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Abstract

In a context of population ageing, public policies encourage the utilization of professional home care for the elderly living in the community. This chapter studies the determinants of professional home care use by the disabled elderly in the French context. It focuses on the effects of the regulation of the supply and the generosity of public financing. We use departmental variations in both the regulation of providers and the implementation of the main program devoted to the disabled elderly, the APA policy. We exploit an original survey on departmental practices matched with the HSM survey to estimate the determinants of formal care use, at the extensive margin. We find no effect of the departmental generosity while, on the supply side, when non-regulated providers — whose quality is uncertain and price is lightly regulated — dominate the market, the disabled elderly have a lower probability to use formal home care. Our results contribute to discuss both the questions raised by the decentralization of a national policy and the recent reform of the home care sector requiring all home care structures to be regulated.

JEL Classification: D12, H75, I18, J14

Keywords: long-term care, home care, supply regulation, decentralization.

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1 Introduction

OECD countries are facing the aging of their population, which results in an increasing demand for long-term care. Most disabled elderly keep on living in the community rather than entering nursing homes (Colombo et al., 2011). In this demographic context, public policies foster the utilization of formal care, defined as the provision at home of basic domestic help and personal care by a paid professional caregiver. In France, the main long-term care program, the APA policy, is granted to the disabled elderly in order to help them financing the consumption of formal care services when they keep on living in the community. In 2015, it counted 748,000 community-dwelling beneficiaries and amounted to an overall public spending of €3.2 billions (0.15% of GDP).[1] The implementation of the program is decentralized to local authorities, the departmental councils. Their role is of utmost importance regarding both the generosity of the allowance and the regulation of the home care providers. According to field studies and public reports, it results in substantial differences in the costs and the availability of professional care across departments (Billaud et al., 2012; Hege et al., 2014; Bourreau-Dubois et al., 2015; Gramain et al., 2015; Observatoire National du domicile, 2018).

We use these departmental variations to study the determinants of formal care use by the disabled elderly in the French context. Our question is twofold. Does the demand for formal care depend on the generosity of public financing? Is it sensitive to the regulation of the home care supply? To the best of our knowledge, the latter question has never been addressed in the literature, despite the existing heterogeneity in the regulation of care providers in France (Devetter et al., 2012). A few papers have investigated the effect of public generosity, using territorial variations in long-term care programs. Stabile et al. (2006) find that, in Canada, the generosity level of provinces, measured by the yearly spending per individual aged 65 and older, increases formal care utilization and decreases informal caregiving. In France, the APA take-up has been found to increase with the departmental generosity, measured by the rate of APA beneficiaries in the elderly population and the average subsidy rate (Arrighi et al., 2015). Barnay and Juin (2016) use the departmental proportion of APA beneficiaries in the elderly population to instrument formal care consumption and study its effect on mental health.

We exploit an original departmental survey to describe departmental practices regarding long-term care. Matched with the HSM survey (DREES and INSEE, 2008), it makes it possible to study both the individual and departmental determinants of formal care use (at the extensive margin). Departmental determinants are the generosity of the allowance, measured by the way the department council computes the hourly subsidy, and the market share of regulated providers compared to the others. We discuss the exogeneity of these indicators. We find no effect of the generosity of the policy while, on the supply side, the disabled elderly have a lower probability to use formal care when non-regulated providers, whose price and quality are little regulated, dominate the market.

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[1]Source: DREES (2015b).

Though the interpretation of results needs to be cautious, our work has several policy implications. These results first contribute to the debate on the difference of treatment that can result from the decentralization of a national policy and questions the need for further central control. Moreover, they highlight the determinants of formal care use, especially those that depend on public policies, namely the public generosity and the supply regulation. This understanding is needed to increase the efficiency of the long-term care system. Indeed, formal care used has been found to have positive effects on the health of the elderly and it also affects their relatives by relieving the burden of informal care. According to our results, the 2016 reform of the home care program, which requires all providers to be regulated, could help increasing home care utilization.

2 Institutional context

2.1 Financing of the demand

The French APA program[2] aims at fostering the utilization of professional care services by the elderly requiring assistance in the activities of daily living. To be eligible, an individual must be at least 60 years old and recognized as disabled. The assessment of the disability level is performed by a team from the departmental council, made of medical professionals and/or social workers. The assessment is done using a national standardized scale ("grille AGGIR"). It allows the evaluation team to assign the individual to a disability group ("Groupe Iso-Ressources", or GIR). Individuals found to be moderately (GIR–4) to extremely disabled (GIR–1) are eligible for APA, while the least severely disabled (GIR–5 or –6) are not. If the individual is recognized as eligible, the evaluation team defines the maximum number of hours of care that can be subsidized given her limitations, called the "care plan volume".[3] Departmental heterogeneity has been proven regarding eligibility decisions and hours open to public financing (Arrighi et al., 2015).

We focus on another dimension of the generosity of the program that depends on the departmental council. For each hour consumed within the care volume, the out-of-pocket (OOP) price of care is lowered by the APA subsidy.[4] By law, the OOP price depends on the copayment rate of beneficiaries, which is a linear function of the individual's income.[5] However, the central law does not make clear how the final OOP payment is computed.[6]

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[2]In our work, we describe the scheme before the 2016 reform. This reform has affected the copayment scheme and the regulation of providers. We will discuss the potential effects of the last point with our results.

[3]The monetary equivalent of the care plan volume (hours of the care plan converted in euros using a tariff fixed by the department) must not exceed a legal ceiling, which is set nationally and depends on the disability level of the beneficiary.

[4]The financing of the APA allowance by central government and departments is detailed in Appendix 7.1.A.

[5]The participation rate is zero for low-income individuals and it is capped to 90% for high-income individuals.

[6]To illustrate our point, one can see that the official webpage on the OOP payment in the APA scheme only mentions the copayment rate depending on income. See (in French): https://www.service-public.fr/

Three types of practices are observed : either the copayment is applied to the provider price (rule 1), either it is applied to a lump sum price, lower than the provider price. In this second case, the difference between the price and the lump sum price is supported by the beneficiary (rule 2) or it is paid by a departmental specific grant (rule 3). System 1 summarizes these possibilities. Rule 3 is the most generous as it yields the lower OOP payment[7] while Rule 2 is the less generous.

$$OOP_i = \begin{cases} c_i.p_i & \text{(Rule 1)} \\ c_i.t + (p_i - t) & \text{(Rule 2)} \\ c_i.t & \text{(Rule 3)} \end{cases} \tag{1}$$

with OOP_i the OOP price paid by the individual; c_i the copayment rate depending on I_i individual i's income ($c_i = c(I_i)$); p_i the provider price and t the lump sum price set by the department.

Using the average value for the copayment rate, price and care plan volume in the sample of APA beneficiaries used in Chapter 2, Appendix 7.1.B illustrates the variation in monthly OOP payments that can result from the utilization of one rule or another. In this case, using rule 2 rather than rule 3 would create a difference of €100 per month, or about 8% of the average monthly income. The minimum difference (using rule 1 or rule 3) is of €22, or 2% of average income.

2.2 Regulation of the supply

In France, there is one key distinction in the home care sector: home care providers can be regulated by the departmental council or not. Regulated providers receive a special authorization from the departmental council to enter the market. They have to meet quality standards, including certifications and regular external evaluations. Their price is fixed by the departmental council on the basis of their previous costs of provision (Gramain and Xing, 2012). The other providers, that we call non-regulated providers, are lightly regulated. There are two types of non-regulated providers: non-regulated structures and over-the-counter workers.[8] Non-regulated structures have lower quality requirements and they are relatively free to set their price.[9] Over-the-counter workers contract directly with the consumer who is free to set the hourly wage provided that she complies with general labor law. Overall, the uncertainty regarding quality and price is higher when the provider is not regulated.

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[7]Provided that $t < p$, which is systematically the case.

[8]In the General introduction of the thesis, non-regulated providers only refers to non-regulated structures. Here, the term is used in opposition to regulated structures and implies both non-regulated structures and over-the-counter workers.

[9]Restrictions on yearly price evolution are enacted at the national level.

There are few empirical elements on the market segmentation between regulated and non-regulated providers. All providers can intervene on both publicly and privately financed formal care, and serve consumers with different disability levels. In the department studied in Chapter 2, severe disability levels are less frequently observed among individuals served by a regulated provider. The determinants of the choice of a provider might depend on the availability of providers (serving her municipality), the price and other unobserved characteristics of the provider.[10]

To give a visual insight of variations existing in both the financing of the demand and the regulation of the supply, Figure 1 shows the differences existing in the OOP payments borne by an APA beneficiary with a copayment of 20%[11] and served by the biggest regulated provider in the department.[12] Differences result from the choices of departmental councils regarding the computation formula as well as differences in provider prices. In the last group of our distribution divided by quartiles, the hourly OOP payment is expected to be between €3.7 and €4.1 while in the first group, it is between €4.4 and €6.2. The Figure also reveals differences existing regarding the regulation of the supply, as some departments declare they do not have any regulated provider.

3   Data and modeling of the demand

3.1   Description of departmental practices

The "*Territoire*" survey (LEDa-LEGOS and CES, 2012) was implemented by a team of sociologists and economists. Field studies were first conducted in eight departmental councils to observe their practices regarding long-term care. They aim at evaluating the latitude they have in the implementation of the policy. Their results underline the variety existing in the organization of the policy (Billaud et al., 2012; Gramain and Xing, 2012).[13] They have been used to construct a questionnaire that was sent to the 96 metropolitan departmental councils in 2012.[14] 71 departmental councils returned the questionnaire. Appendix 7.2.A compares the characteristics of respondents and non respondent departments with respect to sociodemographic characteristics and social policy indicators and does not find significant differences between the two groups.

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[10]Appendix **??** in Chapter 2 studies the determinants of the choice of a provider with a low price, but among consumers served by a regulated provider.

[11]It corresponds to the average copayment rate of APA beneficiaries in the administrative data from the APA program *"Remontées individuelles"* (DREES, 2011).

[12]We use the departmental survey "SolvAPA". It is not the departmental survey we use in this paper as we do not have concomitant individual information, but it is presented in Section 5 as an additional source of information.

[13]In particular, on the basis of interviews with the persons in charge of the management of the allowance, the researchers have identified the existence of the different computation formulas presented in the preceding section.

[14]The questionnaire can be found here (in French): http://modapa.cnrs.fr/questionnaire.pdf.

Figure 1: Hourly out-of-pocket payments of an APA beneficiary served by the biggest regulated provider in the department
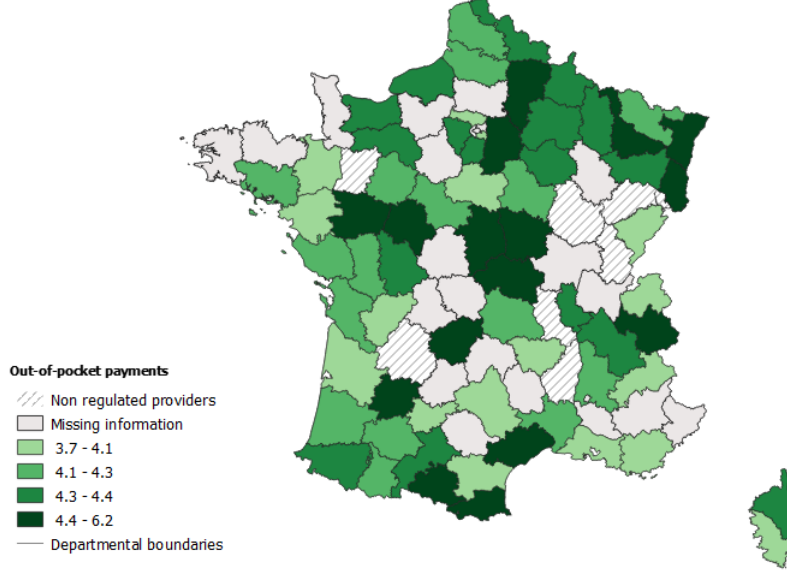
We use this original survey to get indicators of both the generosity of public financing and the importance of the regulation of the supply in the department. First, we isolate departments that have no regulated providers (7 departments). They have a limited intervention on the formal home care sector, not controlling for prices or quality. They use rule 2 to compute the allowance for all (non-regulated) providers. We then measure departmental generosity with the rule used to compute the allowance when the beneficiary is served by a regulated provider.[15] The classical case is when departmental councils use rule 1. A few departments use the third rule for regulated providers. As it implies additional spending for the departmental council, we consider it is a "generous" policy. Interestingly, this indicator of policy generosity does not depend by construction on the distribution of the population nor on its actual consumption, but directly shows the decisions of the departmental councils. Previous indicators used in the literature come from departmental policies and actual consumption of beneficiaries. For instance, the average subsidy per beneficiary depends on the copayment of APA beneficiaries, on the care plan volume and on the share of the care plan that is actually consumed.

Regarding the regulation of the supply, we use the share of APA hours that is provided by regulated providers, as a proxy for the market power of regulated in the home care sector

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[15]Departments can use different rules depending on the provider status. Quasi-systematically, beneficiaries served by non-regulated providers are subsidized using rule 2. Variations are observed regarding the rule used for beneficiaries served by regulated providers.

of the department. Either non-regulated providers are dominating the market, or there is competition, or regulated providers providers dominate the market.[16] This indicator does not depend directly on the number of individuals consuming formal care, nor on the volume they consume.

Appendix 7.2.B compares the characteristics of departments in each category. We report here significant differences. In generous departments, the population is, on average, younger and wealthier than the population in other departments. In departments where non-regulated providers dominate the market, the population is, on average, younger, with a lower rate of the elderly population receiving the APA. Interestingly, departments without regulated providers are not different from the majority of departments in other categories. We thus observe a correlation between some departmental practices and the characteristics of the demand. We extensively discuss the endogeneity issues in Section 5 and, in the absence of an alternative empirical strategy confirming the exogeneity of our indicators, we will remain cautious in the causal interpretation of our results.

Table 1 summarizes the distribution of departments according to their practices. Each computation rules is represented in every level of supply regulation, suggesting that choices are made independently. The size of categories, though, are unbalanced, with some cases being much more frequent than others. Thus, we will evaluate the effects of marginal practices compared to the more frequent case (classical with dominance of regulated providers).[17]

Table 1: Distribution of departmental practices

	No regulated providers	Classical (rule 1)	Generous (rule 3)	Total
No regulated providers	7	-	-	7
Dominance of non-regulated providers	-	2	1	3
Competition	-	25	3	28
Dominance of regulated providers	-	30	3	33
Total	7	57	7	71

SAMPLE: 71 metropolitan departments respondents to the survey.
SOURCE: *Territoire* survey (LEDa-LEGOS and CES, 2012)
NOTES: Columns correspond to the generosity of the hourly APA subsidies. Lines correspond to the importance of the regulation in the home care sector.

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[16]The question in the questionnaire is: "What is the proportion of APA hours served by regulated providers?". Departmental councils choose either less of 1/3, between 1/3 and 2/3, more than 2/3 of APA hours.

[17]Appendix 7.2.C shows the distribution of the observations in our sample across categories.

3.2 A sample of disabled elderly

These indicators are used to supplement the HSM survey (DREES and INSEE, 2008). Collected in 2008, this national survey focuses on the disabilities and health limitations encountered by the French population. Our sample of interest gathers together individuals aged 60 or more, who declare having at least one restriction in the activities of daily living, either essential or instrumental (ADL or IADL)[18].

We use as a variable of interest the variable indicating if the individual receives formal home care.[19] This variable comprises both privately and publicly funded formal care. It includes care provided either by regulated or non-regulated providers.

We could alternatively have focused on the variable indicating if the individual receives the APA (or, at least, has applied to receive it). Indeed, our demand indicator is likely to directly influence the take-up of the program. The choice of the broader variable of formal care use is motivated by two reasons. The first is technical: the variables related to the APA program in the HSM survey have been shown to underestimated the actual use of the APA program (Tenand, 2016). The weighted number of elderly declaring they receive the benefit in the survey is much lower than the actual number of APA beneficiary in 2008. In our sample of disabled elderly, among formal care users, only 17% declare they are APA beneficiaries. The second argument relates to the effect of our supply indicator. It might affect formal care used by disabled elderly, regardless of their APA status. Some disabled elderly are not eligible for the APA program (GIR 5 and 6) but they could nonetheless consume formal care, while being potentially subsidized by other schemes like pension funds.

On the basis of the department of residence, we match the individual data with the *Territoire* survey.[20] In our estimations, we will control for a set of sociodemographic characteristics: age, sex, marital status, education level (highest diploma obtained) and monthly income. We distinguish between different disability level using the Katz Index. This index proposes eight categories that are constructed to take into account both the number and the type of ADL restrictions (Katz et al., 1970; Katz, 1983). Group A refers to independent individuals. Activity limitations increases in other groups, up to Group G which gathers together individuals requiring assistance for six activities of daily living (personal hygiene, dressing, toileting, transferring, eating and drinking, and continence). In the last group, Group H, are found persons requiring assistance for at least two activities but not falling in previous categories.[21] We group some categories to distinguish between independent (group A), moderately disabled

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[18]See Appendix 7.3 for more details on ADL and IADL.

[19]In our definition, individuals consume formal care if they have specifically declared they receive care from home care providers.

[20]The HSM survey was constructed to be representative at the national level, not at the departmental level. Consequently, we are not able to provide descriptive statistics on individuals by department. In our estimations, the precision of estimates will depend on the number of individuals that have been surveyed in each department. Remarkably, three departments are not represented in our sample.

[21]See Appendix 7.3 for the definition of each category.

(B-C-H), highly disabled (D-E) or severely disabled (F-G) individuals, as has been done previously in the literature (Fontaine, 2012). We also control for the fact that another person could have responded to the survey (proxy), as this variable is correlated with the level of functional limitations and the perception of unmet needs (Davin et al., 2009).[22] To take into account the care provided by the relatives, we control for the number of daughters and sons of the individual. In the literature, these variables have been used to instrument informal care (Van Houtven and Norton, 2004); they permit to capture only the effect of potential informal care provision on the formal care use, while avoiding the potential reverse causality that would exist if we include the volume of informal care provided by children.[23] Finally, we also control for the area of residence of the individual (rural or urban).[24] Table 2 shows the descriptive statistics of these variables on our sample.

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[22]Some studies have also found that the proxy tends to over-estimate the activity limitations of the individuals, but this is not what is found by Davin et al. (2009), working on French data.

[23]In that case, the coefficient would capture both the effects of informal care on formal care and the reverse relationship.

[24]We use the zoning ZAUER proposed by the INSEE. Rural municipalities are those who belong to an employment area defined as rural, or in the halo of such an area and other municipalities predominantly rural.

Table 2: Descriptive statistics on the sample

	%
Individual characteristics	
Consumes formal care	43.89
Woman	69.24
Age: 60-70	21.23
Age: 70-80	38.48
Age: 80-90	33.40
Age: older than 90	6.89
Does not live with a spouse	51.67
Lives in a rural municipality	19.36
No diploma	47.10
Diploma of primary studies	39.61
Diploma of secondary school	7.24
Diploma: *baccalauréat* (high school)	6.05
Monthly income $< $ €1000	20.59
€1000 $\leq$ monthly income $< $ €1500	25.28
€1500 $\leq$ monthly income $< $ €2000	17.34
Monthly income $\geq$ €2000	26.44
Income missing	10.35
Katz Index: independent	77.54
Katz Index: moderatly disabled	13.88
Katz Index: highly disabled	3.41
Katz Index: severely disabled	5.16
Use of a proxy	10.76
Number of sons (mean)	1.22
Number of daughters (mean)	1.25
Lives in a department...	
Non-respondent	27.6
No regulated providers	3.55
Classical	55.70
Generous	13.13
Dominance of regulated providers	30.22
Competition	28.24
Dominance of non regulated providers	10.38

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.
SOURCE: HSM survey (DREES and INSEE, 2008).

3.3 Modeling formal care use

We focus on the extensive margin and denote y_i the formal care utilization of individual i, with $y_i = 1$ if the individual receives formal care, $y_i = 0$ otherwise. Formal care utilization depends on a latent variable y_i^* modeling the utility the individual gets from formal care consumption. Only y_i is observed. If y_i^* is positive, the utility of formal care is high enough to result in consumption. It can be expressed as follows:

$$\begin{cases} y_i = 1 \Leftrightarrow y_i^* > 0 \\ y_i = 0 \Leftrightarrow y_i^* < 0 \end{cases} \tag{2}$$

The utility of formal care is assumed to depend on individual characteristics X_i and on the practices in the department where the individual lives, denoted $D_{d(i)}$.

$$y_i^* = \beta_0 + X_i\beta + D_{d(i)}\alpha + u_i \tag{3}$$

With X_i individual characteristics of i and $D_{d(i)}$ departmental variables of the department d of individual i.

We use a Logit[25] model explaining the probability to consume formal care with individual and departmental determinants.[26] As we are using mixed-level data, we cluster standard errors at the department level to take into account potential correlation of disturbances within departments (Moulton, 1990).[27]

To control for the characteristics of departments, we use the departmental classification recently proposed by the Ministry of Health (DREES, 2014; Fizzala, 2016).[28] It offers an interesting opportunity to control for sociodemographic characteristics of departments. This classification has been established on the basis of a principle component analysis and it creates five departmental groups with respect to demographic and socioeconomic characteristics, that we will call "sociodemographic groups". Variables taken into account relate to the elderly population in the department: importance in the population, health status, wealth, socio-professional characteristics and living arrangements. The classification also takes into

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[25]Appendix 7.4 details the formalization of the Logit model.

[26]Appendix 7.5.A repeats our estimations using linear probability and Probit models to test whether our results are sensitive to the functional form.

[27]We could have used a multilevel modeling, which less straightforward and more demanding in terms of assumptions regarding the distribution error terms (Primo et al., 2007). Appendix 7.5.B discusses this choice and provides the estimation of such a model.

[28]See Appendix 7.6 for a detailed presentation.

account the equipment rate in institutions[29] in the department.[30] Controlling for the sociodemographic group of the department decreases the potential omitted variable bias in the analysis of the effect of departmental practices.

4 Results

4.1 Main results

Several estimations of the model are provided. While controlling for individual determinants, we first include the generosity of the financing of demand (Estimation 1) or the regulation of the supply (Estimation 2). Then, we include both types of indicators (Estimation 3). Standard errors are systematically clustered at the department level.[31]

The coefficients of the Logit estimations for departmental practices are provided in Table 3. To ease the reading, the odds-ratios derived for departmental variables in Estimations 1 to 3 are presented in Figures 2, 3 and 4.

Without controlling for the supply characteristics, using a classical or generous computation rule for the APA program does not affect the probability to use formal care (Figure 2, or Column (1) in Table 3). Compared to those living in a department with a classical policy, an individual living in a department with a generous APA computation formula does not have a higher probability to consume formal care. Quite unexpectedly, individuals living in a department that did not respond to the *Territoire* survey have a higher probability to consume formal care.

Turning to the regulation of the supply (Figure 3, or Column (2) in Table 3), we observe that individuals living in a department with the dominance of non-regulated providers have a significantly lower probability to consume formal care, compared to those living in a department with a dominance of regulated providers. The magnitude of the impact, given by the marginal effect for the average individual of our sample[32] derived from the observed

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[29]One could want to additionally control for the importance of bed blockers in the department. This phenomenon refers to the situation when individuals stay in short-term care units because a lack of appropriate available infrastructures outside. It is correlated to the long-term care supply in the area (Gaughan et al., 2017) and could give information on the potential saturation of the home care market. Gansel et al. (2010) present the construction of this notion in the French context, underlying the coordination issues resulting from the medical specialization and segmentation; but to the best of our knowledge, there is no data available at the national level that would permit to control for this phenomenon in our study.

[30]The policy regarding institutional care is mainly decided at the regional level by specific health authorities (*Agences régionales de santé*). Departmental councils, however, may negotiate and have a latitude in the implementation regarding this domain. This is all the more so likely that they are also financing the part of the APA scheme devoted to elderly living in nursing homes. However, they are not influencing the allocation of elderly across care settings: individuals apply to the APA program for a given part of the scheme (in the community or in nursing homes).

[31]We have 93 clusters, corresponding to the 96 metropolitan departments minus the three departments that are not represented in our sample.

[32]A woman aged between 70 and 80, living alone, not in a rural area, who did not get a diploma, has a monthly income of at least €2,000, is independent in the Katz Index sense, not using a proxy, having a

coefficient, is -0.062. This effect is robust when controlling for both departmental generosity, despite a small loss of precision (statistical significance at the 10% level). Column 3 (and Figure 4) suggests that the dominance of non-regulated providers lowers formal care use, whatever the demand side practices. It could reveal that a low level of regulation decreases the incentives to consume formal care, potentially through a price effet: when non-regulated dominate the market, the expected OOP payment is higher. It could also be through a quality effect: when non-regulated dominate the market, the quality is more uncertain. It could also reveal that these departments are less involved into the long term care policy: the low regulation level would signal limited information processes and restrictive practices at the extensive margin of the APA program. Finally, the geographical coverage within the department could be deteriorated when non-regulated dominate the market, as they have no universal coverage obligation. All these interpretations, however, needs to be cautious. Indeed, we additionnaly observe that the absence of any regulated providers does not correlate with low use.

Table 4 presents the effects of individual determinants in Estimation 3.[33] They are consistent with previous findings of the literature. The probability to consume formal care is higher for women, when individuals are older, severely disabled (as captured by the Katz Index) or when they live without a spouse. A lower income and a higher level of education also increase the probability to use formal care. Regarding informal care, we find a negative effect of the number of daughters but no significant effect for the number of sons. Living in a rural area increases formal care use. This interesting result could be explained by the lower availability of substitutes to formal care in rural areas (informal care or other type of formal services) compared to urban areas.

We now want to compare the quality of our models to estimations that do not include departmental information, or that use departmental fixed-effects only. Table 5 compares the information criteria obtained on several estimations. The first estimation includes individual determinants only, the second estimation adds departmental fixed-effects and the last three estimations correspond to the estimations with departmental indicators presented in Table 3. The Akaike's and Bayesian information criteria (AIC and BIC) make it possible to compare models when they are not nested. They measure the loss of information coming from the model: the lower the indicator, the better the model. As is shown in Table 3, the AIC indicates that the loss of information is the lowest with Estimation (4) and (5) — including only supply indicators or both types - followed by Estimation (3) — with demand indicators. The BIC more severely sanctions additional explaining variables: thus, its lower value is observed for the first model (without departmental variables), just before models (3), (4) and (5). This comparison shows that including the departmental indicators rather than departmental fixed effects makes it possible to increase the quality of the estimations.

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daughter and a son, living in group D.

[33]Their sign and magnitude are stable across the three estimations.
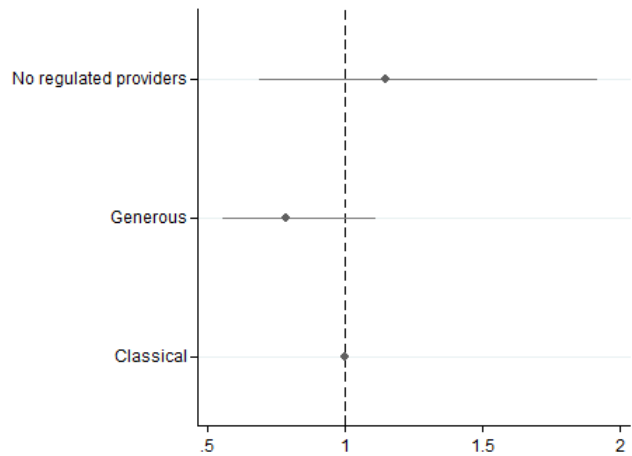
Table 3: Departmental determinants of formal care use

| | Consumes formal care | | |
	(1)	(2)	(3)
Departmental characteristics			
Non respondent	0.200*	0.278**	0.269*
	(0.115)	(0.140)	(0.145)
No regulated providers	0.137	0.205	0.199
	(0.262)	(0.257)	(0.258)
Ref: classical			
Generous	-0.243		-0.058
	(0.177)		(0.157)
Ref: dominance of regulated providers			
Competition		0.166	0.166
		(0.152)	(0.153)
Dominance of non regulated providers		-0.320**	-0.288*
		(0.152)	(0.164)
Individual controls	Yes	Yes	Yes
Department socio–demographic group	Yes	Yes	Yes
Observations	4395	4395	4395
Number of clusters	93	93	93
Log-likelihood	-2644.983	-2640.987	-2640.919
AIC	5343.965	5337.974	5339.839
BIC	5516.447	5516.844	5525.097

Figure 2: Odds-ratios for the effect of public generosity on formal care use (Estimation 1)
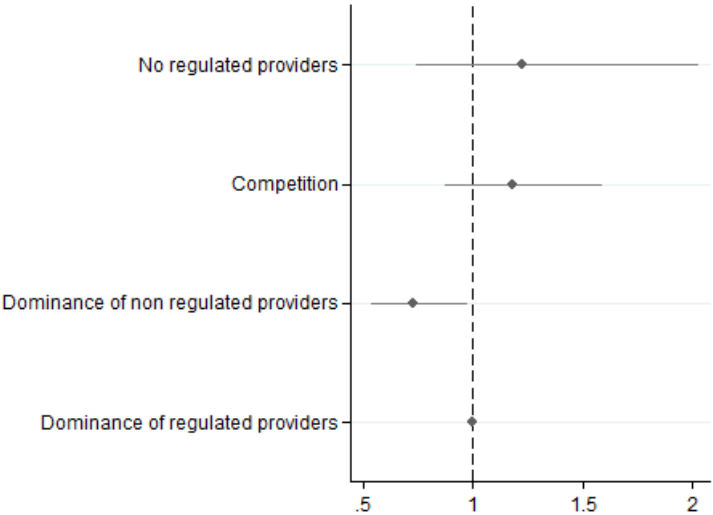

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.
SOURCE: HSM survey (DREES and INSEE, 2008); *Territoire* survey (LEDa-LEGOS and CES, 2012)
NOTES: odds-ratio derived from the estimation of a Logit model explaining the probability to consume formal care and controlling for individual characteristics and the sociodemographic group of the department (Estimation 1 in Table 3).

Figure 3: Odds-ratios for the effect of supply regulation on formal care use (Estimation 2)
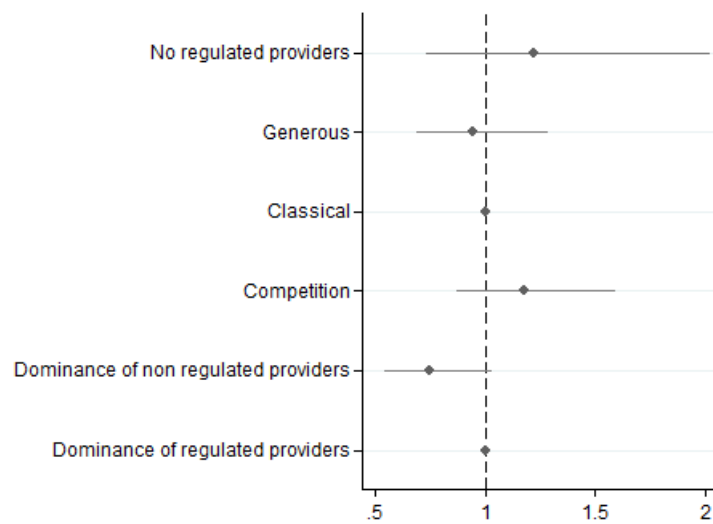

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.
SOURCE: HSM survey (DREES and INSEE, 2008); *Territoire* survey (LEDa-LEGOS and CES, 2012)
NOTES: odds-ratio derived from the estimation of a Logit model explaining the probability to consume formal care and controlling for individual characteristics and the sociodemographic group of the department (Estimation 2 in Table 3).

Figure 4: Odds-ratios for the effect of public generosity and supply regulation on formal care use (Estimation 3)

Table 4: Individual determinants of formal care use

	Consumes formal care
Individual characteristics	
Woman	0.633***
	(0.070)
Age: 60-70	-0.821***
	(0.103)
Ref: age 70-80	
Age: 80-90	0.432***
	(0.079)
Age: older than 90	0.644***
	(0.183)
Does not live with a spouse	0.480***
	(0.092)
Ref: lives in an urban municipality	
Lives in a rural municipality	0.268*
	(0.109)
Ref: no diploma	
Diploma of primary studies	0.183*
	(0.072)
Diploma of secondary school	0.463**
	(0.160)
Diploma: *baccalauréat* (high school)	0.655***
	(0.120)
Monthly income < €1,000	0.256*
	(0.101)
Ref: €1,000 ≤ monthly income < €1,500	
€1,500 ≤ monthly income < €2,000	0.023
	(0.107)
Monthly income ≥ €2,000	-0.351***
	(0.100)
Income missing	-0.373**
	(0.133)
Number of daughters	-0.102**
	(0.032)
Number of sons	-0.023
	(0.023)
Ref: Katz Index: A	
Katz Index: moderatly disabled	0.744***
	(0.092)
Katz Index: highly disabled	0.915***

Table 4 - *Continued from previous page*

	Consumes formal care
	(0.211)
Katz Index: severely disabled	1.065***
	(0.164)
Use of a proxy	-0.288*
	(0.133)
Observations	4395
Number of clusters	93
Log-likelihood	-2640.919
AIC	5339.839
BIC	5525.097

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.

SOURCES: HSM survey (DREES and INSEE, 2008); *Territoire* survey (LEDa-LEGOS and CES, 2012).

NOTES: Standard errors clustered at the department level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Estimation of a Logit model explaining the probability to consume formal care. Departmental controls include response to the *Territoire* survey, demand and supply indicators and the socio-demographic group of the department.

Table 5: Information criteria

	(1)	(2)	(3)	(4)	(5)
Estimation characteristics					
Departmental indicators	None	Fixed effects	Demand (D)	Supply (S)	D+S
Clusters	No	No	Yes	Yes	Yes
Department socio–demographic group	No	No	Yes	Yes	Yes
Information criteria					
AIC	5357.394	5342.640	5343.965	5337.974	5339.839
BIC	5485.159	6045.344	5516.447	5516.844	5525.097

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.

SOURCES: HSM survey (DREES and INSEE, 2008); *Territoire* survey (LEDa-LEGOS and CES, 2012).

NOTES: Estimations of Logit models explaining the probability to consume formal care. Additional controls for individual characteristics and response to the *Territoire* survey.

Coefficients obtained from Estimations (1) and (2) are available upon request. Estimations (3) to (5) are presented in Table 3.

4.2 Extensions and robustness checks

We have tested the sensitivity of our results to the form of control for departmental characteristics. Instead of the groups mentioned here-before, we directly include the variables that have been used to construct the classification: the share of individuals aged 75 or more in the population, their poverty rate and the rate of individuals living alone in the community,[34] and the equipment rate in institutions. Our results are robust to this change.[35]

The organization of long-term care is likely to be specific in French metropolis. In Paris, for instance, the department actually corresponds to the capital. As a robustness check, we estimate the models without the departments including the three biggest metropolis: Paris (75), Marseille (13) and Lyon (69). Our results are robust to this exclusion only if we do not control for the departmental sociodemographic group. With the group effect, we considerably loose precision and it prevents us from identifying any significant effect.

5 Discussion

We use the inter-departmental variations to study the effect of public financing and regulation of the supply on formal care use. To treat these variations as exogenous, we assume that the disabled elderly did not choose their department of residence according to their willingness to consume formal care or not. This is a usual hypothesis when focusing on the disabled elderly (see, for instance, Stabile et al. (2006)). Indeed, the residential mobility of the elderly is very low and when moves occur, they are mainly explained by family motives or the need for adapted residences (Laferrère and Angelini, 2010). We thus consider that the departmental practices are exogenous to the location choice of individuals.

To be exogenous to formal care use, departmental practices should not be correlated with unobserved variables that would also affect the individual formal care use (omitted variable bias) nor by the actual demand in the department (reverse causality issue). We control for the sociodemographic group of the department and we are thus comparing departments that are supposedly similar regarding the level of the demand for home care. Indeed, the classification we use specifically builds on the characteristics of the elderly population and the equipment rate in institutions. It does not prevent departmental unobserved heterogeneity from biasing our estimation but it should substantially limit it. Moreover, the criteria we study are little-known by departmental councils and citizens. Field studies have shown that the rules used on the demand side are not identified as key points of the APA policy, nor as a political issue (Billaud et al., 2012) and they essentially results from decisions of the technical desk in charge of the APA program. In parallel, the disabled elderly and their family are poorly

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[34]We use the rate of individuals living alone in the community for the year 2014 as previous rates are not available as open data. Other indicators are from 2012.

[35]We have not been able, though, to reconstruct and include the variables relating to the share of individuals living in rural areas or the socio-professional characteristics of the population.

rallied around collective action (Weber et al., 2013), such that they are not likely to influence these technical decisions.

Though these reasons support the hypothesis of the exogeneity of departmental practices, in the absence of an alternative empirical strategy confirming it, we will remain cautious and interpret our results in terms of association rather than causal impact. The link between our indicator of departmental generosity and the demand for home care is limited. This is not what we expected, as the literature has shown that the consumption of formal home care is sensitive to its price (Fontaine, 2012; Bourreau-Dubois et al., 2014; Arnault, 2015; Hege, 2016; Roquebert and Tenand, 2017). However, we are focusing on the extensive margin. The variations we study might be negligible for the decision to consume care but more important regarding the volume of care consumed within the program. The next step of research is thus to examine the volume of care consumed, conditional on positive use.[36] Moreover, we are studying both publicly and privately funded care, such that our results might be blurred by exclusively privately funded care. Finally, the absence of correlation between the computation formula and the decision to consume care could also reveal that the parameters of importance are those related to the opening of rights (care plan volume), or the other parameters of the OOP payment (provider price and/or lump sum price).

This work interestingly sheds light on the previous results of the literature. Arrighi et al. (2015) and Barnay and Juin (2016) find that the rate of APA beneficiaries in the elderly population (above 60 or 75) increases the take-up of the APA program and formal care use. The descriptive part of our work shows that a lower rate of APA beneficiaries among the elderly population correlates with the dominance of non-regulated providers on the supply side. However, we find no effect of departmental generosity regarding computation formal on formal care use, probably because we focus on a very tiny aspect of the long-term care policy compared to the more aggregated indicator used in the literature.[37]

Finally, on the technical side, we use two surveys that have not been collected the same year. The HSM was collected in 2008 while the *Territoire* survey was implemented in 2012. We thus implicitly assume that the departmental practices observed in 2012 are correlated with those of 2008: either they have not changed, or they have evolved in a way that is consistent with the preceding practices. This assumption could be threatened by the fact that departmental elections occurred between 2008 and 2012.[38] However, the points we study are far from being central in the political debate, or even identified as a political issue. Thus, they are likely not to be affected by the departmental elections. To shed some light on the persistence of departmental practices, we use the survey implemented in 2015 by the Ministry of Health (Drees), which collected a survey called SolvAPA focusing on the departmental

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[36]It could be done using a two-part model, with the first step corresponding to the decision of using formal care and the second step the volume of the formal care consumed.

[37]Appendix 7.7 provides details on the differences between Arrighi et al. (2015)'s approach - which is close to our study - and our work.

[38]In 2008 for half of the departments, in 2011 for others.

practices regarding the APA program (DREES, 2015a). Its questionnaire was close to the questionnaire of the *Territoire* survey and offers the opportunity to compare departmental practices in 2012 and 2015 - though, unfortunately, the question on the regulation of the supply was not included -. It is done in Appendix 7.8. It shows that among departments respondent to both surveys, 4 departments over 5 use the same rule in 2012 and 2015. For those who changed, they systematically use a less generous rule in 2015: some were classical department and turned to use rule 2 for regulated providers; other were generous and turned to be classical. This could be explained by the increasing constraints weighting on departmental finances. If we assume that the same trend was ongoing between 2008 and 2012, it means that the departmental practices we observed in 2012 are either the same than those of 2008, or they are less generous. In this last case, the estimates of each category would under estimate the effect of departmental practices.

6   Conclusion

This paper estimates, at the extensive margin, the link between formal care use and two parameters that depend on departmental decisions: the generosity of the hourly APA subsidy and the importance in the regulation of providers. It finds no effect of the generosity of the APA policy while, on the supply side, the dominance of non-regulated providers — whose quality is uncertain and price is little regulated — decreases the probability to consume formal care, potentially due to a price effect or a quality effect. Such an interpretation should be taken cautiously, however, since we additionnaly observe that the absence of any regulated providers does not correlate with low use.

These results first contribute to the debate on the difference of treatment that can result from the decentralization of a national policy (see for instance Argoud (2007); Chevreul and Berg Brigham (2013); Maarse and Jeurissen (2016)). Indeed, we highlight a little-known latitude of departmental councils in the generosity of the APA program. It does not correlate, however, with the demand for formal care at the extensive margin. We also underline the variety of situations regarding the regulation of the home care providers and implications in terms of price and quality for the elderly.

Our results are also of interest for discussing the recent reform of the home care sector, requiring all providers to be regulated. According to our results, it could help increasing formal care use in departments where the regulation level was initially low. This reform, though, did not impose the pricing by the departmental councils to all providers. Then, it could be expected to increase overall quality in the home care sector, while the effect on prices is rather uncertain. If the low level of regulation correlates to a low level of demand because of a low quality, we could expect this reform to increase the demand and have beneficial effects for the health of the elderly.

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7 Appendices

7.1 Additional information on the institutional context

7.1.A Financing of the APA allowance

Along with the creation of the APA program in 2002 was organized the financial support from the central government to departmental councils (*Concours APA I*). The central French government is represented by a specific central agency, the CNSA. Each year, it allocates to departmental councils resources coming from social contributions and some consumption taxes.

The sharing of these resources proceeds as follows. The characteristics of departments are used to construct a weighted coefficient representing the share of the total of resources the department will get. This coefficient depends on the number of individuals aged 75 or more living in the department compared to the national 75+ population (weight: 50%), the APA spending (weight: 20%), the fiscal capacity[39] of the department (weight: -25%) and the number of recipients of unemployment benefits (RSA) (weight: 5%). The coefficient affected to department D, c_D, is thus:

$$c_D = \Big[(\frac{N75_D}{\sum_d N75_d}) * 0,5 + (\frac{SPEND_D}{\sum_d SPEND_d}) * 0,2$$
$$- (\frac{FC_D}{\sum_d FC_d}) * 0,25 + (\frac{RSA_D}{\sum_d RSA_d}) * 0,05 \Big] * 2$$

Where $N75_D$ is the number of individuals aged 75 or more in department D, $SPEND_D$ is the amount of APA spending, FC_D is the fiscal capacity and RSA_d is the number of RSA beneficiaries.

The central resources devoted to the financing of the APA have not notably increased since the creation the program, while the expenditure of the departments have risen. Consequently, the cost of the APA program for the departmental finances is increasing: Figure 5 shows that the coverage rate of the APA spendings of departmental councils by central government contributions has fallen from 43% in 2002 to approximately 30% in 2009; it has then slightly increased to 32 % in 2014 and 2015.[40]

In this context, departmental councils have incentives to use the latitude they have in the implementation of the APA program to adjust their expenditures; it can be done with the reduction of the number of hours open to subsidies, with potential restrictions of the number of APA beneficiaries at the extensive margin or through variations in the way the care plan

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[39]It corresponds to the expected amount of tax that would be obtained when implementing average tax rates in the department.

[40]Data are available on the following link: https://www.cnsa.fr/compensation-de-la-perte-dautonomie/financement-des-prestations-concours-aux-departements/le-concours-allocation-personnalisee-dautonomie.

volume is translated into a subsidy (Haut conseil de la famille de l'enfance et de l'âge, 2017). This last point may include both the way the monetary equivalent of care plan volume is computed and the way the hourly subsidy is computed.

With the 2016 reform of the APA program, a second part of the central contribution was created (*Concours APA II*) to take into account the additional spending generated by the reform (increases in legal thresholds for care plan volumes, changes in the copayment scheme, financing of the right to respite for caregivers and increase of the professional caregivers' wages). It explains why, on Figure 5, the central contribution and the coverage rate are expected to increase in 2016.

Figure 5: Contribution of the central government to the APA spending of departmental councils between 2002 and 2016
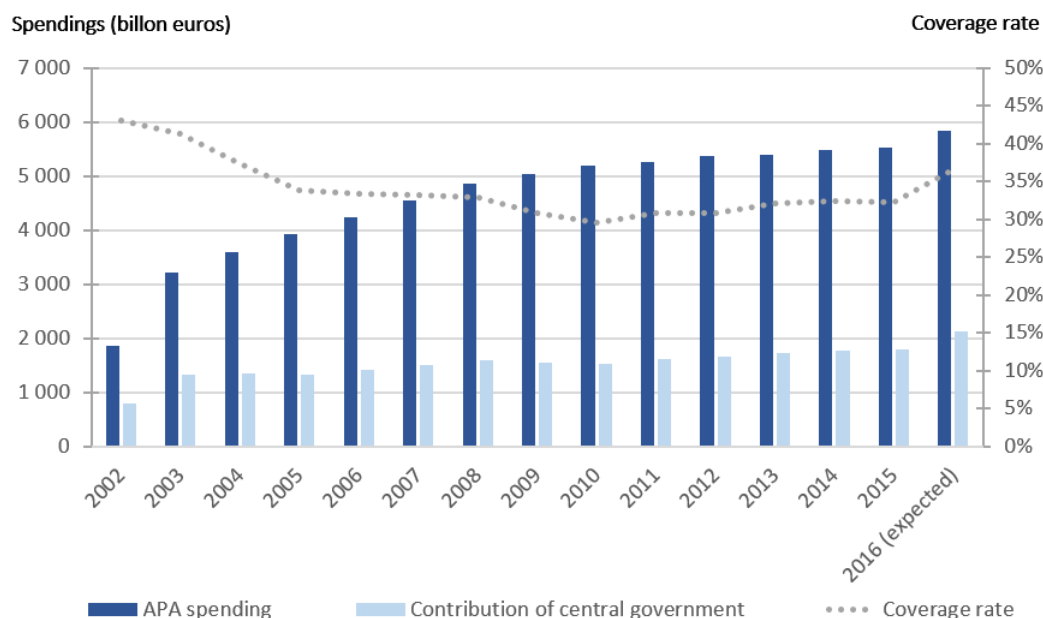
Source: Direction des affaires générales et financières (DAGF), CNSA.

7.1.B Variation in the generosity of the APA subsidy: an example

We illustrate the variation in the generosity of the APA subsidy due to the computation formula used by the departmental council. We consider the sample of APA beneficiaries used in Chapter 2. In this sample, the average provider price is €22, the average copayment rate is 22% and the tarriff used with rule 2[41] is €17.6. As shown in Figure 6, if the department council chooses rule 3, the hourly OOP payment of the individual is €3.9 per hour of formal care (rule 3). It increases to €8.3 if it chooses rule 2, while rule 1 yields an OOP payment of €4.8 per hour. The maximum difference (between rule 2 and rule 3) is thus of €4.4 per hour of care. This is far from being negligible: with an average care plan volume of 22 hours, it results in a monthly difference of €97, or 8% of the month average net income.[42] The difference between rule 1 and rule 2, with the average care plan volume, yields a monthly gap of €75 (or 6% of average income). Between rule 1 and rule 3, the monthly gap is of €22 (2% of average income).

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[41]It corresponds to the rule used to compute the allowance of beneficaries served by non-regulated providers.

[42]As underlined by Billaud et al. (2012), the choice of the departmental council also has implication regarding the redistributive property of the APA program. Indeed, the rule changes the effective copayment rate of the beneficiary. With rule 2 for instance, the effective copayment rate of the beneficiary equals $\left(c_i.t + (p_i - t)\right)/p_i$, which is higher than the APA copayment rate c_i.

Figure 6: Example of the effect of computation formulas
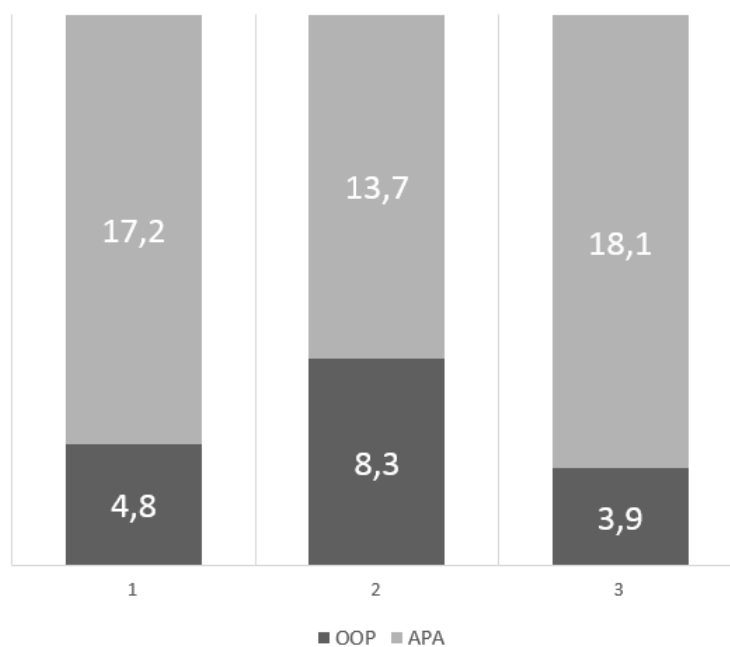
NOTES: example of the effect of variation in computation formulas resulting in different hourly OOP payment, with a provider price at €22, a copayment rate at 22% and a tariff at €17.6. Rule 1 yields an OOP payment of €4.8 (0.22*22); rule 2 yields an OOP payment of €8,3 (0.22*17.6 + (22-17.6); rule 3 yields an OOP payment of €3.6 (0.22*17.6).

7.2 Descriptive statistics on departments...

7.2.A ...According to response to the *Territoire* survey

Table 6 compares the characteristics of departments according to their (non) response to the *Territoire* survey. We distinguish between two types of characteristics: the sociodemographic characteristics of the department (age distribution of the population, share of households subject to income tax, interdecile range) and indicators more directly related to the needs in terms of social policies in the department (poverty rates, share of APA beneficiaries among the elderly population, rate of recipients of unemployment benefits RSA) or disability benefits (ACTP or PCH[43]). The equipment rate in institutions is also included. Apart from a slightly younger population on average in non respondent departments, no remarkable differences are observed: there are no statistically significant differences at the 10% level.

Table 6: Departmental characteristics and response to the *Territoire* survey

	NR	Respondent	Total	Sources	Difference (p-value)
60+ population/total population (%)	25.27	26.05	25.85	[A]	0.42
75+ population/total population (%)	9.88	10.23	10.14		0.47
Households subject to income tax (%)	62.64	61.54	61.83	[B]	0.38
Interdecile range	3.31	3.29	3.30		0.88
Poverty rate (%)	14.43	14.32	14.35	[B]	0.88
Poverty rate in 75+ population (%)	10.62	11.13	11.00		0.52
Rate of APA beneficiaries (%)	8.14	8.32	8.27	[C]	0.63
Mean spending per APA beneficiary (€)	4479.38	4528.12	4515.43		0.67
ACTP-PCH coverage rate[a]	4.48	4.96	4.83	[C]	0.12
RSA coverage rate[b]	6129.52	5984.82	6022.50	[D]	0.75
Equipment rate[c]	128.72	123.23	124.66	[E]	0.31

SAMPLE: 96 metropolitan departments, with 71 respondents to the *Territoire* survey (LEDa-LEGOS and CES, 2012).
SOURCES: [A]: INSEE (2012); [B]: INSEE-DGFiP-CNAF-CNAV-CCMSA (2012); [C]: DREES (2012); [D]: (CNAF, 2012); [E]: DREES and INSEE (2012).
NOTES: P-values from Student test.
"NR" stands for non-respondent. [a]: number of beneficiaries of the ACTP or PCH for 1,000 individuals in the department.
[b]: number of beneficiaries of the RSA for 100,000 individuals in the department.
[c]: number of accommodation places for 1,000 individuals aged 75 or more.

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[43]The PCH is an allowance targeted to the disabled individuals younger than 60. It has replaced the ACTP in 2006 but previous beneficiaries of the ACTP can continue to receive the allowance.

7.2.B ...According to the generosity of financing and the regulation of the supply

Tables 7 and 8 describe the characteristics of the departments according to their practices regarding the financing of the demand and their regulation of the supply. As we did for the comparison of respondent and non-respondent departments, we distinguish between two types of characteristics: the sociodemographic characteristics of the department and indicators relating to the needs in terms of social policies in the department. These tables additionally present the mean of the equipment rate in institution as it is used in the estimations. We perform an analysis of variance (Anova) tests to study whether the difference between group means is significant.

Table 7 shows that the population in departments with a generous policy is, on average, significantly younger than those of other departments. The rate of APA beneficiaries, however, is not significantly different, nor is the average level of spending per APA beneficiary. The departments with a generous policy are also significantly wealthier on average, with a higher share of households subject to the income tax and a lower poverty rate in the 75+ population. No significant differences are observed regarding the importance of other social policies.

According to Table 8, when non-regulated providers dominate the market, the population is, on average younger and the rate APA beneficiaries among the elderly population is lower, but there is no significant difference in the average expense per APA beneficiary. Although the share of households subject to the income tax is significantly higher in these departments, there is no significant difference in the poverty rates. No significant differences is observed regarding the importance of other social policies.

Overall, there is one atypical category both on the demand side (generous computation formula) and on the supply side (dominance of non-regulated providers). These two categories, however, do not correspond one to each other: there is only one department belonging to these two categories.

The computation formula and the provider mix are potentially influenced by the likely demand in the department. Departments could be incentivized to be more generous when taxes are more important (demand side). When the rate of APA beneficiaries is low compared to the elderly population, they might not be eager to enter into a relatively-costly regulation process. In this context, the causal interpretation of our results will remain cautious.

Table 7: Departmental characteristics and generosity of the APA policy

	No regulated providers	Classical	Generous	Total	Source	Difference (p-value)
60+ population/total population (%)	25.97	26.74	*20.55*	26.05	[A]	0.00
75+ population/total population (%)	10.23	10.57	*7.52*	10.23		0.00
Households subject to income tax (%)	62.38	60.45	*69.57*	61.54	[B]	0.00
Interdecile range	3.15	3.21	*4.11*	3.29		0.00
Poverty rate (%)	13.50	14.60	12.79	14.32	[B]	0.22
Poverty rate in 75+ population (%)	10.10	11.60	*8.37*	11.13		0.05
Rate of APA beneficiaries (%)	8.40	8.45	7.17	8.32	[C]	0.11
Mean spending per APA beneficiary (€)	4255.59	4571.83	4444.78	4528.12		0.22
ACTP-PCH coverage rate[a]	5.04	5.05	4.16	4.96	[C]	0.32
RSA coverage rate[b]	5255.00	6147.88	5386.86	5984.82	[D]	0.36
Equipment rate[c]	127.66	123.89	113.49	123.23	[E]	0.50

SAMPLE: 71 metropolitan departments respondents to the *Territoire* survey (LEDa-LEGOS and CES, 2012).
SOURCES: [A]: INSEE (2012); [B]: INSEE-DGFiP-CNAF-CNAV-CCMSA (2012); [C]: DREES (2012); [D]: (CNAF, 2012); [E]: DREES and INSEE (2012).
NOTES: P-values from Anova test. If it is inferior to 0.10, we indicate in italics the mean(s) that is/are significantly different to the mean of classical departments.
[a]: number of beneficiaries of the ACTP or PCH for 1,000 individuals in the department.
[b]: number of beneficiaries of the RSA for 100,000 individuals in the department.
[c]: number of accommodation places for 1,000 individuals aged 75 or more.

Table 8: Departmental characteristics and regulation of the supply

	No regulated providers	Dominance non-regulated	Competition	Dominance regulated	Total	Source	Difference (p-value)
60+ population/total population (%)	25.97	*19.07*	26.88	26.00	26.05	[A]	0.01
75+ population/total population (%)	10.23	*6.79*	10.66	10.19	10.23		0.02
Households subject to income tax (%)	62.38	*72.88*	61.40	60.45	61.54	[B]	0.00
Interdecile range	3.15	*3.82*	3.34	3.24	3.29		0.23
Poverty rate (%)	13.50	*12.76*	14.08	14.83	14.32		0.39
Poverty rate in 75+ population (%)	10.10	*7.07*	11.52	11.38	11.13	[B]	0.14
Rate of APA beneficiaries (%)	8.40	*6.06*	8.50	8.38	8.32	[C]	0.08
Mean spending per APA beneficiary (euro)	4255.59	4428.63	4564.97	4563.71	4528.12	[C]	0.33
ACTP-PCH coverage rate[a]	5.04	4.44	5.04	4.92	4.96	[C]	0.92
RSA coverage rate[b]	5255.00	5334.33	5646.71	6485.64	5984.82	[D]	0.17
Equipment rate[c]	127.66	128.87	121.15	123.55	123.23	[E]	0.81

SAMPLE: 71 metropolitan departments respondents to the *Territoire* survey (LEDa-LEGOS and CES, 2012).

SOURCES: [A]: INSEE (2012); [B]: INSEE-DGFiP-CNAF-CNAV-CCMSA (2012); [C]: DREES (2012); [D]: CNAF (2012); [E]: DREES and INSEE (2012).

NOTES: P-values from Anova test. If it is inferior to 0.10, we indicate in italics the mean(s) that is/are significantly different to the mean of departments with dominance of regulated providers.

[a]: number of beneficiaries of the ACTP or PCH for 1,000 individuals in the department.

[b]: number of beneficiaries of the RSA for 100,000 individuals in the department.

[c]: number of accommodation places for 1,000 individuals aged 75 or more.

7.2.C   Sample distribution in departmental categories

Table 9: Distribution of the sample in the departmental categories

	Non respondent	No regulated providers	Classical (rule 1)	Generous (rule 3)	Total
Non respondent	1214	-	-	-	1214
	27.62%				*27.62%*
No regulated providers	-	156	-	-	156
		3.55%			*3.55%*
Dominance of non-regulated providers	-	-	79	377	456
			1.80%	*8.58%*	*10.38%*
Competition	-	-	1144	97	1241
			26.03%	*2.21%*	*28.24%*
Dominance of regulated providers	-	-	1225	103	1328
			27.87%	*2.34%*	*30.22%*
Total	1214	156	2448	577	4395
	27.62%	*3.55%*	*55.70%*	*13.13%*	*100%*

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.
SOURCES: HSM survey (DREES and INSEE, 2008); *Territoire* survey (LEDa-LEGOS and CES, 2012).
NOTES: the table shows the number of observations in each category and the percentage of the sample they represent (in italics).

7.3 Disability measures

We refer to several measures for the disability levels: ADL and IADL, GIR and Katz Index. We recapitulate here their definitions and we compare the Katz Index to the GIR available in the HSM.

ADL or IADL refers to activities of daily living, either essential or instrumental. The following activities are included in the ADL group: bathing and showering, personal hygiene and grooming, dressing, toilet hygiene, functional mobility and self-feeding. The following activities are included in the IADL: cleaning and maintaining the house, managing money, moving within the community, preparing meals, shopping for groceries and necessities, taking prescribed medications, using the telephone or other form of communication.

The Katz Index proposes eight categories that are constructed to take into account both the number and the type of ADL restrictions. In group A, the person is completely independent and can perform the six following activities: bathing, dressing and undressing, toileting, transferring, eating and drinking once the food is ready, controlling bowel movements and urination. In group B, she can perform independently five over the six activities. In group C, she needs assistance to perform two activities including bathing. In group D, she needs assistance for three activities, including bathing and dressing or undressing. In group E, she needs assistance for four activities, including bathing, dressing or undressing and toileting. In group F, she needs assistance for five activities, including the previous ones and transferring. In group G, the person requires assistance for the six activities. Finally, in Group H, persons requiring assistance for at least two activities but not meeting previous criteria are to be found. Table 10 summarizes the definitions. Note that as our sample is restricted to individuals facing limitations in ADL or IADL, those who belong to the group A of the Katz Index have at least IADL limitations.

The GIR corresponds to the disability group ("Groupe Iso-Ressources", or GIR) of the individual in the APA program, assessed by the evaluation team with a national tool, the AGGIR (Gerontological Independence Iso-Resource Group) classification. In the survey, we don't know directly the GIR of APA beneficiaries, but we have a simulated GIR ("pseudo-GIR"), computed with an algorithm approaching the logic of the AGGIR classification. It was estimated on the basis of the activity restrictions declared by the individual. This pseudo-GIR indicator suffers from several limitations and, in particular, it cannot be regarded as the official disability group an individual would be assigned to during the APA evaluation (Eghbal-Téhérani and Makdessi, 2011). Thus, in our sample definition and estimations, we prefer using the measures of disability resting on the ADL and IADL.

Nevertheless, we compare in Table 10 the consistency of the Katz Index and the pseudo-GIR. The comparison shows that both indicators are overall consistent, with an increasing share of GIR 1-2 (higher disability level) when going to the high disability level in the Katz Index sense. The highest disability level in the Katz Index (Group G) counts 100% of GIR

1-2. Though, some marginal cases indicate a discrepancy: 1% of individuals regarded as independent with the Katz Index are associated with GIR 1-2.

Table 10: Katz Index: definition and comparison with the GIR indicator

Category	Number of activities requiring assistance	Including	Share of GIR		
			1-2	3-4	5-6
A	0	-	0.9	17.6	81.5
B	1	-	5.9	76.6	17.5
C	2	bathing	16.6	83.4	0
D	3	bathing & (un)dressing	17.7	82.3	0
E	4	bathing & (un)dressing & toileting	55.6	44.4	0
F	5	previous ones and transferring	91.6	8.4	0
G	6		100	0	0
H	2	and is not included in other categories	57	43	0

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.
SOURCE: HSM survey (DREES and INSEE, 2008).

7.4 Details on the Logit estimation

We have assumed that the utility of formal care depends additively on individual characteristics X_i and on the departmental practices observed where the individual lives, denoted $D_{d(i)}$.

$$y_i^* = \beta_0 + X_i\beta + D_{d(i)}\alpha + u_i \tag{4}$$

We express the conditional probability function as follows:

$$P(y = 1|X, D) = P(y^* > 0|X, D) \tag{5}$$
$$= P(-u < X.\beta + D.\alpha|X, D) \tag{6}$$
$$\tag{7}$$

With the assumption that $u \perp\!\!\!\perp X, D$, Equation 5 is written:

$$P(y = 1|X, D) = G(X.\beta + D.\alpha) \tag{8}$$

With G the cumulative distribution function of u.

We use the logistic function as cumulative distribution function of u. We test, in Appendix 7.5.A, the sensitivity of our results to this choice by estimating Probit and linear probability models.

Then, Equation 7.4 becomes:

$$P(y = 1|X, D) = G(X.\beta + D.\alpha) \tag{9}$$
$$= \frac{1}{1 + exp^{-X.\beta - D.\alpha}} \tag{10}$$

And the probability of not consuming is expressed as follows:

$$P(y = 0|X, D) = 1 - P(y = 1|X, D) \tag{11}$$
$$= \frac{1 + exp^{-X.\beta - D.\alpha}}{1 + exp^{-X.\beta - D.\alpha}} - \frac{1}{1 + exp^{-X.\beta - D.\alpha}} \tag{12}$$
$$= \frac{exp^{-X.\beta - D.\alpha}}{1 + exp^{-X.\beta - D.\alpha}} \tag{13}$$

As y is binary, the conditional likelihood of the sample can be written as follows:

$$L(y_1, ..., y_n|X, D, \beta, \alpha) = \Pi_{i=1}^n \left[\frac{1}{1 + exp^{-X.\beta - D.\alpha}}\right]^{y_i} \times \left[\frac{exp^{-X.\beta - D.\alpha}}{1 + exp^{-X.\beta - D.\alpha}}\right]^{1-y_i} \tag{14}$$

The log-likelihood function writes:

$$lnL(y_1, ..., y_n | X, D, \beta, \alpha) = \sum_{i=1}^{n} y_i.ln\frac{1}{1 + exp^{-X.\beta - D.\alpha}} + (1 - y_i).ln\frac{exp^{-X.\beta - D.\alpha}}{1 + exp^{-X.\beta - D.\alpha}} \quad (15)$$

Consistent estimators of β and α can be derived as arguments of the maximization of the log-likehood function which can be proved to be concave.

7.5   Robustness checks

7.5.A   Functional forms

Table 11 presents estimations of our binary models with different functional forms: linear probability models (Columns 1 to 3) and Probit models (Columns 4 to 6), to be compared to the Logit estimations used as main functional form (Table 3 in the main body). Our results are little sensitive to the choice of the functional form, though the linear probability model is associated with a loss of precision when both demand and supply side indicators are included.

Table 11: Determinants of formal care use - functional forms

| | | | | Consumes formal care | | |
| | | LPM | | | Probit | |
	(1)	(2)	(3)	(4)	(5)	(6)
No regulated providers	0.030	0.044	0.042	0.086	0.124	0.121
	(0.055)	(0.053)	(0.053)	(0.158)	(0.152)	(0.153)
Ref: classical						
Generous	-0.047		-0.011	-0.139		-0.019
	(0.037)		(0.035)	(0.110)		(0.101)
Ref: dominance of regulated providers						
Competition		0.032	0.032		0.094	0.094
		(0.030)	(0.030)		(0.086)	(0.087)
Dominance of non regulated providers		-0.062*	-0.056		-0.204**	-0.193*
		(0.031)	(0.035)		(0.088)	(0.101)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,395	4,395	4395	4395	4395	4395
Number of clusters	93	93	93	93	93	93
Log-likelihood	-2785.317	-2781.648	-2781.587	-2644.378	-2640.118	-2640.097

SAMPLE: 4,395 individuals aged 60 or more, having at least one ADL or IADL limitations.
SOURCES: HSM survey (DREES and INSEE, 2008); *Territoire* survey (LEDa-LEGOS and CES, 2012).
NOTES: Standard errors in parenthesis, clustered at the departmental level. $^*p < 0.10$, $^{**}p < 0.05$ $^{***}p < 0.01$. Estimations of linear probability models (LPM) and Probit models explaining the probability to consume formal care. Controls for individual characteristics and the sociodemographic group of the department.

7.5.B   Random intercept model

We test an alternative specification using a multilevel modeling. With cross-sectional data, we are only able to estimate the random intercept extension of the Logit model. Ideally, with panel data and provided that departmental practices vary over time, we would have wanted to estimate a fixed-effect model to deal with the omitted variable bias.

The random intercept model interestingly makes it possible to take into account an unobserved effect of each department on the outcome of individuals living there. This effect, however, should be regarded as random and must not be correlated with our departmental variables of interest. This is a strong assumption in our case, where non-observed departmental variables affecting the formal care use could correlate with departmental long-term care practices. Thus, one should remain cautious when interpreting our random-effect coefficients as it is inconsistent when the fixed-effect model is appropriate (Cameron and Trivedi, 2009).

Estimation results obtained with the random intercept model are provided in Table 12. As the model directly takes into account the mixed-level nature of the data, we do not cluster standard errors. The sign and magnitude of coefficients are unchanged compared to those of Table 3, but using a random model specification generates a loss of precision.

Table 12: Random intercept model

	Consumes formal care		
	(1)	(2)	(3)
Departmental characteristics			
No regulated providers	0.091	0.138	0.131
	(0.242)	(0.243)	(0.245)
Ref: classical			
Generous	-0.148		-0.093
	(0.216)		(0.214)
Ref: dominance of regulated providers			
Competition		0.121	0.121
		(0.135)	(0.135)
Dominance of non regulated providers		-0.311	-0.294
		(0.271)	(0.276)
Controls	Yes	Yes	Yes
Observations	4395	4395	4395
Log-likelihood	-2633	-2632	-2632

7.6   Departmental sociodemographic groups

In order to control for the sociodemographic characteristics of the departments, we use a classification proposed by the Ministry of Health (DREES, 2014; Fizzala, 2016). It offers the interesting opportunity to control for sociodemographic characteristics of departments. It is based on a principle component analysis (PCA), which takes into account variables related to the elderly population in the department: their importance (share of individuals aged 75 or more in the population), their health status (life expectancy for men at 60, share of APA beneficiaries in the 75+ population), their wealth (poverty rate and average standards of living for the 75+ population), their socio-professional characteristics (share of previously farmers among retired) and living arrangements (share of 75+ living alone). It additionally uses the equipment rate in institutions in the department. In the PCA, the more determining variables are the standards of living, life expectancy and equipment rate.
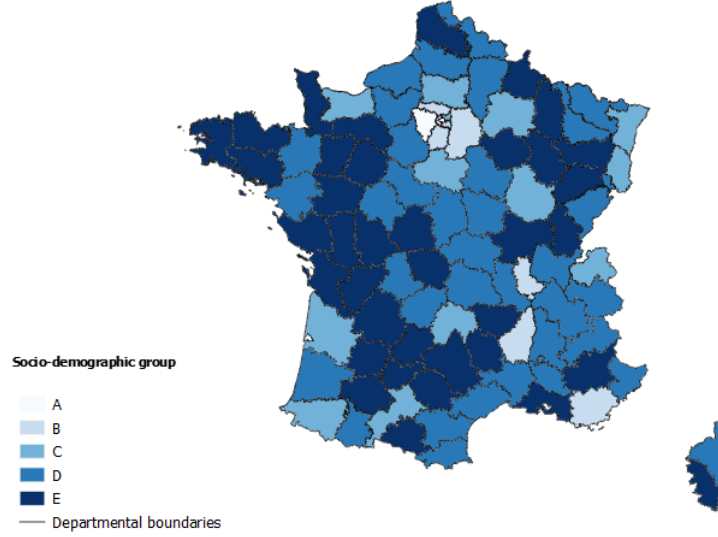
The five groups proposed by the classification are the following (presented by decreasing standards of living):

- Group A is composed of departments with very high living standards, a high urbanization rate and a low equipment rate in institutions. Individuals aged 75 or more are relatively less numerous, they live more frequently alone in in the community.

- Group B, as in the previous group, has high living standards and urbanization rate. The proportion of the 75+ in the population is even lower. The equipment rate is higher and the elderly less frequently live alone at home compared to group A.

- In Group C, the standards of living are closer (but still higher) than the median value. The share of 75+ is higher compared to Group A and Group B, but still lower than the median rate.

- In Group D, departmental sociodemographic variables are close to the median values.

- Group E is constituted of departments with an aging population, poorer and more rural than in other groups. Equipment rates are slightly higher than in other departments.

Figure 7 presents the corresponding departments. It shows the relative heterogeneity in the geographical distribution of groups. Table 13 presents the distribution of departments according the sociodemographic group and the demand indicator, while Table 14 does the same for the supply indicator. Each computation rule is represented in every sociodemographic group, except for the generous one which is never used in the older and poorer departments (Group E). Similarly, different level of the regulation of the supply are found in each group. No wealthier departments (Group A) are found with the dominance of regulated providers, nor the absence of regulated providers. In median departments (Group D) and older poorer departments (Group E), the dominance of non regulated providers is never observed. Overall,

there is a partial correspondence between the sociodemographic group and the departmental practices: when the demand is likely to be higher (Group E), we do observe a high generosity on the demand side, nor the absence of supply regulation.

Figure 7: Five sociodemographic groups

Table 13: Sociodemographic groups and departmental practices (demand side)

	Non respondents	No regulated providers	Classical (rule 1)	Generous (rule 3)	Total
Group A	1	0	1	1	3
Group B	1	1	2	2	6
Group C	6	1	4	3	14
Group D	10	2	23	1	36
Group E	7	3	27	0	37
Total	25	7	57	7	96

Table 14: Sociodemographic group and departmental practices (supply side)

	Non respondents	No regulated providers	Dominance non regulated	Competition	Dominance regulated	Total
Group A	1	0	1	1	0	3
Group B	1	1	2	1	1	6
Group C	6	1	1	2	4	14
Group D	10	2	0	11	13	36
Group E	7	3	0	12	15	37
Total	25	7	3	28	33	96

SAMPLE: 96 metropolitan departments.

SOURCE: *Territoire* survey (LEDa-LEGOS and CES, 2012); sociodemographic classification by DREES (2014).

NOTES: Columns correspond to the level of regulation of the supply. Lines correspond to the sociodemographic group of the department.

7.7 Comparison with results on the take-up of the APA program

Our work is close to the study by Arrighi et al. (2015). This appendix aims at showing the common points and differences in the two approaches. Arrighi et al. (2015) focus on the take-up of the APA program. Their dichotomous dependent variable is equal to one for individuals having applied to the APA program. They find that the generosity of the departmental increases the probability to apply to the program. We focus on the effective consumption of formal care for the disabled elderly (both publicly and privately funded). One complementary study to Arrighi et al. (2015) would have focused on the effect of departmental indicators on the probability to be APA beneficiary (which depends on both individual application and departmental decisions). However, the variable in which individuals declare they are APA beneficiaries has been shown to suffer from important shortcomings, and we are studying, more broadly, the determinants of formal care use.

The sample used by Arrighi et al. (2015) comprises all individuals aged 60 or more who are not APA beneficiaries.[44] Among the individuals aged 60 or more, we restrict our sample to individuals who declare they have at least one activity limitation. Our idea is to focus on the determinants of formal care use from individuals needing concrete help and thus some form of care — either formal or informal — or technical help.

The most important difference probably lies in the indicator of departmental generosity used.[45] The indicator used by Arrighi et al. (2015)[46] is the mean subsidy rate, corresponding to the ratio of per capita subsidized amount of APA to per capita total amount of APA. This aggregated indicator depends on the practices of the department (care plan volumes, computation formulas, regulation of the supply), as well as on the characteristics of the consumption of the APA beneficiaries in the department (average copayment rate, subsidized consumption). They control for a large set of departmental sociodemographic characteristics, which is likely to neutralize the effects of the consumption characteristics of APA beneficiaries. Thus, their indicator captures additional dimensions of departmental generosity compared to our indicator of the computation formula, and these dimensions positively affect the take-up of the APA program.

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[44]They exclude individuals who declare they are already APA beneficiaries, because they could have applied to the program earlier, in other departmental conditions.

[45]We have replicated our analysis using Arrighi et al. (2015)'s sample or/and dependent variable and our results are robust.

[46]They also test the effect of the generosity at the extensive margin, using the rate of APA beneficiaries among the 60+ population.

7.8 Comparison of *SolvAPA* survey and *Territoire*

The French Ministry of Health has recently conducted a survey on departmental practices regarding the APA program, the "SolvAPA" survey (DREES, 2015a), using a questionnaire close to the one of the *Territoire* survey. It makes it possible to compare the rule implemented by department councils in 2012 and in 2015. Unfortunately, the question regarding the share of APA hours provided by regulated providers was not included.

82 metropolitan departments (over 96) responded to the SolvAPA survey (compared to 71 for the *Territoire* survey). Among the 11 departments that did not answer *Territoire* but did return the questionnaire SolvAPA, 8 are regarded as limited in 2015, 15 as classical and 1 as generous. We observe in 2015 a situation that is new compared to 2012: some departments have regulated providers but they treat them as non-regulated by using rule 2 to compute the APA subsidy. They mostly correspond to previous classical departments. As they treat their regulated providers as non-regulated with respect to the computation of the allowance, we include them in the group of "no regulated providers". Among departments that have responded to both surveys, 80% (51 over 64 departments) use the same rule for the computation of APA benefit in 2012 and 2015. For those who have changed the rule, 13 classical departments have turned to have no regulated providers and 2 generous departments have turned classical. Interestingly, departmental councils never have increased their generosity level (measured by the computation formula used) between 2012 and 2015. It could reflect decisions following increased financial constraints with the increase in APA spending without augmented participation from the central government.

Table 15: Description of departments according to demand side indicators

		Survey SolvAPA (2015)				
		NR	No regulated providers	Classical	Generous	Total
Survey Territoire (2012)	NR	4	5	15	1	25
	No regulated providers	1	6	0	0	7
	Classical	6	11	40	0	57
	Generous	0	0	2	5	7
	Total	11	22	57	6	96

SAMPLE: 96 metropolitan departments.
SOURCES: *Territoire* survey LEDa-LEGOS and CES (2012); *SolvAPA* survey DREES (2015a).
NOTES: "NR" stands for non respondent. Classical: rule 1 for regulated providers. Generous: rule 3 for regulated providers.