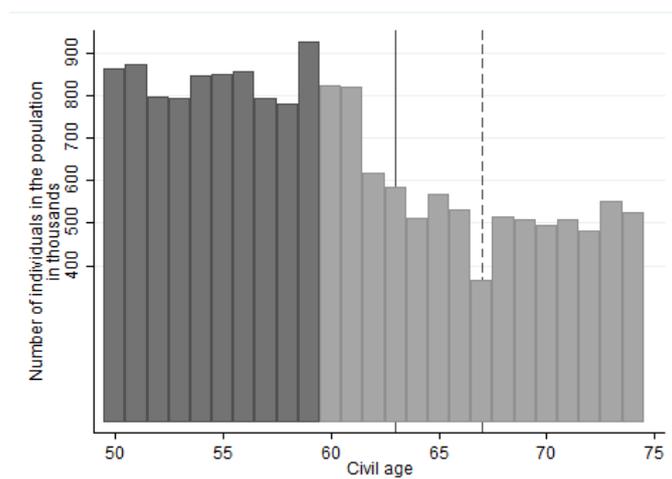Figure A.4: Population size in the matched institution/community survey, per civil age

SAMPLE: Representative sample of the French population aged 50 to 74 in 2008 (N = 12,836 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.

Figure A.5: Population size in community survey, per civil age

A.4 Density of some control variables

Standard checks of the validity of the RD approach include studying the conditional expectation of the covariates (Imbens & Lemieux 2008). 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 disability schemes may be confounded with the effect of an other unobserved change happening at age 60. At the same time, as reminded by (Imbens & Lemieux 2008), "a discontinuity in the conditional expectation of the covariates does not necessarily invalidate the [RD] approach." (p. 18).

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.
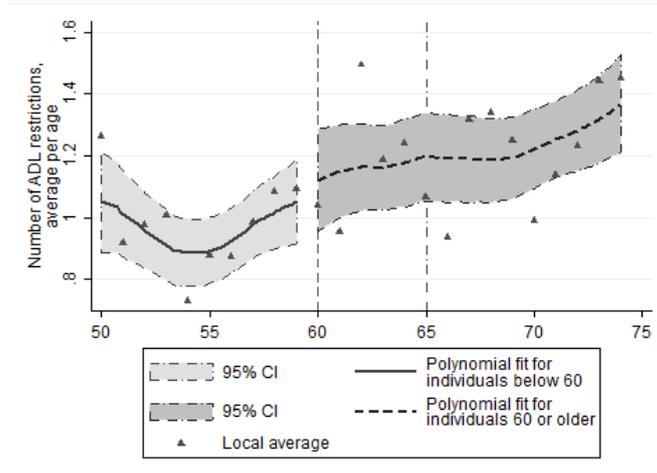
Prevalence of impairments around the threshold

As differential utilization rates around the age threshold may arise because of differential epidemiological conditions, we check the evolution of prevalence of restrictions in ADL and IADL around age 60. Figure A.6 displays the average number of ADL individuals have difficulties to perform alone by civil age groups. In order to detect a discontinuity around age 60, a flexible polynomial in age is fitted on each side of the institutional threshold.

The number of restrictions in ADL increases starting at age 55, with no marked difference around age 60. On the contrary, the number of restrictions in non-cognitive IADL increases sharply at 60 (Figure A.7). The pattern is quite similar for cognitive IADL, although the increase after age 60 is more gradual: the number of restrictions increases markedly between 60 and 64, stabilizes and then starts increasing again from age 70 (Figure A.8).

We may wonder whether the increase in prevalence is partly induced by the institutional discontinuities at ages 60 and 65: if disability schemes make individuals more likely to receive a transfer and get professional care, they may in turn become more aware of their restrictions, and more likely to declare them in the survey. Retirement, which usually happens between 60 and 65 in France, may also have adverse consequences on physical and mental health (Dave et al. 2006).

Figure A.6: Severity of impairments around the age 60 threshold: average number of ADL individuals have difficulties to perform, by civil age

Figure A.7: Severity of impairments around the age 60 threshold: average number of non–cognitive IADL individuals have difficulties to perform, by civil age.

Figure A.8: Severity of impairments around the age 60 threshold: average number of cognitive IADL individuals have difficulties to perform, by civil age.

Notes: Dots represent average number of cognitive IADL by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.

Density of employment status and income

Figure A.9: Work status around the age 60 threshold: proportion of individuals working, by civil age
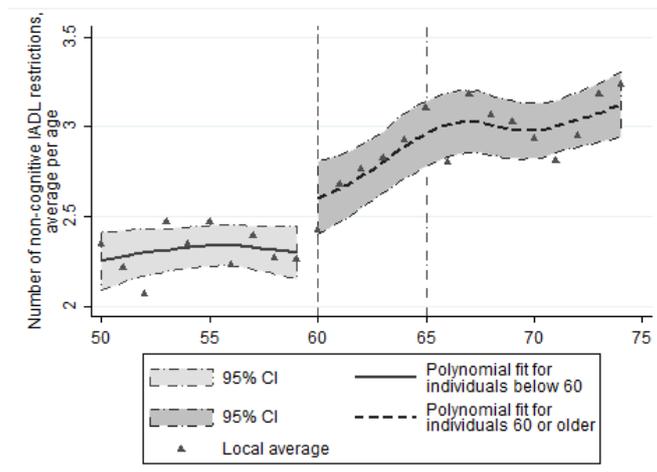

SAMPLE: French individuals aged 50 to 74, living in the community and having difficulties to perform alone at least one ADL or IADL (3,036 individuals).
SOURCE: Insee-Drees, HSM 2008.
NOTES: Dots represent average number of ADL by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.

Figure A.10: Retirement status around the age 60 threshold: proportion of retired individuals, by civil age.
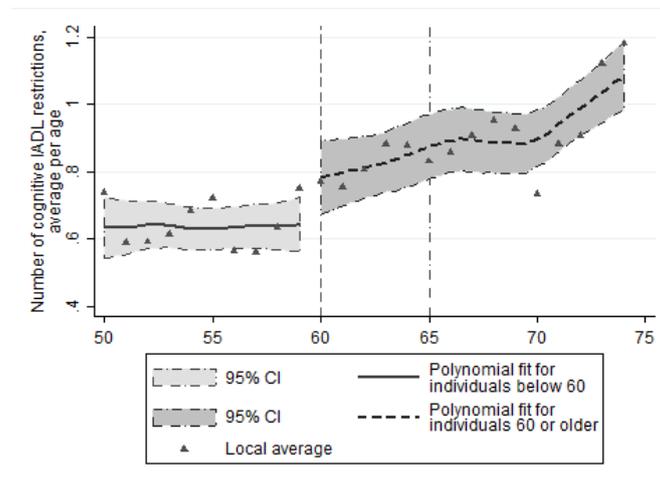

SMALL CAPS SAMPLE: French individuals aged 50 to 74, living in the community and having difficulties to perform alone at least one ADL or IADL (3,036 individuals).
SOURCE: Insee-Drees, HSM 2008.
NOTES: Dots represent average number of non–cognitive IADL by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.

Figure A.11: Household income around the age 60 threshold: average household income per consumption unit, by civil age.
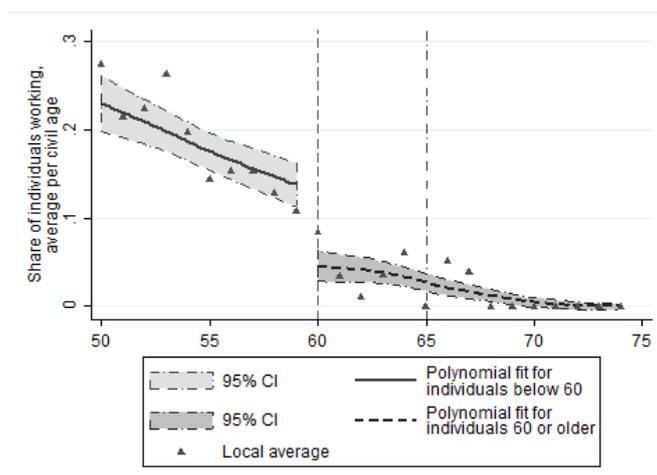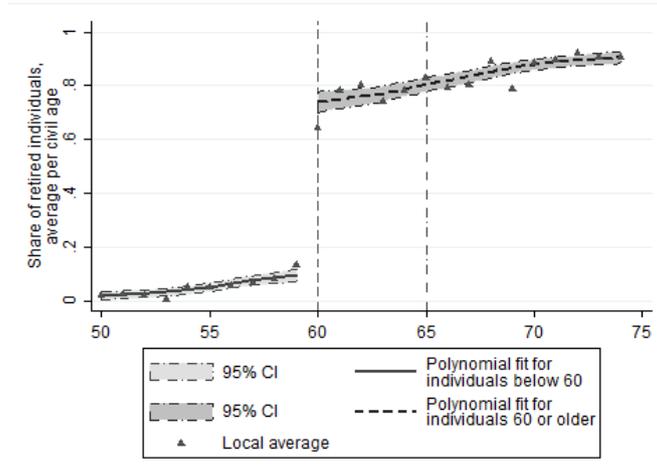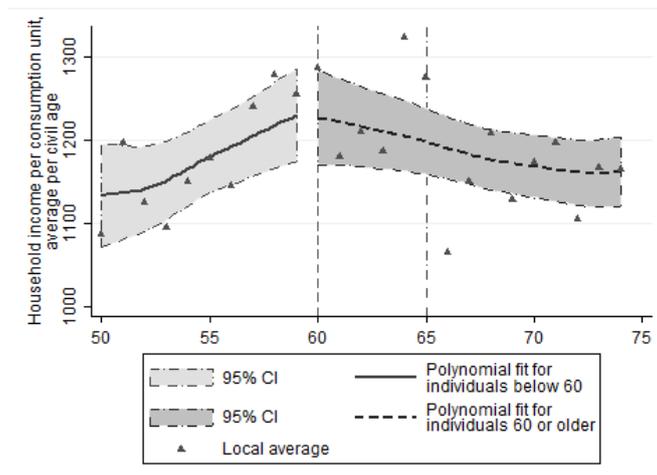

SAMPLE: French individuals aged 50 to 74, living in the community and having difficulties to perform alone at least one ADL or IADL (3,036 individuals).
SOURCE: Insee-Drees, HSM 2008.
NOTES: Dots represent average number of cognitive IADL by civil age and include varying numbers of individuals. Polynomials in age are fitted using individual observations.

A.5 Impairments, socio–demographic and family characteristics

Additional information on the covariates

Informal and formal care utilization depends on various factors beyond home care public subsidies. In order to increase the precision of our estimates, sex is included in our specification, as elderly women have been shown to be prone to receiving less informal care.[38] Second, severity of impairments are likely to affect the demand for paid home care services and the propensity of relatives to provide some assistance. We include as control variables 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[39] and finding route. This will allow to control more accurately for differences in the type of impairments 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 provide a good indicator of the severity of an individual's impairments.[40] To better account for potential heterogeneity in care needs, we control also for physical, sensory and cognitive functional limitations (Cambois & Robine 2003). Finally, we include the self-declared health status, coded in three levels.

A second range of controls include the level of education and the monthly household income per consumption unit, as well as the status relative to employment with a dummy for employment (additional dummy for being retired does not add explanatory power). To take into account potential differences in professional home care services local supply,

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[38]Demographics partly explains 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 seem to play a role.

[39]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 impairments, we exclude it from our index of cognitive impairments.

[40]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 limitations in functionings. Similarly, Stabile et al. (2006), Rapp (2011), Barnay & Juin (2015) find that increased availability of publicly financed home care has a positive effect on health status.

area of residence is included, coded in 5 categories.[41] As disability and dependence policies are implemented at the local level in France, we include a dummy for each department (*département*).[42] We also include a dummy for living oversea, as public schemes and, more largely, long-term care features may differ from the situation in metropolitan France.

We then include some family characteristics that reflect the existence of potential care-givers and that could account for 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 day-to-day the activities (Horowitz 1985, Bonnet et al. 2013).[44] We also control for the fact of any siblings alive, and we add a dummy equals to one if individual has at least one sister. Having a partner alive may increase informal care utilization while decreasing formal home care utilization; we may also predict that having a partner alive but aged 75 or more may generate economies of scale in care provision, at the extensive margin at least (the child that comes and help her elderly father may also help her younger mother by doing the cleaning for both parents). For the youngest individuals of the sample, parents are also potential caregivers: we thus include a dummy equal to one when the individual has her father or mother alive.[45]

One last set of covariates include co-residence status of parents and of the partner, as well as the geographical distance of the closest child (co-residence, living in the same city, living somewhere else in France, living abroad). The rationale for their inclusion and the potential econometric issues they raise is discussed further below.

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[41]These 5 categories are: living in a rural area, living in a urban area with less than 20,000 inhabitants, 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.

[42]Field observations (Billaud et al. 2012) and a quantitative survey on local governments[43] have shown that access to APA, evaluation of needs and computation of the copayment vary from one department to the other. Although the main parameters of APA subsidy are defined at the national level, local governments retain non-negligible 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 disability and dependence schemes.

[44]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).

[45]Ages of parents and of siblings were also tested but did not appear to affect significantly home care utilization.

Results on covariates

To check the consistency of our specification with previous literature, Tables A.4 and A.5 display the coefficients estimates of all covariates included in our model.

Being a woman increases the propensity to use formal care. Declaring a good health status has a paradoxially 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 increases with the number of ADL affected. The effect is opposite for informal care utilization. Having cognitive limitations increases professional care utilization.

Type of area of residence has a only limited effects on care utilization rates. Dummies for departments (not reported in results tables) are jointly significant, confirming the existence of inter–departmental differences. Having a tertiarty 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 a 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 impairments are less able to rely on family solidarity.

Consistently with past literature, informal care provision is positively associated with having daugthers or sisters, having a partner alive, or having a child or a parent co–residing. Interestingly, the effects of these same variables on the propension to use formal care is usually of the oppoiste sign.

Table A.4: Informal care and formal care utilization as simultaneous decisions: Results on covariates (1/2).

	Average partial or marginal effects	
	Informal care	Formal care
60^+	-0.020	0.098
	(0.035)	(0.114)
Woman	0.014	0.051***
	(0.013)	(0.015)
Being in bad health	0.012	-0.015
	(0.014)	(0.017)
Being in correct health	Ref.	Ref.
Being in good health	0.017	0.084**
	(0.034)	(0.031)
Having ADL restrictions	0.127***	-0.050**
	(0.019)	(0.048)
Number of ADL restrictions	-0.020**	0.022***
	(0.029)	(0.005)
Number of non–cognitive IADL	0.066***	0.054***
	(0.005)	(0.005)
Number of cognitive IADL	0.013	0.009
	(0.009)	(0.007)
Physical functional limitations	0.052*	0.000
	(0.028)	(0.030)
Cognitive functional limitations	-0.006	0.040**
	(0.012)	(0.016)
Sensory functional limitations	-0.006	-0.000
	(0.011)	(0.015)
Rural area	0.042**	0.020
	(0.016)	(0.034)
Lives in small size urban area	-0.012	-0.015
	(0.030)	(0.031)
Lives in medium size urban area	Ref.	Ref.
Lives in large urban area	0.927	-0.040*
	(0.098)	(0.022)
Lives in Paris	-0.034	0.045
	(0.078)	(0.040)
No education	-0.002	-0.022
	(0.019)	(0.020)
Primary education		Ref.
Secondary education	-0.010	0.024
	(0.018)	(0.017)
Tertiary education	-0.029	0.140***
	(0.047)	(0.040)
Is employed	-0.040**	-0.018
	(0.017)	(0.023)

End of covariates in following table

Table A.5: Informal care and formal care utilization as simultaneous decisions: Results on covariates (2/2)

	Average partial or marginal effects	
	Informal care	Formal care
Beginning of covariates in previous table		
First income quartile	0.013	-0.005
	(0.019)	(0.013)
Second income quartile	*Ref.*	*Ref.*
Third income quartile	0.026*	-0.001
	(0.015)	(0.017)
Fourth income quartile	0.012	0.094***
	(0.014)	(0.017)
Has any child	-0.047**	-0.032
	(0.018)	(0.031)
Number of children	0.010*	-0.002
	(0.005)	(0.004)
Proportion of girls	0.048**	-0.062**
	(0.005)	(0.020)
Having a co-residing child	0.096***	-0.090***
	(0.016)	(0.014)
Having a child living nearby	0.023	-0.010
	(0.014)	(0.025)
Having a partner alive	0.230***	0.003
	(0.066)	(0.098)
Having a partner 75 or older	-0.055*	0.075**
	(0.033)	(0.026)
Partner is co-residing	0.010	-0.176
	(0.065)	(0.111)
Having a parent alive	-0.004	-0.001
	(0.014)	(0.010)
Having a parent co-residing	0.140***	-0.141**
	(0.030)	(0.044)
Having any siblings	0.009	0.003
	(0.022)	(0.020)
Having sisters	0.053**	-0.041**
	(0.020)	(0.020)
ρ	-0.455***	
Age effects	Linear	
Observations	3036	
AIC	5645.1	
BIC	5909.9	

NOTES: Standard errors in parentheses, clustered at the survey stratum level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. 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 bivariate Probit model. Estimations use data from HSM survey. The specification includes departmental fixed effects.

A.6 Robustness checks

Alternative windows

Table A.6: Home care utilization around age 60 threshold: Robustness checks – alternative windows

	Average partial effect of being 60^+					
Outcome	(1)	(2)	(3)	(4)	(5)	(6)
$P(Y_I = 1 \| Y_F = 1)$	0.065**	0.042**	0.057**	0.033*	0.028	0.033
	(0.027)	(0.016)	(0.029)	(0.018)	(0.032)	(0.060)
Age effects	None	None	None	None	None	None
Controls	No	Yes	No	Yes	No	No
Ages included	50–74	50–74	55–69	55–69	55–64	57–62
Observations	3015	3015	1660	1660	1182	707
AIC	2901.2	2309.9	1623.1	1304.6	1235.4	768.8
BIC	2913.2	2568.4	1633.9	1526.6	1245.6	777.9

NOTES: Robust standard errors in parentheses, clustered at the survey stratum level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using the finite–difference method. Estimation by a Probit model. Estimation by a Probit model. Estimations use data from HSM survey.

Table A.7: Formal and informal care utilization around age 60 threshold: Robustness checks – alternative windows

	Average partial effect of being 60^+					
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
$P(Y_I = 1)$	-0.007	-0.020	-0.000	0.014	0.023	-0.026
	(0.051)	(0.035)	(0.067)	(0.046)	(0.082)	(0.090)
$P(Y_F = 1)$	0.059**	0.036	0.044*	-0.001	0.000	-0.017
	(0.026)	(0.028)	(0.026)	(0.027)	(0.029)	(0.030)
$P(Y_I = 1, Y_F = 1)$	0.036	0.017	0.028	0.003	0.006	-0.017
	(0.024)	(0.022)	(0.030)	(0.023)	(0.033)	(0.023)
Age effects	Linear	Linear	Linear	Linear	Linear	Linear
Controls	No	Yes	No	Yes	No	No
Ages included	50–74	50–74	55–69	55–69	55–64	57–62
Observations	3036	3036	1719	1719	1260	801
AIC	7192.7	5645.1	4008.6	3055.4	2876.6	1824.0
BIC	7246.8	5909.9	4057.7	3284.2	2922.9	1866.2

NOTES: Robust standard errors in parentheses, clustered at the survey stratum level; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using the finite–difference method. Estimation by a Probit model. Estimation by a bivariate Probit model. Estimations use data from HSM survey.

A.7   Probability of living in an institution

Table A.8: Probability of living in an institution around the age 60 threshold.

	Dependent variable: Lives in an institution
	(1)	(2)	(3)	(4)	(5)	(6)
60$^+$	-0.031***	0.042**	0.038*	0.012	-0.018	0.043***
	(0.007)	(0.013)	(0.021)	(0.031)	(0.050)	(0.013)
Woman						-0.045***
						(0.006)
Having a chronic disease						-0.042***
						(0.010)
Health is very bad						-0.109***
						(0.009)
Health is bad						-0.086***
						(0.008)
Health is rather good						*Ref.*
Health is good						0.059***
						(0.010)
Health is very good						0.006
						(0.016)
No limitations						*Ref.*
Mild limitations						0.077***
						(0.011)
Strong limitations						0.249***
						(0.012)
Polynomial in age	None	Linear	Quadratic	Cubic	Degree 4	Linear
Observations	12784	12784	12784	12784	12784	12784
AIC	11544.658	10826.601	10802.869	10786.753	10789.393	10789.092
BIC	11559.570	10901.161	10884.885	10876.224	10893.777	10908.387

NOTES: Robust standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using the finite–difference method. Estimation by a Probit model. Estimations use data from the HSM-HSI matched dataset.

Table A.9: Robustness checks: Probability of living in an institution around age 60 – alternative windows.

	Dependent variable: Lives in an institution			
	(1)	(2)	(3)	(4)
60^+	0.043***	0.038**	0.020	0.010
	(0.013)	(0.017)	(0.019)	(0.024)
Polynomial in age	Linear	Linear	Linear	Linear
Controls	Yes	Yes	Yes	Yes
Window (ages included)	60–74	55–69	55–64	57–62
Observations	12784	7556	5769	4011
AIC	10786.753	6119.338	4695.335	3207.715
BIC	10876.224	6202.499	4775.258	3283.277

NOTES: Robust standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.01$. Average partial effects (APE) for binary variables are computed using the finite–difference method. Estimation by a Probit model. Estimations use data from the HSM-HSI matched dataset.