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Pay less, consume more? The price elasticity of home care for the disabled elderly in France

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Abstract

Little is known about the price sensitivity of demand for home care of the disabled elderly. We partially fill this knowledge gap by using administrative data on the beneficiaries of the main French home care subsidy program in a department and exploiting interindividual variation in provider prices. We address the potential endogeneity of prices by taking advantage of the unequal spatial coverage of providers and instrumenting price by the number of municipalities served by a provider. We estimate a price elasticity of around −0.4 that is significantly different from both 0 and −1. This less than proportionate response of consumption to price has implications for the efficiency and redistributive impact of variation in the level of copayments in home care subsidy schemes.

KEYWORDS

censored regression, disabled elderly, home care, long-term care, price elasticity

1 | INTRODUCTION

Like most developed countries, France is facing the ageing of its population: due to the increase in life expectancy and the advance in age of baby-boomers, the share of the population above 75 is predicted to grow from 9.0% in 2013 to 17.2% in 2060 (Blanpain & Buisson, 2016). As the rise in disability-free life expectancy falls short of the increase in life expectancy (Sieurin, Cambois, & Robine, 2011), the number of the elderly needing assistance to perform the activities of daily living is expected to grow substantially. Most disabled elderly keep on living in the community rather than entering specialized institutions (Colombo, Llena-Nozal, Mercier, & Tjadens, 2011). Besides medical and nursing care, they are often provided with domestic help and personal care. Assistance may be provided by relatives (informal care) and also by professional services (formal care), whose utilization is increasing. In most countries, public policies foster the utilization of formal home care by subsidizing its consumption. These programs, however, only partially cover the cost of professional home care and the disabled elderly often bear non-negligible out-of-pocket (OOP) costs. In France, the average monthly OOP payment for home care was estimated to be €300 in 2011 (Fizzala, 2016); over one fifth of the average pension (Solard, 2015).

We address the following question: how sensitive to price are the disabled elderly when consuming professional home care? Besides concerns regarding the financial accessibility of long-term care services, OOP payments raise efficiency issues. As in the health care context, generous home care subsidies may induce overconsumption and a welfare loss, while insufficient coverage could have adverse health effects (Barnay & Juin, 2016; Rapp, Chauvin, & Sirven, 2015; Stabile, Laporte, & Coyte, 2006) or induce beneficiaries to substitute home care for more expensive institutional care (Ettner, 1994; Guo, Konetzka, & Manning, 2015). Uncovering the impact of OOP price on home care consumption is crucial to design an optimal subsidy policy that would achieve ex ante insurance of uncertain long-term care costs while limiting ex post demand-side moral hazard

(Bakx et al., 2015; Cutler & Zeckhauser, 2000; Zeckhauser, 1970). Our paper brings evidence on this empirical question by estimating the price elasticity of the demand for nonmedical home care services of the disabled elderly, at the intensive margin.

We focus on the French home care scheme targeted to the disabled elderly, the APA (*Allocation personnalisée d'autonomie*) policy, which counted 738,000 community-dwelling beneficiaries in 2014 and amounted to a spending of 3.1 billion euros in 2013 (0.15% of GDP).[1] Administrative records of the scheme provide detailed information on home care consumption and OOP payments of APA beneficiaries, but they are available only at the local level. We use an original dataset made of the individual records we collected for the beneficiaries of a given Departmental Council (*Conseil départemental*). We exploit interindividual variations in provider prices to identify consumer price elasticity. Price endogeneity may arise if APA beneficiaries nonrandomly choose their home care provider. To address this issue, we exploit the unequal spatial coverage by providers in the department. We fit a censored regression model to deal with observational issues and control for disposable income and other individual characteristics likely to affect the consumption of home care.

Our results indicate a negative price elasticity, with point estimates ranging from −0.5 to −0.1. According to our favored estimation, an increase of 10% of the hourly OOP price would reduce total hours consumed by 4% on average, or 70 min per month for a beneficiary consuming the median monthly volume of 18 hr. Although confidence intervals are relatively large, we statistically reject a price elasticity of both 0 and −1 in most specifications.

Our paper provides one of the very first estimates of the price elasticity of the demand for home care services of the disabled elderly. Despite the growing concern about the financing of long-term care, the impact of OOP payments on the consumption of home care has been little investigated in the economic literature. A few papers tested for the effect of benefiting from subsidies on the utilization of paid home care (Coughlin, McBride, Perozek, & Liu, 1992; Ettner, 1994; Fontaine, 2012; Pezzin, Kemper, & Reschovsky, 1996; Rapp et al., 2011; Stabile et al., 2006); because of data limitations, they were not able to quantify the price sensitivity. To our knowledge, the only existing studies addressing this gap in the literature exploit French data. Using national survey data, Hege (2016) makes assumptions on unobserved OOP prices and estimates a price elasticity of −0.16. Bourreau-Dubois, Gramain, Lim, and Xing (2014) use APA records from a department to observe exact home care prices, as we do, and estimate an elasticity of −0.55. We use a different, original dataset and propose an instrumental variable strategy to deal with potential price endogeneity.

Our results entail important policy implications, as home care subsidy schemes are expanding with population ageing. Home care consumption is found to be price sensitive, meaning that home care support programs have efficiency implications. Moreover, since consumption of home care reacts less than proportionately to a price change, home care subsidies should be regarded as a tool to achieve redistribution from taxpayers to the disabled elderly and reduce OOP spending on long-term care.

2 | INSTITUTIONAL CONTEXT AND DEMAND FOR HOME CARE

2.1 | The APA program

The French APA program aims at fostering the utilization of professional care services by the elderly requiring assistance in the activities of daily living (household chores, meal preparation, or personal hygiene). The APA policy is established at the national level and implemented at the departmental level.[2] To be eligible, an individual must be at least 60 years old and recognized as disabled. This second condition requires a specific assessment from a team managed by the Departmental Council, called the evaluation team, made of medical professionals (nurses, doctors) and/or social workers. The evaluation team visits each APA applicant to evaluate her needs of assistance using a national standardized scale. The applicant is thus assigned 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.

The evaluation team then establishes a "personalized care plan". This document lists the activities for which the individual needs assistance and sets the number of hours necessary to their realization. It gives the maximum number of hours eligible for APA subsidies of each beneficiary, called the care plan volume.[3] Up to the care plan volume, the OOP price of each hour of care is lowered by the APA subsidy. The beneficiary is free to consume hours beyond the care plan volume but there are no more subsidies.

[1](Drees, 2013; 2014). The APA program also has a component for the elderly living in nursing homes.
[2]Metropolitan France is divided into 95 departments.
[3]The monetary valuation of the care plan volume must not exceed a legal ceiling, which depends on the disability level. At the end of 2014, the ceiling was €1,313 (resp. €563) per month for GIR–1 (resp. GIR–4). Appendix D (available online) provides more elements on the set up of the care plan volume.

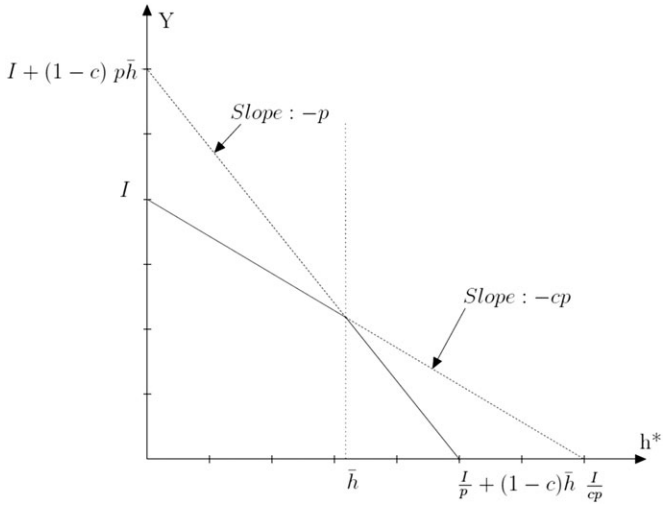

FIGURE 1 Budget constraint for home care under APA program

2.2 | Computation rules of APA subsidies

For subsidized hours, the APA beneficiary is charged an hourly OOP price that depends on both the provider price and a copayment rate, increasing with disposable income. For low-income individuals (income below €739 per month at the end of 2014), the copayment rate is zero, while it reaches 90% for the richest beneficiaries (monthly income above €2,945). In between the two, the copayment rate is an increasing linear function of disposable income.[4]

If the provider chosen by the beneficiary is authorized, then the hourly OOP price is given by applying the copayment rate to the regulated price charged by the provider.[5] For "non-authorized" providers,[6] the copayment rate is applied to a lump-sum price to get the OOP price. This distinction has important implications for what can be known of beneficiaries' OOP payments, since Departmental Councils usually keep track only of the prices of authorized providers.

2.3 | Modeling demand for home care with APA

We write the Marshallian demand for professional home care assuming a heterogeneity-only model (Moffitt, 1986):

$$h_i^* = g(CP_i, \hat{\mathrm{I}}_i; X_i) + \nu_i, \tag{1}$$

where h_i^* is the number of hours of home care consumed by individual i and $g(.)$ denotes the demand function. Care consumption depends on the consumer (or OOP) price for 1 hour of home care, CP_i, on the total disposable income available for consumption $\hat{\mathrm{I}}_i$, and on individual sociodemographic characteristics, X_i. ν_i is an individual preference shifter.

With APA, up to the care plan volume denoted $\bar{h}_i$, the hours consumed are subsidized. The consumer price is $CP_i = c_i p_i$, where p_i is the provider price for individual i and the copayment rate c_i is a function of individual i's monetary disposable income I_i such that: $c_i = c(I_i)$, with $c(.)$ a linear function.

Beyond the care plan volume $\bar{h}_i$, the consumer price equals the full provider price as there is no APA subsidy any more. The budget constraint is

$$\begin{cases} I_i = c_i p_i h_i^* + Y_i & \text{if} \quad h_i^* \leqslant \bar{h}_i \\ I_i = c_i p_i \bar{h}_i + p_i(h_i^* - \bar{h}_i) + Y_i \iff I_i + (1-c_i)p_i\bar{h}_i = p_i h_i^* + Y_i & \text{if} \quad h_i^* > \bar{h}_i \end{cases}$$

where Y denotes the composite good, with price set to 1. The APA program creates a kink in the budget constraint of the beneficiary (Figure 1).

[4]The schedule of APA copayments was substantially reformed in 2016. We describe the pre-reform schedule.
[5]Forty-nine metropolitan Departmental Councils out of the 73 that answered a national survey conducted in 2012 applied this computation rule (Bourreau-Dubois, Gramain, & Roquebert, 2015; LEDa-LEGOS & CES, 2012). Authorized providers are generally priced by the Departmental Councils.
[6]It can be either a nonauthorized structure (*service agréé non–autorisé*) or an over-the-counter worker (*gré–à–gré* or *mandataire*). See Appendix E (available online) for more details on the French home care sector.

As shown by the system above, when deciding upon an increase in home care consumption beyond $\bar{h}_i$, the individual should take into account not only her monetary disposable income I_i but also the subsidies received on the first $\bar{h}_i$ hours of care she has consumed. Denoting $\tilde{I}_i = I_i + (1 - c_i)p_i\bar{h}_i$ the "virtual" income of individual i (Moffitt, 1986; 1990), we rewrite the demand function specified in Equation 1 as follows:

$$\begin{cases} h_i^* = g(c_i p_i, I_i; X_i) + \nu_i & \text{if } h_i^* < \bar{h}_i \\ g(p_i, \tilde{I}_i; X_i) + \nu_i \leqslant \bar{h}_i \leqslant g(c_i p_i, I_i; X_i) + \nu_i & \text{if } h_i^* = \bar{h}_i \\ h_i^* = g(p_i, \tilde{I}_i; X_i) + \nu_i & \text{if } h_i^* > \bar{h}_i \end{cases}$$

The objective of the paper is to obtain an empirical estimate of the following quantity, which is the point price elasticity:

$$\frac{\mathrm{d}g(CP, \hat{\mathrm{I}}; X)}{\mathrm{d}CP} \frac{CP}{g(CP, \hat{\mathrm{I}}; X)}.$$

3 | DATA

3.1 | Administrative data from a Departmental Council

In France, there is no national survey or administrative data set that provides precise information on both the OOP payments and the formal home care use of the disabled elderly. We collected data from one Departmental Council that uses the most frequent APA subsidy computation rule, described in Section 2.2. We selected a department with demographic characteristics close to the national averages, although its population has higher than average incomes (Appendix A.1, available online).

Data were collected for every month in 2012–2014. Since within-year variation in provider prices is negligible, we only use data for the month of October,[7] when home care consumption is less likely to be affected by temporary shocks (like holidays and visits from children).

3.2 | Sample selection

To ensure clean identification, we focus on APA beneficiaries served by an authorized home care provider for which the provider price is observed: we exclude 23% of beneficiaries of the initial sample as they receive care from other providers. We also exclude beneficiaries with missing information on subsidized consumption around the month of interest, so as to limit the risk that unobserved shocks (temporary absences or hospitalizations) could bias the estimates.

In addition, we exclude beneficiaries whose copayment rate is zero: their OOP price on subsidized hours is zero. We also exclude beneficiaries whose copayment is equal to 90%: the relationship between their disposable income and their copayment rate is not linear and this makes identification more complex. We end up with 8,190 individuals, or about 2,700 per year, representing 51% of the initial sample.[8]

3.3 | Descriptive statistics

Columns 3 and 4 of Table 1 describe our estimation sample for October 2014.[9] The typical individual is a woman, in her mid-80s and living alone. Six APA beneficiaries out of 10 do not consume their full care plan volume; price sensitivity is one possible candidate to explain part of this high figure.

Columns 1 and 2 present the same statistics for two larger populations we selected our final sample from (all APA beneficiaries / all beneficiaries with an authorized provider). The last two columns indicate whether our sample and the larger samples differ in statistical terms. Differences are significant in terms of income and disability level, translating into differences in copayment rate and care plan volume and value.[10]

[7] Averaging consumption and OOP prices on an annual basis would hamper identification by blurring the true empirical relationship between price and consumption.

[8] Appendix A.2 (available online) provides more details.

[9] We present the data of October 2014 to draw a more easily interpretable picture of the population of interest. Appendix A.4 (available online) replicates these statistics for the pooled sample.

[10] Implications for the external validity of the analysis will be discussed in Section 5.

TABLE 1 Descriptive statistics for estimation sample and all program beneficiaries (October 2014)

		Beneficiaries with an authorized provider			Differences between samples	
	All beneficiaries		Estimation sample		*p* value	
	Mean	Mean	Mean	Std-dev.		
Variable	[1]	[2]	[3]	[4]	[1]-[3]	[2]-[3]
Care plan volume [a]	*n.a.*	21.9	20.5	10.7	*n.c.*	.00
Care plan monetary value [b]	*n.a.*	€471.7	€455.5	€238.3	*n.c.*	.00
Hours effectively subsidized [c]	*n.a.*	*n.a.*	17.7	10.9	*n.c.*	*n.c.*
Amount of effective subsidies [d]	*n.a.*	*n.a.*	€300.8	€201.4	*n.c.*	*n.c.*
[c] inferior to [a]	*n.a.*	*n.a.*	59.8%	-	*n.c.*	*n.c.*
Ratio [c]/[a]	*n.c.*	*n.c.*	85.0%	20.7 pp.	*n.c.*	*n.c.*
Ratio [d]/[b]	*n.c.*	*n.c.*	65.1%	22.2 pp.	*n.c.*	*n.c.*
Individualized income	€1,324.5	€1,264.6	€1,315.8	€422.5	.00	.00
Copayment rate	24.4%	22.3%	23.7%	17.3pp.	.01	.00
Authorized provider price	*n.a.*	€22.2	€22.2	€1.3	*n.c.*	.04
Hourly OOP price	*n.a.*	€4.9	€5.2	€3.8	*n.c.*	.00
Total OOP payments on subsidized hours	*n.a.*	€84.5	€91.3	€98.6	*n.c.*	.00
Age	*n.a.*	84.1	84.2	7.4	*n.c.*	.29
Women	76.7%	73.8%	74.0%	-	.03	.76
Disability level 1 (most severe)	1.5%	1.3%	1.2%	-	.00	.00
Disability level 2	14.5%	13.8%	12.5%	-		
Disability level 3	21.2%	21.0%	19.6%	-		
Disability level 4 (least severe)	62.8%	63.9%	66.7%	-		
	100%	*100%*	*100%*			
Living with a spouse	32.1%	31.0%	33.8%	-	.00	.00
Living alone	66.6%	67.5%	65.6%	-		
Spouse in institution	1.3%	1.6%	0.6%	-		
	100%	*100%*	*100%*			
Number of individuals	5,486	4,199	2,862		-	-
Number of households	*n.a.*	*n.a.*	2,785		-	-

SAMPLES: [1]: Sample of all at-home APA beneficiaries of the department; [2]: sample of beneficiaries who receive care, but not necessarily exclusively, from an authorized provider; [3] and [4]: estimation sample.

NOTE: "pp." stands for percentage points, "*n.a.*" for "not available", "*n.c.*" for "not computable" (available information is insufficient). Information on care plan volume, effective consumption, and provider price is not available when the beneficiary receives care from a nonauthorized provider. Care plan volume and effective home care consumption are expressed in hours per month; income, subsidies, and total OOP payments are expressed in euros per month. Data from October 2014.

TEST: The last two columns present the *p* values from the tests of difference between the estimation sample and nonselected beneficiaries. The test performed is a Student (resp. Pearson χ^2) test if variable is binary or continuous (resp. categorical). The tests compare the mean or distribution in the estimation sample with the reference sample ([1] or [2]) excluding the estimation sample.

4 | EMPIRICAL STRATEGY

4.1 | A censored measure of home care consumption

APA files register the individual number of home care hours that are charged by the provider to the Departmental Council or, equivalently, the *subsidized* hours of home care. However, we do not observe the *total* volume of home care consumed by each APA beneficiary. For the beneficiaries whose recorded consumption equals their care plan volume (40% of our sample), our measure of home care consumption is then possibly right-censored.[11]

Denote h_i the number of home care hours billed to the Departmental Council for beneficiary i. We observe

$$\begin{cases} h_i = g(c_i p_i, I_i; X_i) + \nu_i & \text{if} \quad g(c_i p_i, I_i; X_i) + \nu_i < \bar{h}_i \\ h_i = \bar{h}_i & \text{if} \quad g(c_i p_i, I_i; X_i) + \nu_i \geqslant \bar{h}_i \end{cases} \tag{2}$$

[11]No public source, at either the departmental or the national level, provides information on home care consumption beyond the care plan volume. However, data collected on a large provider operating in a French department show that 17% of its customers receiving APA consume strictly more than their care plan volume, with a median "overconsumption" of 1.5 hr per month (Fontaine & Gramain, 2017).

Hence, the parameters of the demand function $g(.)$ can only be identified from information relating to the first segment of the budget constraint. For individuals with the maximum number of billed hours $\bar{h}_i$, the only information we can use is that their demand is at least as high as this number.[12]

4.2 | Econometric specification

Because the distribution of (observed) home care consumption is slightly skewed, we assume a log-linear specification of $g(.)$, as follows:

$$ln(h^*_{it}) = \beta_0 + \beta_1.ln(c_{it}.p^j_{it}) + \beta_2.ln(I_{it}) + X'_{it}.\theta + \lambda_t + \epsilon_{it}, \tag{3}$$

where p^j_{it} denotes the price charged by provider j chosen by individual i in year t,[13], λ_t are year-fixed effects ϵ_{it}. Both price and income are included in log so that β_1 represents the consumer price elasticity and β_2 captures the income elasticity of the demand for home care services. As $c(.)$ is fully linear in income in the sample,[14] Equation 3 can be rewritten as

$$ln(h^*_{it}) = \gamma_0 + \beta_1.ln(p^j_{it}) + (\beta_1 + \beta_2).ln(I_{it}) + X'_{it}.\theta + \lambda_t + \epsilon_{it}. \tag{4}$$

Equation 4 makes it clear that the income variations identify the *empirical* income effect within the APA framework. With APA, any marginal increase in the disposable income has two effects. First, it increases home care consumption, provided home care is a normal good (standard income effect). Then, it induces the reassessment of the copayment rate, which may further affect home care consumption through an increased OOP price (price effect).

As System 2 corresponds to the typical observational scheme underlying a censored regression model, β_1 and β_2 can be estimated by Maximum Likelihood after making a parametric assumption on ϵ (Tobit model).[15] Our favored specification though is a more flexible version of Equation 4. In Equation 5, we take as dependent variable the log-share of the care plan volume consumed by the individual, $h^*_{it}/\bar{h}_{it}$ (call it "relative consumption") and include the care plan volume $\bar{h}_{it}$ as a control. Equation 4 is nested in Equation 5 and $\tilde{\beta}_1$ can still be interpreted as a price elasticity.[16]

$$ln(h^*_{it}/\bar{h_{it}}) = \tilde{\gamma_0} + \tilde{\beta}_1.ln(p^j_{it}) + (\tilde{\beta}_1 + \tilde{\beta}_2).ln(I_{it}) + \tilde{\beta}_3.ln(\bar{h_{it}}) + X'_{it}.\tilde{\theta} + \tilde{\lambda}_t + \tilde{\epsilon}_{it}. \tag{5}$$

This specification comes with several advantages. First, it includes $\bar{h}_{it}$ as a control, which might be a proxy of the unobserved determinants of consumption.[17] Technically, relative home care consumption has a better-behaved distribution than absolute consumption, making parametric estimates more likely to be consistent.[18] Its censoring point is unique (equal to 0), which eases the implementation of the estimation.

Our baseline estimates are obtained fitting a population-average[19] censored regression estimation of Equation 5 assuming that

$$\tilde{\epsilon} \quad | \quad p, I, \bar{h}, X, \tilde{\lambda} \sim \mathcal{N}(0, \tilde{\sigma}^2). \tag{6}$$

4.3 | Identification using cross-sectional variations in prices

As suggested by Equations 4 and 5, the *consumer price* elasticity of demand is identified by variation in *provider prices*. In the department, there are 28 authorized providers. Each provider price is reassessed every year. In the panel, provider prices range from €19.35 to €23.50, with an average of €21.8 and a standard deviation of €1.3. As yearly variation in prices was small between 2012 and 2014, most of the price variation is cross sectional.[20]

[12]Appendix C (available online) provides more details.
[13]All beneficiaries with the same provider are charged the same provider price, before APA copayment rate applies.
[14]The relationship between c_{it} and I_{it} actually depends on the year the copayment rate was set. We control for this source of interindividual and intraindividual variation in our estimations. Appendix B.1 (available online) provides more details.
[15]Appendix C (available online) derives the Maximum Likelihood function.
[16]Appendix B.2 (available online) provides more details.
[17]The care plan volume is supposedly based only on the specific activity restrictions of the beneficiary; qualitative studies have shown that the evaluation team is likely to take into account additional characteristics of the individual, such as the informal care she receives (Billaud et al., 2012).
[18]See Figures B.1 and B.2 in Appendix B.2 (available online).
[19]We use the unbalanced sample: selecting individuals staying in the APA program for 3 years would raise additional selection issues.
[20]On average, provider prices increased by 1.9% between October 2012 and 2013 and by 1.3% between 2013 and 2014.

To get unbiased estimates, the provider price charged to individual i must be uncorrelated with the unobserved factors affecting her home care consumption, ϵ_{it}. Supply–demand simultaneity may violate this condition (Zhen, Finkelstein, Nonnemaker, Karns, & Todd, 2014), but it should be negligible in our context. Indeed, although each provider is priced by the Departmental Council on the basis of its average production cost of 2 years earlier, the pricing process largely depends on administrative and political considerations (Gramain & Xing, 2012).

The risk of omitted variable biases is more difficult to dismiss. Beneficiaries may nonrandomly select their provider (price) on the basis of some unobservable individual characteristics such as quality expectations, unobserved health condition, or informal care provision (Billaud et al., 2012). Some sources of price variations can be documented and are unlikely to be correlated with unobserved determinants of home care consumption (Appendix F, available online), but it is insufficient to rule out any price endogeneity induced by nonrandom provider choice. To address this potential bias, we exploit the unequal spatial coverage by authorized providers in the department.

4.4 | An instrumental variable strategy

We propose to instrument the provider price by the number of municipalities in which the provider serves APA beneficiaries and estimate an IV-Tobit. To be valid, our instrument must first correlate with the price, conditional on the control variables. Second, it must be uncorrelated with the unobserved determinants of professional home care consumption.

From a practical standpoint, serving more municipalities translates into higher transportation and coordination costs for a provider. Exploiting the service files of a large French home care provider, an ongoing study suggests that the monetary costs associated to the travels of caregivers could represent from 4 to 20% of the price charged by a provider. This share is found to vary with the organization of caregivers' rounds. For authorized providers, such costs are partially incorporated in the price set by the Departmental Council (Gramain & Xing, 2012). Several public and research reports on the French home care sector have insisted on the heterogeneity in transportation costs borne by providers and the differences in prices it induces (Aube-Martin, Bruant-Bisson, & De Reboul, 2010; Branchu, Jaouen, & Naves, 2015; Garabige, Gomel, & Trabut, 2015; Vanlerenberghe & Watrin, 2014).

In our data, as is evidenced by Figure 2, the price charged by a given provider and the number of municipalities in which it operates are positively correlated. The IV-Tobit first stage (Table 2) shows that a one standard deviation increase in the number of municipalities served by the provider is associated with a 4.9% increase in its price. The F statistic associated with this estimate exceeds 143—a figure far higher than the conventional threshold used to assess the risk that the instrument is weak (Staiger & Stock, 1997).

A potential threat to the exclusion restriction is that the instrument may correlate with individual consumption through another channel than the price charged by the provider. In particular, it would be the case if the number of hours provided by a service

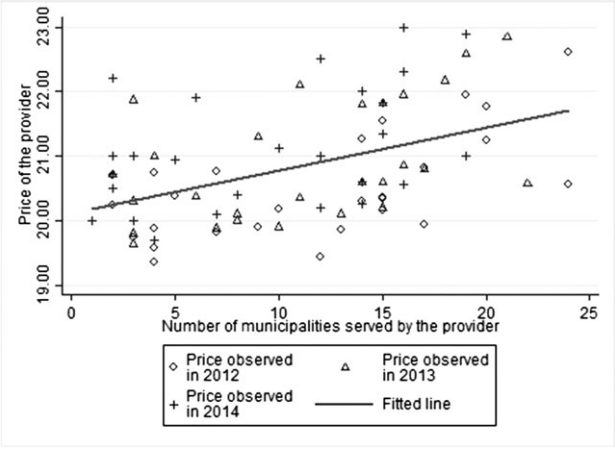

FIGURE 2 Correlation between provider price and number of municipalities served by the provider

NOTE: The number of municipalities served by each provider is constructed using information on all APA beneficiaries receiving home care from an authorized provider in October 2012, 2013, and 2014 (and not just the beneficiaries retained in the estimation sample). The line is fitted using all 3 years of observation. To make the graphical representation more readable, we excluded the largest provider. With 199 municipalities served in October 2014, it charged the highest price over the 3 years of observation (€23.5 in 2014). The positive correlation displayed by the graph is preserved when we include the largest provider.

TABLE 2 Censored regression estimates of demand for home care hours

	Tobit	IV-Tobit
	(1)	(2)
Panel A: Second stage	Dependent variable: relative consumption $h^*/\bar{h}$ (log)	
Price (log)	−0.450**	−0.387**
	(0.1 81)	(0.192)
Disposable income (log)	−0.010	−0.010
	(0.008)	(0.008)
Care plan volume (log)	0.040*	0.040*
	(0.023)	(0.023)
Woman	0.029**	0.030**
	(0.014)	(0.014)
Age: 60–69	−0.124***	−0.123***
	(0.047)	(0.047)
Age: 70–79	−0.042**	−0.042**
	(0.017)	(0.017)
Age: 80-89	*Ref.*	*Ref.*
Age: 90 or older	0.051***	0.052***
	(0.015)	(0.015)
Disability group: 1 (most severe)	0.154***	0.153***
	(0.057)	(0.057)
Disability group: 2	0.027	0.027
	(0.022)	(0.022)
Disability group: 3	*Ref.*	*Ref.*
Disability group: 4 (least severe)	0.008	0.009
	(0.012)	(0.012)
Living with no spouse	0.107***	0.107***
	(0.013)	(0.013)
Spouse receives APA	0.036	0.037
	(0.034)	(0.034)
Spouse in institution	0.170*	0.170*
	(0.095)	(0.094)
Living with non-APA spouse	*Ref.*	*Ref.*
Constant	1.225**	1.032*
	(0.556)	(0.592)
Panel B: First stage		Dependent variable: provider price p (log)
Number of municipalities (std.)		0.049***
		(0.004)
F statistic		143.98
Observations	8,190	8,190
Censored observations	39.6%	39.6%
Number of clusters	28	28
AIC	11,454	−22, 049
BIC	11,644	−21, 860

NOTE: Standard errors in parentheses, clustered at the provider level. Pooled data from October 2012, 2013 and 2014. Estimation of a Tobit or IV-Tobit model by Maximum Likelihood. AIC and BIC designate Akaike and Bayesian information criteria. In the first stage (Panel B), the log-provider price is regressed on the standardized number of municipalities served by the provider. All specifications include year-fixed effects, dummies for the year in which the copayment rate was computed as well as dummies for the year the latest plan was decided upon (in the first and second stages for the IV-Tobit estimation). * $p < .10$, ** $p < .05$, *** $p < .01$.

systematically increases its provision costs due to decreasing returns to scale. Apart from transportation and coordination costs though, the care provision process may be assumed to exhibit roughly constant returns to scale, as most of the provision costs is made of caregivers' wages. The strong association between the price charged by a provider and its geographical area of operation is thus unlikely to be driven by the volume of care it delivers.

5 | RESULTS AND DISCUSSION

5.1 | Main results

Table 2 presents our main results, obtained on the panel data.[21] Column 1 presents Tobit estimates of Equation 5. Column 2 presents the estimates we obtain when the price is instrumented by the number of municipalities served by the provider.[22] We cluster the standard errors at the provider level since our "treatment" variable, p_{it}^{j}, essentially varies at the provider level (Cameron & Miller, 2015; Moulton, 1990).

When the provider price is considered as exogenous, the consumer price elasticity estimate is about −0.45. When using our instrument, the coefficient is slightly lower in absolute value. The difference between the two is not statistically significant, suggesting that the potential bias due to nonrandom provider selection may be limited.[23] Overall, price elasticity estimates are negative, statistically significant, confirming that the disabled elderly are sensitive to the price of professional home care. Our favored estimation, which instruments the price (Column 2), gives a point estimate of −0.387, or about −0.4.

The income effect in the APA framework appears negative, but negligible and statistically not different from zero. Richer APA beneficiaries do not tend to consume more formal care, all other things being equal. With $\hat{\tilde{\beta}}_1 + \hat{\tilde{\beta}}_2$ close to zero, our estimations suggest that the increase in the copayment rate, induced by an increase in income, compensates for the standard income effect. We also derive an estimate of the standard income elasticity $\tilde{\beta}_2$. Both the Tobit and the IV-Tobit give a value of about 0.4, statistically different from zero. Although this income effect is imprecisely estimated,[24] we are able to conclude that home care is a necessity good for the disabled elderly.

Individuals with a higher care plan volume tend to consume a larger share of their care plan. For a given disability level, a higher care plan volume could be explained by a lower provision of informal care. Alternatively, a higher care plan may also have a stronger prescriptive effect. As expected, the highly-disabled individuals consume relatively more than the beneficiaries with mild to moderate disability, all other factors being equal. Even when controlling for the disability level, age retains a significant effect on the consumption on home care services. Being a woman increases the consumption of professional home care relative to the care plan volume, by a small but statistically significant amount. Living alone (spouse in institution or no spouse) increases the amount of professional assistance received, consistently with previous works showing the importance of the co-residing spouse in providing informal care substituting partly for formal home care services.

5.2 | Further results and robustness checks

We replicate the estimations on each year separately (Appendix G.1, available online); price elasticity estimates are found to range from −0.54 to −0.13. Precision is low but we can reject that the price elasticity is zero (except for 2014) or unity.[25] We check our results are robust to the fact that inference relies on a small number of clusters by implementing a cluster percentile–t bootstrap (Appendix G.2, available online). Statistical significance of the price elasticity is preserved at the 5% level on the pooled sample.

To investigate the potential heterogeneity in price sensitivity, we estimate the model interacting the price with the disability level or the income level (Table 3). A credible IV strategy would require to find an additional instrument for each interaction term. As Table 2 suggests that the bias due to potential price endogeneity is limited, we fit a simple Tobit model when adding the interaction terms. We expected more severely disabled individuals to be less price sensitive, but we are not able to detect such an effect. Price sensitivity is higher for individuals whose income is above the sample median income. This result echoes Duarte (2012), who finds that higher income individuals are more price-elastic in their medical care consumption. Richer individuals may be more able to understand the health care system and cost-sharing schedules due to a higher financial literacy.

As a robustness check, we implement an alternative identification strategy (Appendix G.3, available online). We estimate our equation of interest (without instrumenting the price) on the subsample of APA beneficiaries who live in a municipality where a

[21] The coefficients displayed give the predicted impact of a marginal (or 0/1) change in a given explanatory variable on the total, uncensored relative home care consumption.

[22] We use the parametric version of Stata command `ivtobit`. We thus assume the error terms of the first-stage and second-stage equations are jointly normally distributed.

[23] We implement a cluster Bootstrap Hausman test. We cannot reject that the provider price is exogenous ($p = .88$).

[24] $\hat{\tilde{\beta}}_2$ corresponds to the difference between the empirical income elasticity with APA and the price elasticity estimate; the associated standard error is high (around 0.19), due to the relatively large standard error of the price elasticity estimate.

[25] Precision in 2014 is lower, as a provider closed down.

TABLE 3 Price elasticity of home care by severity of disability and income

Dependent variable: relative consumption h^*/h (log)	(1)	(2)	(3)
Price (log)	−0.450**	−0.323	−0.446**
	(0.181)	(0.236)	(0.178)
Price (log) × disability group 4 (least severe)		−0.190	
		(0.270)	
Price (log) × income above median			−0.019***
			(0.006)
Disposable income (log)	−0.010	−0.010	0.011
	(0.008)	(0.008)	(0.010)
Observations	8,190	8,190	8,190
Censored observations	39.6%	39.6%	39.6%
Number of clusters	28	28	28
AIC	11,454	11,453	11,439
BIC	11,643	11,642	11,629

NOTE: Standard errors in parentheses, clustered at the provider level. Pooled data from October 2012, 2013, and 2014. Estimation of Tobit model by Maximum Likelihood. AIC and BIC designate Akaike and Bayesian information criteria. All specifications include as controls the care plan volume, sociodemographic characteristics, year-fixed effects, dummies for the year in which the copayment rate was computed as well as dummies for the year the latest plan was decided upon. * $p < .10$, ** $p < .05$, *** $p < .01$.

single authorized provider is found to operate. In a context in which price selection is arguably limited, we find a price elasticity estimate around −0.5—not statistically different from our main result.

5.3 | Discussion

Our results confirm that the consumption of home care of the disabled elderly is sensitive to the price they pay. Decisions relating to formal home care consumption are influenced by a trade-off between the OOP price of an extra hour and its marginal value. Such a pecuniary trade-off has been documented at the extensive margin, as the take-up of APA benefits is affected by the average subsidy rate in the department (Arrighi, Davin, Trannoy, & Ventelou, 2015). Innovatively, we find evidence that the price elasticity of the demand for home care is seemingly lower than unity at the intensive margin: the adjustment of consumption is proportionally lower than a given change in price. This implies a positive price elasticity of OOP expenditures: a *decrease* in the OOP price should lead to a *decrease* in total OOP payments.

The price sensitivity we obtain is of an order of magnitude similar to the estimates found for health care demand. Although the magnitude of the −0.2 estimate derived from the Rand Health Insurance Experiment (Keeler & Rolph, 1988; Manning et al., 1987) is subject to discussion (Aron-Dine, Einav, & Finkelstein, 2013), a large literature has confirmed that medical spending is price-elastic, with price sensitivity varying with the type of care (Duarte, 2012; Fukushima, Mizuoka, Yamamoto, & Iizuka, 2016). Our paper provides interesting evidence that, at the intensive margin, home care consumption is closer to acute care than to elective care in terms of price sensitivity.

Our OOP price measure does not take into account possible tax reductions on home care services, unobserved in the APA records. Without sufficient information to simulate them, we implicitly assume APA beneficiaries to be sensitive to the "spot" price (Geoffard, 2000). We also assume that APA recipients react in the same way to variations in the copayment rate and in the provider price. If salience differs (Chetty, Looney, & Kroft, 2009), implications for the design of the copayment schedule are less straightforward.

In our administrative data, information on family characteristics is poor. Receiving more informal care has been found to decrease formal care use, both at the extensive and intensive margins (Bonsang, 2009; Van Houtven & Norton, 2004). Omitting informal care provision could bias the estimates of our entire set of coefficients. This is all the more of a concern as the share of (self-declared) APA beneficiaries who declare receiving some informal help is higher in the department than in the rest of France.[26] As a robustness check, we include as a control whether the individual receives formal home care during the weekend and public holidays (Appendix G.4, available online). We hypothesize that individuals not receiving professional home care over

[26]Over four fifths in the department, against 75% in metropolitan France (Insee-Drees, 2014).

the weekend are more likely to receive assistance from their relatives. Receiving formal care during the weekend is associated with more hours consumed during working days; reassuringly though, it does not significantly affect the price elasticity estimate.

Finally, external validity of our results should be qualified. Without data covering the entire population eligible to APA, the potential bias induced by the differential take-up of APA subsidies (Chauveaud & Warin, 2005) cannot be dealt with. Our sample is not nationally representative, and we focus on APA recipients who consume home care from authorized services. As the department is slightly richer than France as a whole, and price sensitivity being greater for richer beneficiaries, our estimates may be an upper bound (in absolute value). Yet the department is reasonably close to "average France" in terms of other sociodemographic characteristics, and most APA beneficiaries in France receive care from authorized providers (Hege, Roquebert, Tenand, & Gramain, 2014). Finally, our results are in line with the two available estimates (Bourreau-Dubois et al., 2014; Hege, 2016), which rely on different estimation strategies and data.

6 | CONCLUSION

This paper estimates the consumer price elasticity of the demand for professional home care services of the disabled elderly benefiting from the French APA program. Our results suggest this parameter is about −0.4, with point estimates statistically different from zero and unity in absolute value.

Our findings pave the way for several policy implications. With income having no effect in the APA scheme, we can interpret our price elasticity estimate as a sufficient statistic for the substitution effect in home care subsidy schemes. As the disabled elderly are sensitive to the price of care, the copayment rates in home care subsidy programs entail allocative and dynamic efficiency issues. Given the low value of the price elasticity, the generosity of home care subsidies also has substantial redistributive effects from taxpayers to the disabled elderly.

While remaining cautious regarding the external validity of the results, our estimates can be used to discuss the effects of potential reforms of home care subsidies. The decrease of copayment rates enacted by the 2016 APA reform, higher for low-income recipients, should reduce overall OOP expenses on professional home care of current APA recipients, while having a limited volume effect.

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CONFLICT OF INTEREST

The authors have no conflict of interests to declare.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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