Pay less, consume more?
Estimating the price elasticity of demand for home care services using French administrative data

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Context

- In all developed countries: **population aging**
- Increase in *disability-free life expectancy* does not match the increase in life expectancy *(Sieurin et al., 2011)*
  - **Disability**: inability to perform alone one or more activities of daily living (ADL or IADL)
- **Encouragement of home care solutions** (/ / institutions)
  - **Home care**: nursing or domestic help provided to the elderly living in the community

⇒ **Growing demand for home care services**
Home care and OOP payments

- **Home care provision**
  - A lot of informal care (relatives)
  - Development of **professional home care** (public services, non-profit or for-profit organizations)

- **Long-term care policies in France**:
  - **home care subsidies** granted to disabled individuals 60+
  - ... but do not cover the full cost of home care

⇒ **Out-of-pocket (OOP) payments** on professional home care services are substantial in France:

  - Average OOP for home care subsidy recipients: 300€/month in 2011 (Fizzala, 2016) - a lower bound
Research question

⇒ RQ: How sensitive to out-of-pocket payments is the consumption of professional home care services?

- **Objective** of the paper: estimate the price elasticity of demand for home care services of the disabled elderly
  - $PE = \%$ increase in hours consumed following a 1% increase in OOP
  - If consumption reacts little to price: home care subsidies as a pure redistributive policy
  - If consumption reacts to price: an efficiency concern (Barnay & Juin, 2016; Rapp et al., 2015)

- **Empirical strategy**: make use of the French *Allocation personnalisée d’autonomie* (APA) program
  - APA = hourly subsidy on professional domestic help
  - Administrative records provide information on home care consumption and copayment
What do we know?

- **Literature on home care consumption**
  - Determinants of home care utilization; substitution between informal care and formal care
  - Price sensitivity: much less prolific
    - Data limitations

  → **A qualitative result**: home care consumption is sensitive to price

- **Get to know more**: the MODAPA project
  - A team of French researchers working on LTC questions
  - Improve knowledge about the effect of OOP payments on home care consumption
  - Use of alternative methods and data (Bourreau-Dubois et al., 2014; Hege, 2016)
Outline

1. Motivation
2. Literature
3. APA policy and demand for home care
4. Data and empirical strategy
5. Empirical results
6. Discussion
How does APA work?

1. Assessment of needs by the District Council (Conseil départemental)
   - Defines the personalized care plan: individual’s $i$ maximum number of hours of care that can be subsidized, $\bar{h}_i$

2. Cost-sharing rule:
   - OOP price on subsidized hours: $OOP_i = c_i p_i$
   - Price $p_i$ charged by the home care service chosen by $i$
   - Copayment rate $c_i$, increasing in disposable income:
     $c_i = c(\text{income}_i)$, $c' \geq 0$
     $0\% \leq c_i \leq 90\%$

3. Actual home care consumption by individual $i$, $h^*_i$
   - Can be less or more than $\bar{h}_i$
   - But no subsidy beyond $\bar{h}_i$
**Figure 1:** APA creates a kinked budget constraint

- *Hours are subsidized by APA*
  - $-cp$
- *Hours are no more subsidized by APA*
- *Budget set*
- $\bar{h}$
- $\frac{l}{p} + (1 - c)\bar{h}$
- $h^*$
Modeling home care demand

- General form of **marshallian demand** for home care services:

\[ h_i^* = g(OOP_i, income_i; characteristics_i) + \nu_i \]

- \( OOP_i \): hourly out-of-pocket price of care (equal to \( c_ip_i \) or \( p_i \))
- \( \nu_i \): individual preference shifter

- Demand with **kinked budget constraint** (Moffit, 1990):

\[
\begin{align*}
  h_i^* &= g(c_ip_i, l^D_i; X_i) + \nu_i & \text{if } h_i^* < \bar{h}_i \\
  g(p_i, l^D_i + (1 - c_i)p_i\bar{h}_i; X_i) + \nu_i & < h_i^* < g(c_ip_i, l^D_i; X_i) + \nu_i & \text{if } h_i^* = \bar{h}_i \\
  h_i^* &= g(p_i, l^D_i + (1 - c_i)p_i\bar{h}_i; X_i) + \nu_i & \text{if } h_i^* > \bar{h}_i
\end{align*}
\]

- With \( l^D_i \) disposable income, \( X_i \) individual characteristics

- What we want to estimate empirically:

\[
PE = \frac{dg(.)}{dOOP} \frac{OOP}{g(.)}
\]
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Data

- **⚠️ No national administrative or survey data**
- **An original dataset**
  - Collected on a French District Council
  - Exhaustive administrative information on APA beneficiaries
    - Hours subsidized by APA and hours effectively consumed, copayment rate, home care producer chosen
    - Income, disability level, family status
- **Selected sample**
  - APA recipients in October 2014
  - With OOP price exactly recorded

⇒ **Final sample**: 2,862 individuals
### Table 1: Sample descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Average</th>
<th>Std-dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care plan volume</td>
<td>20.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Hours effectively subsidized</td>
<td>17.7</td>
<td>10.9</td>
</tr>
<tr>
<td>Under-consumption</td>
<td>59.8%</td>
<td>-</td>
</tr>
<tr>
<td>Individualized income</td>
<td>1,314€</td>
<td>422€</td>
</tr>
<tr>
<td>Copayment rate</td>
<td>23.7%</td>
<td>17.3 pp.</td>
</tr>
<tr>
<td>Hourly OOP price on subsidized hours</td>
<td>5.2€</td>
<td>3.8€</td>
</tr>
<tr>
<td>Total OOP payment on subsidized hours</td>
<td>91.3€</td>
<td>98.6€</td>
</tr>
<tr>
<td>Age</td>
<td>84.2</td>
<td>7.5</td>
</tr>
<tr>
<td>Women</td>
<td>74.0%</td>
<td>-</td>
</tr>
<tr>
<td>Disability level 1 (most severe)</td>
<td>1.2%</td>
<td>-</td>
</tr>
<tr>
<td>Disability level 2</td>
<td>12.5%</td>
<td>-</td>
</tr>
<tr>
<td>Disability level 3</td>
<td>19.7%</td>
<td>-</td>
</tr>
<tr>
<td>Disability level 4 (least severe)</td>
<td>66.7%</td>
<td>-</td>
</tr>
<tr>
<td>Living alone</td>
<td>66.6%</td>
<td>-</td>
</tr>
<tr>
<td>Living with a spouse</td>
<td>33.8%</td>
<td>-</td>
</tr>
<tr>
<td>Spouse in institution</td>
<td>0.6%</td>
<td>-</td>
</tr>
<tr>
<td>Observations</td>
<td>2,862</td>
<td></td>
</tr>
</tbody>
</table>
A censored regression framework

- In the administrative records, **home care consumption is censored** at $\bar{h}_i$

- **Observational scheme**, with $h_i$ the observed consumption:

$$
\begin{cases}
  h_i = h_i^* = g(c_i p_i, l_i^D; X_i) + \nu_i & \text{if } h_i^* < \bar{h}_i \\
  h_i = \bar{h}_i \leq g(c_i p_i, l_i^D; X_i) + \nu_i & \text{if } h_i^* \geq \bar{h}_i
\end{cases}
$$

- **ML estimation of a type-1 Tobit model**
  - Assume a **log-linear** specification for home care demand $g(.)$:

$$
\ln(h_i^*) = \beta_0 + \beta_1 \ln(c_i p_i) + \beta_2 \ln(l_i^D) + X_i' \theta + \epsilon_i \quad (1)
$$
  - $\ln(c_i p_i) \rightarrow$ constant PE along the demand curve
  - Distributional assumption :

$$
\epsilon \mid p, l^D, X \sim \mathcal{N}(0, \sigma^2).
$$
Identification strategy and potential issues

- **Identifying variation**: cross-sectional variations in producer prices
  - for given \( I_i^D \), \( p_i \) is the only source of variation in \( OOP_i \) (\( = c_i p_i \))
  - 23 different prices (standard-deviation of 1.3€)

- Why do prices differ?
  - (NB: home care providers are priced by LAs)
    - Status (public/private); transportation costs; weekend service
    - Differential quality?
  - \( \Delta \) If APA recipients can choose producers on the basis of their price, our estimates may be biased

- However:
  - For 40% of the sample: a single producer operating in their area of residence → no producer choice
**Figure 2: Distribution of producers over the territory**

Several producers are operating in the area (producer with price P1, producer with price P2, producer with price P4)

Only one producer is operating in the area (with price P1)
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Empirical results

- Two different types of areas ⇒ estimation on the two sub-samples as a test of price endogeneity

**Table 2: Testing for producer selection effect**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OOP price (log)</strong></td>
<td>-0.709**</td>
<td>-0.344</td>
<td>-1.054***</td>
</tr>
<tr>
<td></td>
<td>(0.290)</td>
<td>(0.608)</td>
<td>(0.391)</td>
</tr>
<tr>
<td><strong>p-value</strong></td>
<td>0.016</td>
<td>0.572</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sample (type of area)</strong></td>
<td>All</td>
<td>Single producer</td>
<td>Multiple producers</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>2862</td>
<td>995</td>
<td>1867</td>
</tr>
<tr>
<td><strong>Censored observations</strong></td>
<td>40.2%</td>
<td>42.9%</td>
<td>38.9%</td>
</tr>
</tbody>
</table>

* * p < 0.10, ** p < 0.05, *** p < 0.01

- Effects of covariates in line with the literature
- The least disabled are more sensitive to OOP price
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Discussion of results

- On average, a 10% increase in the OOP price of home care would decrease consumption by 4%
  - An increase in the OOP price \textit{decreases consumption less than proportionally}
  - Home care as a \textit{necessity good}

- What about \textit{substitution with informal care}?
  - \textbf{Not observed} in the administrative data
  - A proxy: hours provided on weekends
  - \textit{→} Suggests that taking into account informal care provision should \textit{not} affect our results
Policy implications

- **Effects of home care subsidies policies**
  - $|PE| \neq 0$: allocative and dynamic efficiency implications
  - $|PE|$ quite low: home care subsidies to be analyzed primarily as *redistributive policies*

  → **Reforms of home care subsidies**: reducing hourly OOP price should reduce total OOP payments in the budget of the elderly
    - 2016 APA reform in France: decrease of copayment rate for the more severely disabled

- **Unequal spatial coverage**: no price/producer choice for many APA beneficiaries
Thanks for your attention

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Full Working Paper available at:
http://www.york.ac.uk/media/economics/documents/hedg/workingpapers/1616.pdf

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- ANR and Iresp, for financial support to the project
- An anonymous District Council, for access to the APA files
- Fondation Médéric Alzheimer, for financial support of my doctoral research
Figure 3: APA recipient can choose between different types of home care producers

- Regulated home care service (service agréé et autorisé)
  - Producer price $p_i$ used to compute APA subsidy
  - OOP price recorded in the data

- Unregulated home care service (service agréé non autorisé)
  - Producer price $p_i$ not used to compute APA subsidy
  - OOP price not recorded in the data

- Over-the-counter domestic help (employé à domicile)
Table 3: Sample selection steps

<table>
<thead>
<tr>
<th></th>
<th>All APA recipients</th>
<th>Recipients consuming from a regulated producer at least</th>
<th>&quot;Stable&quot; APA recipients</th>
<th>Recipients consuming only from one regulated producer</th>
<th>Recipients with $0 &lt; c_i &lt; 90%$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>Observations</td>
<td>5,489</td>
<td>4,202</td>
<td>3,530</td>
<td>3,327</td>
<td>2,862</td>
</tr>
<tr>
<td>% of previous step</td>
<td>-</td>
<td>76.5%</td>
<td>83.9%</td>
<td>94.2%</td>
<td>86.0%</td>
</tr>
<tr>
<td>% of initial sample</td>
<td>100%</td>
<td>76.5%</td>
<td>64.2%</td>
<td>60.5%</td>
<td>52.1%</td>
</tr>
</tbody>
</table>

Notes: (i) “Stable” APA recipients in October 2014 are defined as those for which information is available also for the months of September and November 2014. (ii) For additional 86 individuals (not in the numbers here above), our administrative files contained no information on the copayment rate or on the consumption of home care hours. These individuals are presumably former APA recipients not yet erased from the files.
Figure 4: Copayment rate schedule, as a function of monthly individualized disposable income
Figure 5: A censored measure of home care consumption

The diagram illustrates the concept of home care consumption with budget constraints. It shows the budget set where hours are subsidized by APA and where hours are no more subsidized. The kink in the graph represents the threshold where the subsidy changes. The figure also indicates that $h^*$ is observed when hours are subsidized, and $h^*$ is censored when hours are not subsidized.
### Effects of socio-demographic characteristics

**Dependent variable : total hours consumed (\(\log h^*\))**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 60-69</td>
<td>-0.265</td>
<td>0.079</td>
</tr>
<tr>
<td>Age: 70-79</td>
<td>-0.070</td>
<td>0.032</td>
</tr>
<tr>
<td>Age: 80-89 (Ref.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age: 90 or older</td>
<td>0.072</td>
<td>0.032</td>
</tr>
<tr>
<td>Woman</td>
<td>0.065</td>
<td>0.026</td>
</tr>
<tr>
<td>Disability group: 1</td>
<td>0.729</td>
<td>0.128</td>
</tr>
<tr>
<td>Disability group: 2</td>
<td>0.433</td>
<td>0.045</td>
</tr>
<tr>
<td>Disability group: 3 (Ref.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability group: 4</td>
<td>-0.523</td>
<td>0.023</td>
</tr>
<tr>
<td>Living with no spouse</td>
<td>0.317</td>
<td>0.032</td>
</tr>
<tr>
<td>Spouse receives APA</td>
<td>0.031</td>
<td>0.059</td>
</tr>
<tr>
<td>Spouse in institution</td>
<td>0.570</td>
<td>0.127</td>
</tr>
<tr>
<td>Living with non-APA spouse (Ref.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 5: Robustness checks: Panel estimations

<table>
<thead>
<tr>
<th></th>
<th>— PA model —</th>
<th>— RE model —</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td><strong>OOP price (log)</strong></td>
<td>-0.452***</td>
<td>-1.001***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.251)</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Year fixed-effects</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sample (type of area)</strong></td>
<td>Single producer</td>
<td>Multiple producers</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>2491</td>
<td>5699</td>
</tr>
<tr>
<td><strong>Censored observations</strong></td>
<td>40.6%</td>
<td>39.2%</td>
</tr>
<tr>
<td><strong>Number of clusters</strong></td>
<td>37</td>
<td>60</td>
</tr>
</tbody>
</table>

Notes: Standard-errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. S-e are clustered at the producer price level in columns (1) and (2), and bootstrapped (25 replications) in columns (3) and (4). Estimations use data from October 2012, 2013 and 2014. Both PA and RE are estimated on the unbalanced panel sample.
## Table 6: Heterogeneity of price elasticity: estimations by disability level

<table>
<thead>
<tr>
<th>Dependent variable: hours consumed (log)</th>
<th>GIR 1 &amp; 2 (1)</th>
<th>GIR 3 (2)</th>
<th>GIR 4 (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OOP price (log)</td>
<td>0.122 (0.656)</td>
<td>-0.701*** (0.002)</td>
<td>-0.998*** (0.248)</td>
</tr>
<tr>
<td>Other controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed-effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>1145</td>
<td>1655</td>
<td>5390</td>
</tr>
<tr>
<td>Censored observations</td>
<td>44.4%</td>
<td>39.5%</td>
<td>38.6%</td>
</tr>
<tr>
<td>Number of clusters</td>
<td>27</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

Notes: Standard-errors in parentheses, clustered at the producer level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimations use pooled data from October 2012, October 2013 and October 2014 (population-average model).
**Table 7: Robustness checks: inclusion of hours received on weekends**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hours consumed during the week (log)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer price (log)</td>
<td>-0.795***</td>
<td>-0.921***</td>
<td>-0.867***</td>
</tr>
<tr>
<td></td>
<td>(0.248)</td>
<td>(0.253)</td>
<td>(0.260)</td>
</tr>
<tr>
<td>Consumes care on weekends</td>
<td>0.491***</td>
<td>0.076</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.056)</td>
<td>(0.107)</td>
<td></td>
</tr>
<tr>
<td>Number of hours received on weekends</td>
<td></td>
<td>0.119***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.031)</td>
</tr>
<tr>
<td>Other controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed-effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>8190</td>
<td>8190</td>
<td>8190</td>
</tr>
<tr>
<td>Censored observations</td>
<td>39.6%</td>
<td>39.6%</td>
<td>39.6%</td>
</tr>
<tr>
<td>Number of clusters</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

Notes: Standard-errors in parentheses, clustered at the producer level; * \( p < 0.10 \), ** \( p < 0.05 \), *** \( p < 0.01 \). Estimations use pooled data from October 2012, October 2013 and October 2014 (population-average model).