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The Effect of Public Subsidies for Formal Care on the Care Provision for Disabled Elderly People in France

Roméo Fontaine *

Résumé

The aim of this paper is to assess the effect of the personalised autonomy allowance (*allocation personnalisée d'autonomie*, or APA) on the care received by disabled elderly people living in the community. Using data from the French *Handicap Santé Ménage* Survey, we conduct an empirical analysis using the propensity score matching method. Our results suggest that the use of publicly funded formal care partially substitutes for privately funded formal care and informal care, depending on the disability level and informal care resources, and improves the support that disabled elderly people receive to assist them in performing the primary activities of daily living.

Résumé

Ce papier vise à évaluer l'effet de l'allocation personnalisée d'autonomie (APA) sur l'aide reçue par les personnes âgées dépendantes vivant à domicile. À partir des données de l'enquête Handicap-Santé Ménage, nous proposons une analyse statistique basée sur une méthode d'appariement par score de propension. Nos résultats suggèrent que l'aide

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professionnelle financée par l'intermédiaire de l'APA se substitue partiellement, selon le niveau de dépendance et les ressources en aide informelle, à de l'aide professionnelle financée de manière privée et à de l'aide informelle, mais que globalement, bénéficiaire de l'APA améliore la prise en charge des personnes âgées dépendantes.

Keywords: Long-term Care, Informal Care, Public Subsidy, Crowding-out Effect, Propensity Score Matching.

Mots-clés : Soins de longue durée, aide informelle, subvention publique, effet d'éviction, appariement par score de propension.

J.E.L. : D13, H24, H51, I18, J14

1. Introduction

Within the ageing population, a growing number of individuals need assistance to perform the activities of daily living. In light of this observation, one of the main objectives of European policymakers is to keep disabled elderly people in the community for as long as possible. Implementing this objective raises the issue of how responsibilities related to elder care are shared between the family and the state. In many countries, the family is the main provider of care for disabled elderly people. Existing surveys consistently estimate that informal care accounts for at least 80% of the total care (by volume) received by disabled elderly people (OECD, 2005). However, informal provision of care may lead to adverse private and social effects. One of these adverse effects is a reduction in the caregivers' labour supply (Crespo, 2006; Bolin *et al.*, 2008). Another adverse effect is a potential decline in the caregiver's health. Previous studies suggest that providing care increases symptoms of depression and the incidence of heart conditions (Coe and Van Houtven, 2009).

Policymakers have a strong interest in providing care to improve the well-being of disabled elderly people, reducing the risk of institutionalisation induced by the eventual termination of the informal care arrangement and alleviating the burden on informal caregivers. One possibility is to provide publicly funded formal care. In 2002, the French government introduced the personalised autonomy allowance (*allocation personnalisée d'autonomie*, or APA) to encourage the use of professional

home care workers. The APA is a form of public financial support indented for individuals over 60 years old who need assistance to perform activities of daily living (ADLs)¹. The eligibility for the APA is determined by a social medical team that conducts an initial assessment of the disability level of the applicant based on the Gerontological Independence Iso-Resource Group (*Autonomie Gérontologie Groupes Iso-Ressources*, or AGGIR) classification. The AGGIR classification is composed of 6 iso-resource groups (*groupes iso-ressources*, or GIRs), from GIR 1 (the highest disability level) to GIR 6 (the lowest disability level). Only GIRs 1 to 4 are eligible for the APA. This disability level assessment is used in conjunction with the income of the recipient to calculate the amount of public financial support². Over 90% of recipients use the public allowance to finance professional services, such as home help, personal care (e.g., assistance with bathing and dressing) or home monitoring. The allowance can also be used to remunerate an informal caregiver (other than the recipient's partner) or to finance assistive technologies and home accessibility modifications. In 2009, approximately 1,100,000 disabled elderly people benefited from the public allowance (Debout and Lo, 2009). Total APA-related expenditures in the same year amounted to 5.1 billion Euros and represented 23% of the public financial support for disabled elderly people, which was estimated to be 21.6 billion Euros (1.1% of French GDP) (Rosso-Debord, 2010).

The aim of this paper is to analyse how the use of APA impacts the care received by disabled elderly people living at home. In particular, we examine whether publicly funded formal care is a substitute for informal care. This issue refers to the well-known "crowding-out effect", which involves the substitution of public transfers for private ones. In the context of the care provided to the disabled elderly, the crowding-out effect is not necessarily an unwanted consequence from the policymaker's perspective if the allowance aims to alleviate the burden faced by informal caregivers. However, if the purpose of the public allowance is to complement the pre-existing family support with public support and increase the total amount of care provided, a crowding-out effect would reduce the efficacy of such a policy. Indirectly, the question is whether a policy aimed to provide publicly funded formal care tends to increase the well-being of elderly people, through an increase in care provision, or the caregivers' well-being, through a decline in their involvement in care and in associated adverse effects.

It is worth mentioning that the effect of publicly funded formal care on informal care provision depends on the increase in formal care that the public allowance

1. See the supplementary material provided by Fontaine (2011) for a more detailed description of APA.

2. As we will see later, the uncertainty concerning APA eligibility and the gradual decrease in the APA amount as a result of income are two possible explanations for the unsystematic use of APA among disabled elderly people. To the best of our knowledge, the decision not to use the APA has yet to be investigated.

generates. In particular, publicly funded formal care may lead to a pseudo dead-weight effect if disabled elderly people would benefit from similar professional care even without the public subsidy. In this case, publicly funded formal care would substitute for privately funded formal care rather than informal care. Here too, this effect would not be necessarily an unwanted consequence of public support from the policymaker's perspective, for instance if the allowance was also designed to provide the policymaker with a means of exerting some control over the quality of professional care³. Note that the social medical team that assists the APA recipient in selecting professional care strongly encourages the use of home care provider agencies suggested by the general councils.

To inform policymakers on how publicly funded formal care impacts care provision for disabled elderly people, particularly with regard to the different possible objectives of such a policy (increasing support for disabled elderly people living in the community, alleviating the burden on informal caregivers, and improving the quality of professional care, among other goals), we present an empirical analysis in this paper that uses the French *Handicap-Santé Ménage* (HSM) survey. Our methodological approach consists of comparing the APA recipient population with the non-APA recipient population with respect to the care they received from both home care workers and informal caregivers. We control for observed heterogeneity between the two sub-populations using the propensity score matching method. Our results suggest that the use of publicly funded formal care partially substitutes for privately funded formal care and informal care, depending on the disability level and the informal care resources of the elderly. Nevertheless, receiving APA benefits is associated with an overall improvement in the support that disabled elderly people receive to assist them in performing the primary activities of daily living.

The remainder of this paper is organised as follows: Section 2 reviews the previous literature; Section 3 presents the data used in the analysis and the main determinants of APA use; Section 4 outlines the empirical strategy we employ to

3. The data used here do not allow for an investigation of the effects of APA on the quality of professional care. However, this is an important issue because the population of home care workers is very heterogeneous, particularly regarding the degree of formalisation. In the French context, we traditionally distinguish three types of formal care (Rivard, 2006). The first type consists of home care provider agency (*service prestataire*) chosen by the general councils; the agency is the employer of the formal caregiver. In this case, formal caregivers are generally characterised by a high level of formation. The second is the intermediary service (*service mandataire*) in which the care structure provides the beneficiary with a professional caregiver. In this situation, the care recipient is the employer of the professional caregiver. By contrast, the care structure manages the administrative paperwork. The third type uses an "over-the-counter" professional (*professionnel en gré-à-gré*), and no care structure is involved in the relationship between the person who needs care and the personal assistant. "Over-the-counter" home care workers are generally characterised by a lower level of formation

investigate the effect of the public allowance on care provision; Section 5 provides the results; and, finally, Section 6 concludes.

2. Literature Review

To the best of our knowledge, only two studies have investigated the effect of public support on the care received by disabled elderly people in France. The first study was conducted using data collected by the *Direction de la recherche, des études, de l'évaluation et des statistiques* (DREES) only one year after the introduction of the APA. Based on a representative sample of 2,614 beneficiaries, Petite and Weber (2006) compare the care that APA recipients received at the time of the survey to the care they received prior to receiving the APA. They conclude that family involvement in care is stable. Moreover, in families in which the provision of care is impacted by the receipt of the APA, Petite and Weber observe that household chores are the main care activities that are delegated by informal caregivers to formal caregivers. This empirical approach makes it possible to control for observed and unobserved heterogeneity that remain constant over time, but may, however, underestimate the true effect of receiving the APA on informal provision for at least two reasons. First, the data related to the care that the beneficiaries received prior to the receipt of the APA are retrospective. The authors suggest that the respondents may have underestimated the change in informal care induced by receiving the APA and thus considered the amount care they reported receiving before benefiting from the APA tantamount to the amount of care they reported receiving afterwards. The respondents may also have been ashamed to acknowledge that their family provides less care than they did previously. Second, if elderly people's needs increase over time, identifying the effect of the treatment (i.e., the receipt of the APA) by comparing the care provided by family before and after treatment is likely to lead to underestimation of the true treatment effect. We can assume that the care they received prior to benefiting from the APA (when they were likely less dependent) underestimates the care they would receive today if they were not APA beneficiaries. Using different data and a different empirical approach, Rapp et al. (2011) study whether benefiting from the allowance is associated with both an increase in formal care and a decrease in informal care as a proportion of total care. Their analysis focuses on people with Alzheimer's disease and is based on a cross-sectional sample of 1,131 elderly French patients. The results suggest that receiving the APA is associated both with an increase in the total number of care hours and a significant (13%) decline in the share of informal care in total care. Informal care still represents more than 80% of total care among those who benefit from the allowance. However, these results are related to a specific population suffering from Alzheimer's disease, and

their needs are likely not representative of APA recipients in general. Furthermore, to participate in the survey, the patients were required to have a primary informal caregiver. Therefore, it was not possible to assess how receiving the APA affected the likelihood of receiving informal care. Finally, the survey only examined the informal care provided by the primary informal caregiver, and 29% of APA recipients receive care from several informal caregivers (Petite and Weber, 2006).

Outside of France, several studies analyse the effect of public support on care provision. These studies generally focus on the potential for a crowding-out effect of informal care and also present mixed results. Both Christianson (1988) and Pezzin *et al.* (1996) examine data from the Channelling experiment, an assessment of public financing for home care that took place in the US during the 1980s. Christianson (1988) finds that an increase in the provision of formal care is not associated with a significant decline in informal care. In particular, the author finds that primary caregivers maintain their total level of involvement in the presence of formal services but tend to concentrate their involvement in certain areas. Using the same data but modelling both living and care arrangements, Pezzin *et al.* (1996) find that the increased use of publicly funded formal care leads to a slight decrease in the provision of informal care. In another US study, Ettner (1994) assesses whether Medicaid home care benefits affect the probability of entering a nursing home and the use of formal and informal home care. Using data from the National Long-Term Care Survey, the author finds evidence that home care subsidies reduce the rate of nursing home entry. Moreover, among disabled elderly people living in the community, Ettner identifies a substitution between informal care and formal non-medical care. Using data from the National Population Health Survey and General Social Survey in Canada, Stabile *et al.* (2006) examine whether differences in the availability of publicly funded home care between provinces are associated with differences in individual utilisation of formal and informal care and with self-reported health status. Their results suggest that increased availability of publicly financed home care is associated with an increase in its utilisation, a decline in the provision of informal care and an improvement in self-reported health status. Using data from urban populations in Norway, England, Germany, Spain and Israel, Motel-Klingebiel *et al.* (2005) observe that the total volume of care received by elderly people from both formal and informal caregivers is greater in countries with strong formal services infrastructure. Moreover, they do not find evidence of a substantial "crowding-out effect" on family care due to publicly funded formal care. By contrast, Viitanen (2007) uses data from the European Community Household Panel (1994-2001) and finds that increased long-term care expenditures are associated with a decline in the informal care provided by non-co-residents.

Overall, the main conclusion we can draw from this literature review is that we do not observe a strong crowding-out effect from publicly funded formal care on

the provision of informal care, regardless of the country in question. In fact, all of the studies that find that public support displaces informal care also find that this substitution is modest. We propose to extend the existing literature by using recent French data from the HSM survey. The HSM survey is one of the richest sources of data on the informal and formal care received by the disabled elderly in France. Our empirical method is based on a statistical comparison of the care received by APA recipients and the care received by a control group of non-APA recipients. We use the matched sampling method proposed by Rosembaum and Rubin (1985), which allows us to produce a control group of non-APA recipients that is similar to the group of APA recipients with respect to the distribution of observed covariates. Before presenting our empirical approach, the next section outlines the data used.

3. Data and Descriptive Statistics

To assess the effect of APA on the care received by disabled elderly people living at home, we use data from the *Handicap-Santé Ménage* (HSM) survey. The HSM survey was conducted in France by the INSEE and DREES in 2008. In addition to the main information linked to the socio-demographic characteristics of the individuals surveyed and their families, the HSM survey collected information regarding these individuals' disability levels and the professional and informal care that they receive to assist them in performing the primary activities of daily living. The survey allows us to identify APA recipients and thus to study both the determinants of APA use and the effects of the allowance on the assistance received by the recipients.

3.1. Sample

Our initial sample includes 9,927 individuals aged 60 and over. However, most of these individuals do not experience any difficulties or inabilities in performing the activities of daily living (ADLs) or instrumental activities of daily living (IADLs). In this study, we use the Katz index to measure the disability levels of the respondents (Katz *et al.*, 1970; Katz, 1983). We use the Katz index as an alternative to the GIR classification, which is used to officially assess applicant eligibility for the APA. A GIR estimation is also proposed in the database for each individual over age 60. The estimation is nevertheless associated with a number of inconsistencies that lead us to prefer another index, i.e., the Katz index, as a control in our evaluation of disability level. The Katz index defines eight levels of disability according to one's ability to perform the ADLs without assistance:

- Group A: The person can perform the six following activities independently: "bathing", "dressing and undressing", "toileting", "transferring", "eating and drinking once the food is ready", "lying down in or getting out of bed and sitting down in or getting up from a chair" and "controlling bowel movements and urination".
- Group B: The person can perform five of the six activities independently.
- Group C: The person requires assistance for two activities, including "bathing".
- Group D: The person requires assistance for three activities, including "bathing" and "dressing and undressing".
- Group E: The person requires assistance for four activities, including "bathing", "dressing and undressing" and "toileting".
- Group F: The person requires assistance for five activities, including "bathing", "dressing and undressing", "toileting" and "transferring".
- Group G: The person requires assistance for all six activities.
- Group H: The person requires assistance for at least two activities but does not meet the criteria for the previous categories.

The Katz index is solely based on an individual's inability to perform ADLs without assistance. However, some individuals may report difficulties in performing certain ADLs or IADLs, even if they are capable of performing all ADLs without assistance. Therefore, we distinguish among the individuals in Group A based on the Katz index: those who do not experience any difficulties in performing ADLs or IADLs, denoted "Group A-", and those who experience difficulty in performing at least one ADL or IADL, denoted "Group A+". Table 1 outlines, by age, the weighted distribution⁴ of individuals aged 60 and over according to their disability levels. Seven out of 10 individuals are fully independent, whereas 3 out of 10 individuals report experiencing difficulty in performing at least one ADL or IADL. The majority of these individuals are classified as slightly disabled. In particular, less than 4% of the population aged 60 and over is unable to perform at least one ADL or IADL without assistance. Disability level appears to be highly correlated with age: the proportion of individuals reporting difficulty or inability in performing ADLs or IADLs increases from 12% among those aged 60 to 64 to 73% among those over 85.

Within our initial sample, 9% of the individuals over 60 years of age living in the community receive the APA; this figure equates to 4% of the population represented by the sample. The proportion of APA recipients, which is less than

4. In the HSM sample, individuals presenting incapacities are overrepresented compared to the general population. The numbers presented in this section are weighted. Therefore, they are relative to the population represented by the sample.

Table 1 : *Weighted distribution of individuals aged 60 and over by disability level (Katz index)*

age	60;64 (n=1942)	65;69 (n=1526)	70;74 (n=1807)	75;79 (n=1946)	80;84 (n=1458)	85;+ (n=1248)	All (n=9927)
A- (fully self independent)	88,1%	85,8%	78,6%	61,7%	47,7%	26,8%	71.7%
A+ (slightly disabled)	11,2%	12,9%	19,4%	34,2%	45,5%	53,3%	24.4%
B-C-H (moderately disabled)	0,5%	1,0%	1,3%	2,8%	4,5%	13,6%	2.6%
D-E (highly disabled)	0.1%	0,1%	0,2%	0,6%	1,0%	2,1%	0.5%
F-G (severely disabled)	0.1%	0,2%	0,5%	0,7%	1,3%	4,2%	0.8%

Data: HSM 2008

Sample: Individuals aged 60 or over (n=9927)

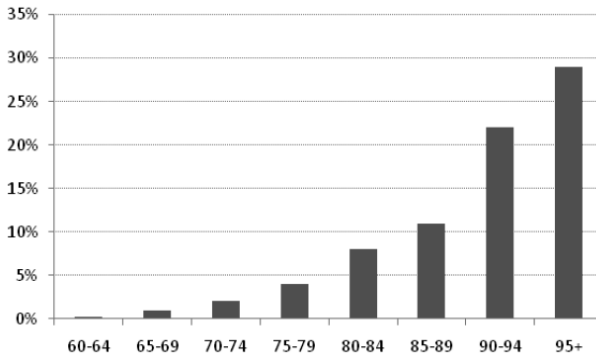


Figure 1 : *Share of APA recipients by age*

Data: HSM 2008

Sample: Individuals aged 60 or over (n=9927)

5% among individuals between 60 and 80 years old, increases with age until reaching a maximum of 30% among those over 95 years old (Figure 1). The same heterogeneity appears with regard to the disability level measured using the Katz index (Figure 2). However, even among the individuals identified as highly disabled (Groups F and G according to the Katz index), only 70% resort to using the APA.

Table 2 presents a comparison of the main characteristics of APA recipients (gender, age and marital status) within the HSM sample and the 500,000 APA beneficiaries from the APA individual data 2006-2007 survey (Debout, 2010). These administrative data were collected by DREES from the general councils of representative departments, and they allow us to ensure that our sample is representative of APA recipients at the national level. Similar to the sample in the APA individual data from 2006-2007, the recipients of the allowance in our sample are primarily women. In addition, the average age of the APA recipients was 82 years (83 in the APA individual data 2006-2007 survey), and approximately one in three recipients live with a partner.

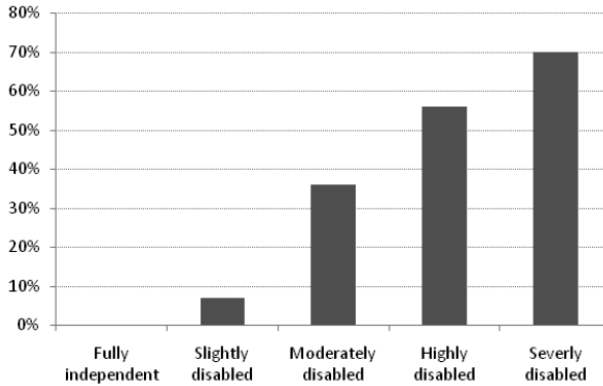


Figure 2 : Share of APA recipients by disability level (Katz index)

Data: HSM 2008

Sample: Individuals aged 60 or over (n=9927)

Table 2 : Comparison to the APA individual data 2006-2007 survey (only APA recipients)

	HSM	"APA individual data 2006-2007 survey"
Proportion of women	72%	74%
Average age	82 years	83 years
Proportion living with a partner	35%	35%
Proportion of men living with a partner	61%	63%
Proportion of women living with a partner	25%	25%

In the remainder of our empirical analysis, we exclude all fully independent individuals (i.e., individuals who belong to “Group A-”) because they are not eligible for the APA. Moreover, because our empirical analysis aims to study the effect of professional care funded by the APA on the care received by recipients, we exclude those APA recipients who used the allowance to pay for an informal caregiver (7% of APA recipients in our initial sample) or to finance assistive technologies or home accessibility modifications (1% of APA recipients in our sample). Our final sample includes 4,256 observations. Table A1 in Appendix A reports the distribution of all covariates used in our analysis.

3.2. Primary Determinants of APA Use

The use of the APA is far from systematic among disabled elderly people. Arrighi *et al.* (2010) described various factors that may explain the lack of APA use. First, elderly people (and their families) may not be aware of the program. Moreover, the implicit costs associated with take-up of the allowance may be prohibitive with regard to the expected benefits. For example, the expected advantages may be

considered modest for individuals with high incomes for whom the out-of-pocket cost may represent 90% of the Care Plan defined by the social medical team (see Fontaine, 2011). Conversely, the use of the APA may be accompanied by costs for beneficiaries who may view the use of the APA as an unwanted social acknowledgement of aid dependency, for those who do not wish to change from a pre-existing care organisation, or for those who refuse any external intrusion on the part of the social medical team or professional services.

To the best of our knowledge, with the exception of the study by Arrighi *et al.* (2010), which primarily focused on the possible price effects of APA requests, no quantitative studies have attempted to identify the individual determinants of APA use. Using data from the HSM, Table 3 reports estimation results from a Probit model that makes it possible to identify the main factors associated with APA use.

Women appear to be more likely to use the APA than men. The positive effects of age and disability level on the probability of resorting to the allowance are confirmed *ceteris paribus*. In particular, those individuals experiencing difficulties in preparing meals, accomplishing household chores, doing administrative work or bathing have a higher propensity to use the APA. Moreover, self-reported health status is negatively correlated with the probability of resorting to the APA; whereas those suffering from Alzheimer's disease are more likely to benefit from the APA, the effect is only significant at the 15% level. Two variables potentially related to informal care resources show significant effects on the propensity to resort to the APA, corresponding to the trend that having a greater number of informal care resources available to disabled elderly people is associated with a lower probability of recourse to the APA. First, elderly people living with a partner or living with a child resort to the APA less frequently than individuals living alone. From this perspective, individuals living with both a partner and at least one child have the lowest probability of resorting to the APA. Second, the number of children is significantly associated with recourse to the APA. Nevertheless, the effect varies according to the genders of the children. Having daughters decreases the probability of resorting to the APA; however, the number of sons an elderly person has produces the opposite effect, suggesting that sons may encourage their parents to use the APA.

As expected, a household's standard of living is negatively associated with the probability of resorting to the APA. Because the out-of-pocket costs increase with the household's standard of living, the allowance provides a smaller financial benefit to the wealthiest individuals. Moreover, individuals living in rural areas are characterised by a higher probability of benefiting from the APA. This result may highlight the effect of the size of the market for "over-the-counter" professional caregivers, which is likely to be less developed in rural areas or small towns compared to large cities. When possible, the employment of privately financed "over-the-counter" home care workers can constitute an alternative to using pub-

licly funded home care service providers. Finally, overseas respondents report that they benefit from the APA less frequently than others.

Table 3 : *Probability of benefiting from the APA – Estimated coefficients (Probit model)*

Gender		
Woman	0.14**	(0.06)
Man	Ref.	
Age	0.19***	(0.05)
Age ²	-0.00***	(0.00)
Household configuration		
Living alone	Ref.	
Living with a partner	-0.36***	(0.06)
Living with a child	-0.17*	(0.09)
Living with a partner and an child	-0.61***	(0.15)
Living with other	-0.26*	(0.15)
Number of daughters	-0.05**	(0.02)
Number of sons	0.04*	(0.02)
Log Standard of living (in thousands of Euros)	-0.12**	(0.06)
Rural area		
No	Ref.	
Yes	0.22***	(0.06)
Department		
Overseas departments	-0.49***	(0.09)
Others	Ref.	
Katz index		
A	Ref.	
B or C	0.52***	(0.08)
D or E	0.78***	(0.13)
F or G	0.99***	(0.14)
H	0.41**	(0.16)
ADLs (reporting difficulties in performing)		
Bathing	0.31***	(0.07)
Dressing and undressing	0.01	(0.07)
Cutting food and pouring a drink	-0.06	(0.09)
Eating and drinking once the food is ready	0.04	(0.15)
Toileting	0.05	(0.12)
Lying down in or getting out of the bed	0.10	(0.10)
Sitting down in or getting up from the chair	0.04	(0.10)
IADLs (reporting difficulties or inabilities in performing)		
Shopping	0.01	(0.08)
Preparing meals	0.30***	(0.07)
Doing common household chores	0.48***	(0.08)
Doing less common chores	0.15*	(0.08)
Doing administrative works	0.14**	(0.07)
Taking medications	0.06	(0.08)
Moving around in all of the rooms on a floor	-0.08	(0.09)
Leaving your home	0.08	(0.07)
Using a method of transportations	-0.02	(0.07)
Finding its way	0.04	(0.08)
Using a telephone	0.04	(0.09)
Using a computer	0.04	(0.07)
Self-reported health status		

"Bad" or "very bad"	0.21***	(0.06)
"Pretty good"	Ref.	
"Good" or "very good"	-0.22*	(0.12)
Alzheimer disease		
No	Ref.	
Yes	0.13	(0.09)
constant	-10.15***	(1.84)
N	4256	

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Data : HSM (2008)

Sample: individuals aged 60 or over experiencing difficulty or inability in performing at least one ADL or IADL. APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded (n=4256).

4. Effects of the APA on Care Received: An Empirical Approach

From a theoretical perspective, public subsidies, such as the APA, reduce the cost of professional care and are expected to reorient the distribution of care resources used for formal and informal care toward an increase in formal care utilisation and, if the two factors of production are substitutes, a decrease in informal care utilisation⁵. However, the intensity of this change is unclear and may vary from one individual to another. The effect of public financial support on formal care utilisation primarily depends on the price elasticity of formal care demand. For some individuals, a reduction in formal care costs can empirically result in a substantial increase in formal care utilisation. For example, slightly disabled elderly people living with a partner are likely to be characterised by a highly elastic formal care demand if they choose informal care resources rather than professional services when they do not receive public financial support. In contrast, highly disabled elderly people living alone may be characterised by rather inelastic formal care demands because these individuals are likely to use formal care even without public financial support. The effect on informal care utilisation is also unclear. This effect primarily depends on the care production function and the degree of substitution between informal care and formal care. Additionally, this effect may depend on the individual preferences of disabled elderly people, who

5. For a formalised framework, the reader may refer to Stabile *et al.* (2006). Although developed in the Canadian institutional framework, the proposed model appears to be relatively appropriate for theoretical research on the effect of the APA on the care received by the recipients.

may place different values upon informal care and formal care, or the preferences of family members who may have difficulty, according to normative motives, in withdrawing from providing care, even if the disabled relative may benefit from professional care.

Our empirical analysis aims to study the effect of professional care funded by the APA on the care received by the recipients, particularly on the care that they receive from their family environment⁶. As previously mentioned, the effect on informal care highly depends on the degree to which the public subsidy increases formal care. Thus, our empirical analysis assesses both the direct effect of the public allowance on formal care provision and the indirect effect on informal care provision.

The use of the APA can affect the care received from both types of care providers in three distinct ways. First, the allowance can affect the care arrangement (i.e., the use of formal care and/or informal care). Some disabled elderly people may only use professional services when they benefit from public financial support or only use informal care when they do not benefit from public financial support that would allow them to pay for formal care. Second, receiving the APA may not affect the use of informal or formal caregivers but may affect the intensity of the care provided by both types of care providers. Finally, benefiting from the APA may not affect the intensity of the care provided but may modify the care activities in which caregivers are engaged. For instance, receiving the APA may reduce the involvement of informal caregivers in activities such as cleaning the house in favour of increased involvement in ensuring companionship for the elderly.

Thus, we consider three different outcomes ($Y_k, k = 1, 2, 3$) related to informal care or formal care in our analysis: (i) the use of informal care (resp. formal care), represented by a dummy variable equal to 1 if the APA recipient receives informal care (resp. formal care) and 0 otherwise; (ii) the intensity of informal care (resp. formal care) conditional on receiving informal care (resp. formal care), represented by a variable corresponding to the total number of informal care (resp. formal care) hours received per week by the APA recipient⁷; and (iii) the range of the informal care (resp. formal care) received, represented by a variable measuring the number of care activities in which informal caregivers (resp. formal caregivers) are engaged.

6. The majority of APA recipients (92%) use the allowance to fund formal care. In addition, 7% of APA recipients use the allowance to remunerate an informal caregiver (other than their partner) and, in a small number of cases (1%), to finance assistive technologies or home accessibility modifications. We excluded from our analysis those APA recipients who used the allowance to pay for an informal caregiver or finance assistive technologies or home accessibility modifications to focus on the effect of using publicly funded professional home care.

7. Note that the data do not permit a distinction to be made between the hours of formal care funded by the APA and the total amount of formal care.

To empirically investigate how publicly funded formal care affects the care received by disabled elderly people and how the effect varies across individuals, we use the analytic framework proposed by Rubin (1974, 1979). Let APA be a dummy variable equal to 1 if an individual resorts to the APA and 0 otherwise, and let Y_{1ki} denote care outcome k when individual i resorts to the APA and Y_{0ki} denote the care outcome k when individual i does not resort to the APA. Our analysis aims to compare the care received by APA recipients ($Y_{1ki}/APA_i = 1$) to the care they would have received if they were not recipients of the allowance ($Y_{0ki}/APA_i = 1$). Among the recipients of the allowance, the average effect of the APA on a given care outcome Y_k , ATT_k , can be defined as follows:

$$ATT_k = E(Y_{1ki}/APA_i = 1) - E(Y_{0ki}/APA_i = 1)$$

The care that APA recipients would have received if they were not recipients of the allowance is obviously unobservable. However, as previously noted, recourse to the APA is not systematic among individuals over the age of 60 who need assistance to perform the ADLs and IADLs. Thus, it is possible to estimate the average level of care that APA recipients would have received if they had not been recipients of the allowance, $E(Y_{0ki}/APA_i = 1)$, using the care received by non-recipients, $E(Y_{0ki}/APA_i = 0)$. However, this estimation is likely to be biased because the expectation of care APA recipients would have received if they not been recipients is likely to be different from the care that is actually received by non-recipients: $E(Y_{0ki}/APA_i = 1) \neq E(Y_{0ki}/APA_i = 0)$.

In our sample, the use of the APA is neither random nor exogenous. As noted in Section 3, the use of the APA depends on individual and family characteristics. Recourse to the APA is a component of a choice whose determinants are distributed unequally across recipients and non-recipients. Using the care that non-recipients of the APA receive to estimate the care that the recipients of the allowance would have received if they had not benefited from the allowance could thus attribute the pre-existing differences between the populations to the effect of the APA. However, the main determinants of the choice to resort to the APA, such as disability levels or household configurations, are observed in our data and make it possible to compare APA recipients to non-APA recipients who exhibit the same observed determinants of choice.

We use the matched sampling method proposed by Rosebaum and Rubin (1985). This method allows us to select units from a large "reservoir" of potential controls to produce a control group that is similar to the treated group with respect to the distribution of observed covariates. The reasons for why one individual in a matched pair receives the APA while the other individual does not are assumed to depend on unobserved factors. Our empirical analysis is based on the additional assumption that these unobserved factors are randomly distributed in the population. This crucial assumption implies, conditional on the observed individual

and family characteristics, that benefiting from the APA is orthogonal to the care received without the APA (that is, that $E(Y_{0ki}/APA_i = 1, X_i) = E(Y_{0ki}/APA_i = 0, X_i)$). This “conditional independence assumption” (Heckman *et al.*, 1997) allows us to estimate the effect of the APA by comparing a given care outcome for each APA recipient with the care outcome of a non-APA recipient whose values in the vector of observed characteristics are identical.

We estimate the effect of the APA on a given care outcome Y_k using the nearest neighbour method (Rosebaum and Rubin, 1985; Givord, 2010). Formally, let T be the set of APA recipients (treated units) and C the set of non-APA recipients (control units). Denote by p_i the estimated value of the propensity score of APA recipient i and p_j the estimated value of the propensity score of non-APA recipient j . The nearest neighbour, denoted $C(i)$, is such that $C(i) = \min_j \|p_i - p_j\|$. Hence, the average effect of the APA on Y_k is estimated as follows:

$$A\hat{T}T_k = \frac{1}{N^T} \sum_{i \in T} \left[Y_{ki} - \sum_{j \in C} w_{ij} \cdot Y_{kj} \right]$$

where N^T denotes the number of units in the treated group, and $w_{ij} = 1$ if $j = C(i)$, 0 otherwise.

Some issues related to our empirical approach must be addressed. The first issue concerns the matching procedure. Ideally, it would be optimal in this analytic framework to match each APA recipient with a non-APA recipient with an identical set of observed characteristics. However, the size of our sample does not allow us to match all individuals with a counterpart possessing identical observed characteristics. Therefore, our matching procedure is based on the propensity score (Rosenbaum and Rubin, 1983, 1985). The propensity score corresponds here to the probability of benefiting from the APA, which can be simulated for each individual in our sample using the Probit model presented in Section 3. We then estimate the care outcome counterfactual (without APA) for each APA recipient using the observed care outcome of the nearest non-APA recipient with respect to his or her propensity score⁸. However, propensity score matching can lead to the matching of individuals with different observed characteristics, even though their propensity scores are similar. For example, age and living alone are two factors that are positively associated with the probability of having recourse to the APA. Therefore, we can imagine a situation in which an APA recipient living alone is matched with an older non-APA recipient who lives with a partner and who has a very similar propensity score. Such a match would be problematic in this case because the informal care received by the non-APA recipient does not appear to be a credible counterfactual. To limit this risk, we constrain the matching procedure to only

8. We have used the STATA module `psmatch 2` (Leuven and Sianesi, 2003).

associate individuals having both (i) a similar marital status, by distinguishing the individuals living with a partner from those not living with a partner⁹ and (ii) a similar disability level, by distinguishing slightly disabled individuals from highly disabled individuals. The slightly disabled sub-population includes all individuals who experience difficulty (but not inability) in performing at least one ADL or IADL (i.e., individuals who belong to Group A+ of the Katz index). The highly disabled sub-population includes all individuals who report an inability to perform at least one ADL without assistance (i.e., individuals who belong to groups B, C, D, E, F, G or H of the Katz index).

Second, our matching procedure is solely based on the observed characteristics. Thus, the presence of unobserved heterogeneity may bias the estimate if these unobserved factors simultaneously affect APA utilisation and care outcomes. The health status of a disabled elderly person's partner is one of the main unobserved factors that may simultaneously explain both the decision to apply for the APA and informal care utilisation. Disabled individuals who have a partner who is in poor health or has disabilities are likely to receive less informal care, as the partner is generally the main caregiver; these disabled individuals are also likely to have greater incentives to benefit from publicly funded formal care that may benefit both individuals. From this perspective, failing to consider the ability of a partner to provide care could lead to an overestimation of the decrease in informal care induced by utilising the APA. The results we present here do not account for the potential presence of unobserved heterogeneity. However, previous studies suggest that our results related to informal care are not driven by unobserved heterogeneity. Indeed, Rapp *et al.* (2011) test the exogeneity of the APA benefit and their results lead them to fail to reject the hypothesis that the use of publicly funded formal care in France is exogenous with respect to the provision of informal care¹⁰. This result is also consistent with the results of Holly *et al.* (2010), who recently compared the relationship between formal and informal care in the US and in Europe. Using data from the Health and Retirement Study (for the US) and SHARE (for Europe), they develop a simultaneous equation model that allows them to jointly estimate both the direct effect of informal care provided by children on formal care and

9. It would have been preferable to be more specific in defining sub-populations within which the matches were made by distinguishing, for instance, among those not living with a partner, those living alone from those who cohabit with an adult child. However, the size of our sample requires us to limit the number of sub-populations used. Moreover, living with a partner may be assumed to be exogenous, while cohabitating with a child could be endogenous with respect to benefiting from the APA.

10. Rapp *et al.* (2011) consider successively two dependent variables: the total hours of formal and informal care and the ratio of informal care utilisation to total non medical care utilisation. They control for the potential endogeneity of APA use by employing 2-stage least squares regressions with instrumental variables. Using the Durbin, Wu and Hausman test for endogeneity, they failed to reject the null hypothesis that APA receipt was exogenous.

(vice versa) the direct effect of formal care on informal care provided by children. They first observe that the substitution effects are larger in the US than in Europe. They also find that in Europe, children tend to consider the amount of formal care received by their elderly parent before making their caregiving choices.

The final issue concerns the large number of non-responses regarding reported caregiving time, especially concerning informal care. In the sample, 31% of the individuals who report receiving informal care have a missing value for the number of informal care hours, which represents 20% of the entire sample. Moreover, 9% of those who report receiving formal care are also missing the value for the number of formal care hours, which represents 5% of the entire sample. In our analysis, the effect of the APA on the number of care hours received per week is estimated after excluding non-responses. Our empirical strategy makes it possible to control for the observed factors that simultaneously affect the use of the APA and the non-response regarding caregiving time. Nevertheless, excluding non-responses may affect our results, especially if the non-responses depend on unobserved characteristics.

5. Results

As previously mentioned, three outcomes related to both formal care and informal care are used to study how recourse to the APA affects the care received by elderly people who need assistance to perform ADLs or IADLs. First, we study the effect on care arrangement (i.e., the use of formal and informal care). Second, we study the effect of recourse to the APA on the intensity of formal care (resp. informal care) conditional on benefiting from formal care (resp. informal care). Third, we evaluate how the use of the APA affects the range of care received. Finally, to assess the global effect on the recipients' well-being, we investigate the overall effect of the public subsidy by addressing the question of whether the allowance reduces the proportion of ADLs and IADLs that the recipient reports needing more assistance for the ADLs and IADLs for which the recipient reports experiencing difficulty in performing.

For each care outcome, we assess the effect of the APA on the care provision for the overall population of APA recipients and for 4 sub-populations, by distinguishing slightly disabled elderly people from highly disabled elderly people and elderly people who cohabit with a partner from those who do not¹¹. Following the results provided by Bonsang (2009) suggesting that the substitution between

11. To preserve space, we do not report in the article the figures for each sub-population, except for the use of formal care and informal care (Figures B1 and B5 in Appendix B). They are nevertheless available in the supplementary material provided in Fontaine (2011).

informal care and formal care appears to be much larger for elderly people whose needs are low and who require unskilled types of care, we expect the crowding-out effect of informal care to be higher for slightly disabled elderly people. Moreover, we hypothesise that the existence of a pseudo dead-weight effect is more likely in the case of disabled elderly people who do not cohabit with a partner because in this case formal care is likely to be an important source of care even in the absence of the public allowance.

5.1. Effect of Recourse to the APA on Formal Care

The first step of our empirical analysis aims to evaluate the degree to which APA benefits affect formal care utilisation¹². For each outcome related to formal care, we then compare the observed outcome among APA recipients with their estimated counterfactual outcome.

As expected, benefiting from the APA significantly increases the use of formal care. However, formal care utilisation remains high even when individuals do not resort to the APA. In particular, 6 out of 10 APA recipients would have used formal care in the absence of the APA. The increase in formal care utilisation is weaker among highly disabled APA recipients not cohabiting with a partner (Figure B1 in Appendix B). In this case, 72% of APA recipients would use formal care even in the absence of the APA. However, for slightly disabled APA recipients who cohabit with a partner, formal care utilisation would be remarkably less common if they did not benefit from the APA: only 34% of individuals would have used formal care without the APA.

In addition to the increase in the probability of receiving professional care, APA use significantly increases the intensity of care received from home care workers. An analysis in terms of stochastic dominance shows that, conditional on receiving professional care, the distribution of the number of hours per week with the APA dominates, at the first order, the distribution without the APA, for the overall population of APA recipients (Figure B2 in Appendix B) and for each sub-population considered¹³. The dominance is always significant at the 1% level¹⁴. Conditional on receiving formal care, benefiting from the APA is thus

12. Note that our evaluation is partial because the data used here do not allow us to assess the effect of the APA on the quality of formal care.

13. All figures by sub-population are available in the supplementary material (see Fontaine, 2011).

14. To verify the significance of this first-order stochastic dominance, we use the test proposed by Anderson (1996). Let F_1 be the cumulative distribution of the outcome Y_K conditional on benefiting from the APA ("Distribution 1") and F_0 be the cumulative distribution of the outcome Y_K conditional on not benefiting from the APA ("Distribution 0"). Following Anderson (1996), the first-order dominance of "Distribution 1" over "Distribution 0" requires that $F_1(y_k) - F_0(y_k)$ is (i) never significantly greater than 0 for each possible value of y_k and (ii) significantly lower than 0 for at least one value of y_k .

associated with a greater amount of formal care: the median number of care hours¹⁵ provided by professionals increases by 4 hours per week in the overall sample (from 6 hours without the APA to 10 hours with the APA). However, the increase in formal caregiving time is higher for highly disabled elderly people: the median number of formal care hours increases by 2 hours per week among slightly disabled elderly people (from 4 hours without the APA to 6 hours with the APA) and by 7 hours per week for highly disabled elderly people (from 7 hours without the APA to 14 hours with the APA). Furthermore, note that publicly funded professional caregiving time does not seem to be affected by the marital status of APA recipients¹⁶. This independence suggests that the Care Plan defined by the social medical team does not depend on informal care resources. This result confirms the implementation of the principle that the APA is not subsidiary to family support.

The increasing professional involvement induced by recourse to the APA is also observed with regard to the range of formal care received¹⁷ (Figure B3 in Appendix B). In the overall sample, the average number of care activities involving professional caregivers increases significantly from 2 to 2.5. Regardless of the disability level and marital status of the APA recipients, we observe a significant dominance of the distribution with the APA over the distribution without the APA with similar average increases for each sub-population. The average number of care activities involving professional caregivers is, however, lower among APA recipients who cohabit with a partner. Therefore, even if those who cohabit with a partner receive the same amount of publicly funded formal care (with respect to the number of hours) as those who do not cohabit with a partner, formal care is, in their case, more concentrated with regard to certain activities. Figure B4 in Appendix B reports the activities in which professional caregivers are involved. The use of the APA leads to a significant increase in professional caregivers'

We then use standard two-sample proportion tests for testing: (i) $H_0: F_1(y_K) - F_0(y_K) = 0$ against $H_a: F_1(y_K) - F_0(y_K) > 0$ and (ii) $H_0: F_1(y_K) - F_0(y_K) = 0$ against $H_a: F_1(y_K) - F_0(y_K) < 0$ for each observed value y_K .

15. As a central tendency measure, we prefer median caregiving time, which is more robust to extreme values than average caregiving time. Some individuals report receiving 24 hours of assistance per day from one caregiver. Although these extreme values reveal the necessity of being constantly available to meet the needs of disabled elderly people, they may not be considered a reflection of real "care production" because, at a minimum, the caregiver must devote a certain amount of time to sleep.

16. Whether or not they cohabit with a partner, highly disabled APA recipients receive a median professional caregiving time equal to 14 hours. This equality also characterises the slightly disabled APA recipients who receive a median professional caregiving time equal to 6 hours whether they cohabit with a partner or not.

17. The HSM questionnaire allows us to distinguish 8 care activities: 1) personal care (bathing, dressing, meals); 2) household chores (cleaning, making meals); 3) managing the budget and completing paperwork and administrative processes; 4) ensuring a presence or providing companionship; 5) monitoring the actions of the elderly person; 6) taking the elderly person to the doctor and taking care of his/her health problems; 7) shopping and buying medicine; and 8) Other activity.

involvement in all activities (except category 8, other). However, professional caregiver involvement is primarily focused on household chores and personal care, especially for individuals not cohabitating with a partner.

5.2. Effect of Recourse to the APA on Informal Care

Turning now to the effect of benefiting from the APA on the probability of receiving informal care, we observe, in addition to the significant increase in formal care utilisation, a significant decrease in informal care utilisation. While 69% of APA recipients receive informal care, this figure would increase to 76% in this case if these recipients had not benefited from the APA. However, the increase in formal care utilisation is only partially offset by the decreasing involvement of informal caregivers. Indeed, the relative decline in informal care utilisation (-9%) is seven times lower than the relative increase in formal care utilisation (+64%). Moreover, the increase in formal care utilisation and the decline in informal care utilisation associated with recourse to the APA are higher among slightly disabled elderly people and those who live with a partner (Figure B5 in Appendix B). In particular, the 3 percentage point decrease in informal care that we observe among highly disabled APA recipients living alone is not significant at the 10% level. On the contrary, among slightly disabled APA recipients cohabitating with a partner, the decision to use the APA would be associated with a 20 percentage point decrease in the probability of receiving informal care (p-value=1%). From this perspective, changes in informal care are primarily the result of APA recipients' partners; the decline in the probability of receiving care from other relatives is not significant. Nevertheless, the clear decline in informal care provided by a partner to slightly disabled APA recipients must be considered in detail. The decrease is only significant for the less disabled sub-population, identified as the population of individuals who report having difficulties in performing fewer than 6 ADLs or IADLs¹⁸. Among these individuals, recourse to the APA induces a 28 percentage point decrease (p-value<1%) in the probability of receiving informal care (decreasing from 86% without the APA use to 58% with the APA), whereas the 9 percentage point decrease observed among those who report having difficulties in performing at least 7 ADLs or IADLs is not significant (p-value=19%). The substitution we observe between the informal care provided by a partner and publicly funded formal care is then concentrated within the less disabled population (i.e., a population whose needs may require only limited care provision). Similarly, the significant 8 percentage point decrease in informal care utilisation that we observe among slightly disabled

18. We selected 6 as the threshold because it represents the median number of difficulties in performing ADLs and IADLs as reported by the individuals surveyed.

elderly people not cohabitating with a partner is concentrated in the less disabled sub-population¹⁹.

Regarding the intensity of informal care, conditional on receiving informal care, we also observe a strong persistence in informal caregiving time (Figure B6 in Appendix B). The distribution of informal caregiving time with APA use does not significantly differ from the distribution of informal caregiving time without APA use. The median informal caregiving time received is equal to 20 hours per week and is the same regardless of whether individuals benefit from the APA. The stability in the amount of informal care is observed for the four sub-populations we consider, according to the disability level and marital status of APA recipients, except among slightly disabled elderly people cohabitating with a partner, for whom the median informal caregiving time decreases significantly from 21 to 15 hours per week. Therefore, in this case, informal caregivers would partially offset the non-use of the APA with an increased level of involvement.

The stability we observe with respect to informal caregiving time is also observed when we consider the number of care activities involving informal caregivers; the stochastic dominance of the distribution without APA over the distribution with APA is not significant (Figure B7 in Appendix B). However, we observe a significant decrease in the number of activities involving informal caregivers among APA recipients not cohabitating with a partner, regardless of the disability level. This decrease is concentrated in informal caregiver involvement in household chores and personal care; their involvement in other activities remains stable (Figure B8 in Appendix B). Among APA recipients not cohabitating with a partner, we do not observe such a decrease, although we observe a modification in the care activities involving informal caregivers. In particular, the decrease in informal caregiver involvement in personal care or household chores is partially compensated for with increased involvement in activities such as providing companionship, monitoring the activities of the APA recipients or help with paperwork. It is worth mentioning that the number of care activities in which informal caregivers are involved appears to be considerably higher than the number of care activities involving professional caregivers: informal caregivers are on average involved in 5.1 activities without APA and 5.0 with APA (while home care workers are on average involved in 2.0 activities among non-APA recipients and 2.5 among APA recipients).

19. Among those who report experiencing fewer than 6 difficulties in performing ADLs or IADLs, we observe a 15-percentage point decrease in informal care utilisation, while we observe a strict stability among those who report having at least 7 difficulties in performing ADLs or IADLs.

5.3. Overall Effect on Care Provision

The main results related to changes in care provision associated with APA use may be summarised as follows. Overall, APA use increases formal care utilisation and tends to reduce informal care utilisation. However, the magnitudes of these changes are highly dependent on the elderly individuals' needs and the presence of a partner as an alternative to professional caregivers. From this perspective, two extreme cases can be distinguished.

On the one hand, the effect of recourse to the APA appears to be relatively modest for highly disabled elderly people not cohabitating with a partner. For this population, recourse to the APA is associated with a pseudo dead-weight effect in the sense that formal care utilisation remains high even when these individuals do not use the APA. This pseudo dead-weight effect must be qualified because we observe a significant increase in the amount of formal care. In parallel, we do not observe a significant crowding-out effect whether we consider the family's involvement in care or the amount of informal care. The only significant effect we observe is a modification in the activities involving an informal caregiver, decreased involvement in activities such as personal care or household care are offset by increased involvement in other activities.

On the other hand, we observe greater changes in care provision for slightly disabled elderly people living with a partner. For these individuals, recourse to the APA leads to a clear increase in the probability of receiving formal care, which would be used considerably smaller without the public allowance, and a significant decline in partner involvement in care. When the needs of elderly people are reduced or limited to a specific activity, a disabled elderly person's partner thus appears to be a credible alternative to the use of professional services.

The APA benefit is thus associated with a partial pseudo dead-weight effect in some cases and a partial crowding out effect of informal care in other cases. By assuming that the public allowance aims to increase care provision, both effects tend to dilute the efficacy of the policy. Nevertheless, benefiting from the APA appears to be associated with a clear improvement in the coverage needs of disabled elderly people. To assess the overall effect of the APA benefit, we consider the proportion of ADLs and IADLs for which the elderly report needing more assistance among the ADLs and IADLs performed with difficulty without assistance. With respect to this criterion, 56% of non-APA recipients report needing more assistance with at least one ADL or IADL performed with difficulty but without assistance. Among APA recipients, this proportion decreases to 50% (Figure 3). The significant stochastic dominance we observe for the overall population is also observed for each sub-population, suggesting that the public allowance leads to an improvement in the support received by disabled elderly people, regardless of needs and informal care resources.

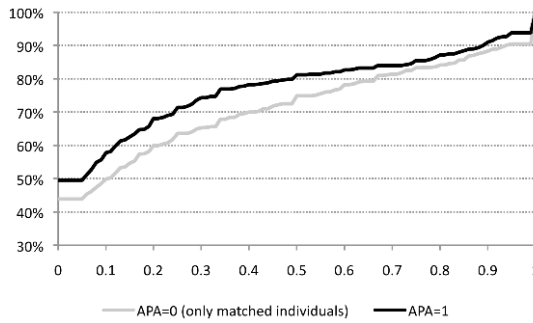


Figure 3 : *Cumulative distribution of the proportion of ADLs and IADLs for which the respondents need more assistance (among ADLs and IADLs performed with difficulty)*

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

6. Conclusion

This paper aims to assess the effect of public subsidies for formal care on the care provision received by disabled elderly people living in the community. In particular, we address the question of whether public support for the use of professional home care leads to a decline in family support. The potential crowding out effect is investigated in the French context to assess how the receipt of the APA changes the care received by disabled elderly people.

We outline a comparison of the APA recipient population and the APA non-recipient population with respect to the care they received. We control for observed heterogeneity between the two sub-populations using the matched sampling method proposed by Rosembaum and Rubin (1985). Our comparison is based on the critical conditional independence assumption. A previous study by Rapp *et al.* (2011) provides evidence that the use of the APA is exogenous with respect to the provision of informal care, suggesting that our results are not driven by the presence of unobserved heterogeneity. However, further studies are needed to validate this crucial assumption in our sample.

The comparison of the populations suggests that the use of publicly funded formal care better addresses the needs of disabled elderly people living in the community and does not result in a massive withdrawal of family support despite the significant decreases in family support in some specific situations. This finding is consistent with previous studies focusing on France and in each country where this question has been addressed. The main beneficiary of the public allowance is

thus the recipient himself: even if the public allowance partially benefits informal caregivers who tend to slightly decrease their involvement in care, using the APA appears to be associated with a clear improvement in addressing the needs of elderly disabled people. In this context, the failure to take-up the APA among eligible disabled elderly people appears to be a key issue requiring further research.

We found that the degree of substitution between public and family support depends on an elderly person's family configuration and disability level. From this perspective, the involvement of the partners of disabled elderly people appears to be strongly associated with the use of publicly funded formal care. This finding is particularly true when the needs of an elderly person are low, meaning that they can potentially be supported with either informal care or formal care alone. In this case, benefiting from the APA leads to a decrease in the probability of receiving informal care but also, conditional on receiving informal care, to a significant decrease in the intensity and range of informal care. Therefore, at least for slightly disabled elderly people, receiving informal care from a disabled elderly person's partner appears to be a clear alternative to the use of formal care.

The substitution is much lower for disabled elderly people who cannot rely on care from a partner. In this situation, formal care demand appears to be rather inelastic with respect to the price of professional care because most of these individuals already use home care workers without benefiting from the APA. For highly disabled elderly people in particular, the need to meet important needs seems to influence the choice of care resources more than the price of professional services. Thus, in contrast to care provided by a partner, care provided by children and other relatives does not seem to represent a substitute for the use of publicly funded formal care.

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Appendix

A. Descriptive Statistics

Table A.1 : *Descriptive statistics*

	Without APA (n=3487)	With APA (n=769)	All (n=4256)
Receive IC	63%	69%	64%
Receive FC	42%	100%	52%
Gender			
Woman	67%	73%	68%
Man	33%	27%	32%
Age (average)	76	81	77
Household configuration			
Living alone	38%	46%	40%
Living with a partner	43%	33%	42%
Living with a child	9%	14%	10%
Living with a partner and a child	6%	3%	6%
Living with other	3%	3%	3%
Number of daughters (average)	1.4	1.3	1.4
Number of sons (average)	1.3	1.4	1.3
Standard of living (average, in Euros)	1271	1174	1253
Rural area			
No	78%	68%	76%
Yes	22%	32%	24%
Department			
Overseas departments	14%	9%	13%
Others	86%	91%	87%
Katz index			
A	85%	45%	78%
B or C	9%	25%	12%
D or E	2%	9%	3%
F or G	3%	17%	5%
H	2%	4%	2%
ADLs (difficulties in performing)			
Bathing	29%	73%	37%
Dressing and undressing	26%	61%	32%
Cutting food and pouring a drink	14%	41%	19%
Eating and drinking once the food is ready	3%	14%	5%
Toileting	8%	31%	12%
Lying down in or getting out of the bed	13%	41%	18%
Sitting down in or getting up from the chair	12%	34%	16%
IADLs (difficulties or inabilities in performing)			
Shopping	63%	89%	67%
Preparing meals	30%	71%	37%
Doing common household chores	53%	90%	60%
Doing less common chores	68%	91%	73%
Doing administrative works	50%	80%	55%
Taking medications	16%	46%	22%
Moving around in all of the rooms on a floor	9%	31%	13%

Table A.1 : *Descriptive statistics (continued)*

	Without APA (n=3487)	With APA (n=769)	All (n=4256)
Leaving your home	27%	61%	33%
Using a method of transportations	39%	72%	45%
Finding its way	15%	42%	20%
Using a telephone	10%	31%	14%
Using a computer	18%	27%	20%
Self-reported health status			
"Bad" or "very bad"	40%	62%	44%
"Pretty good"	49%	34%	47%
"Good" or "very good"	10%	3%	9%
Alzheimer disease			
No	94%	78%	91%
Yes	6%	22%	9%

Data: HSM (2008).

Sample: individuals aged 60 or over experiencing difficulty or inability in performing at least one ADL or IADL. APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded (n=4256).

B. Graphs of Results

All graphs presented here are obtained using the propensity score matching method. Among non-APA recipients, only matched individuals, i.e., the nearest neighbours with respect to the propensity score, are represented here.

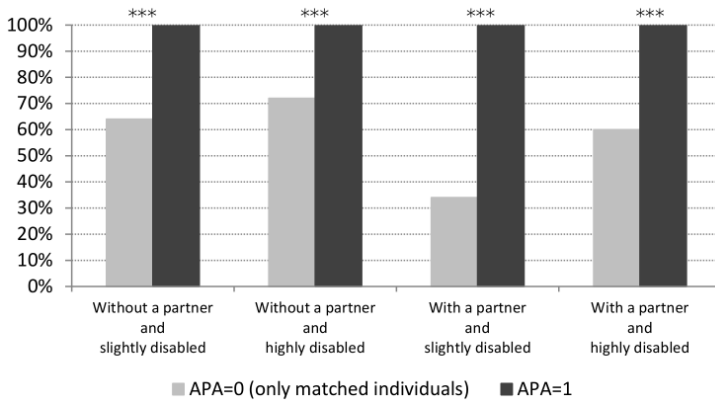


Figure B.1 : *Proportion of APA recipients receiving formal care*

Note: *, **, *** mean that differences in proportions are statistically significant at the 10%, 5% and 1%-level, respectively.

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

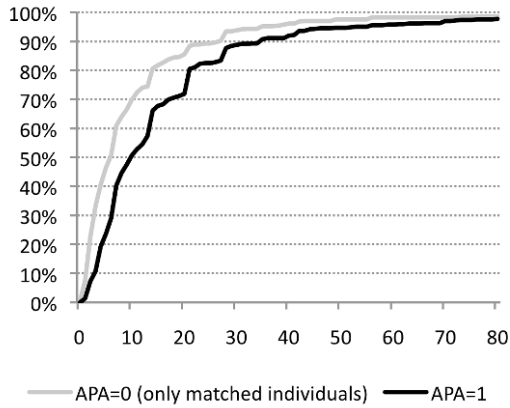


Figure B.2 : *Cumulative distributions of formal care hours per week, among those who receive formal care*

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients who receive formal care. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

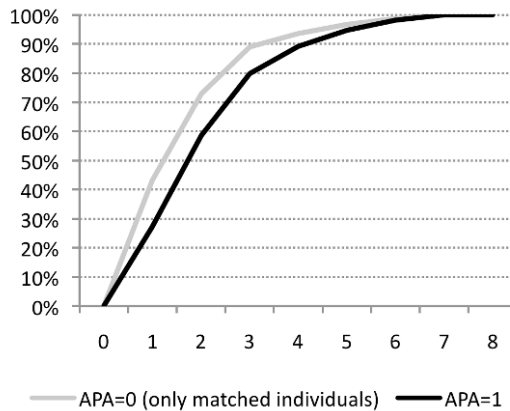


Figure B.3 : *Cumulative distributions of the number of care activities involving formal caregivers, among those who receive formal care.*

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients who receive formal care. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

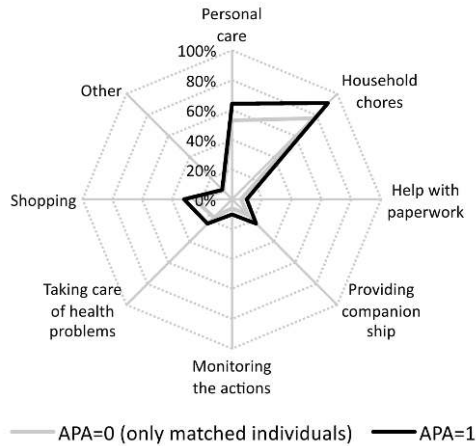


Figure B.4 : Proportion of APA recipients receiving formal care, by care activity, among those who receive formal care

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients who receive formal care. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

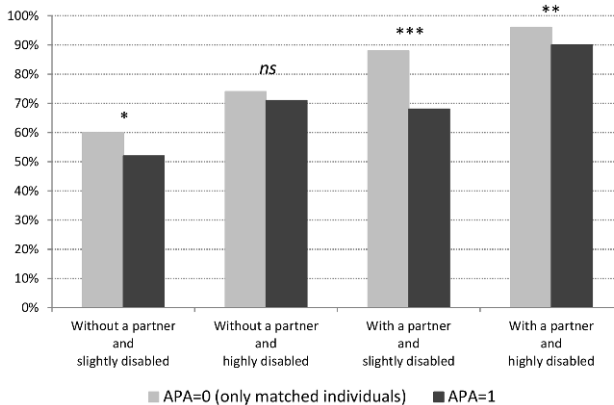


Figure B.5 : Proportion of APA recipients receiving informal care

Note: *, **, *** mean that differences in proportions are statistically significant at the 10%, 5% and 1%-level, respectively. *ns* means that the difference in proportions is not statistically significant at the 10%-level.

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

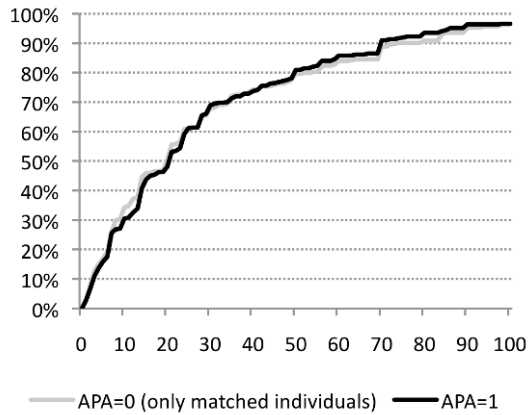


Figure B.6 : *Cumulative distributions of informal care hours per week, among those who receive informal care*

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients who receive informal care. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

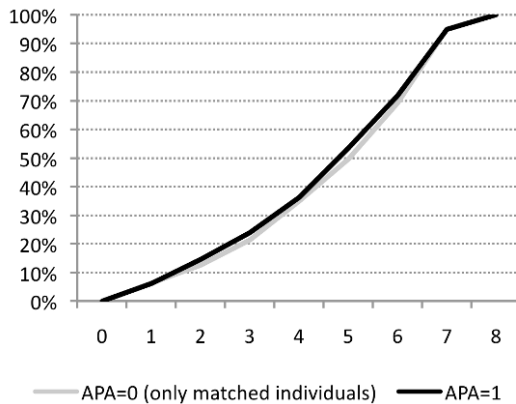


Figure B.7 : *Cumulative distributions of the number of care activities involving informal caregivers, among those who receive informal care.*

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients who receive informal care. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

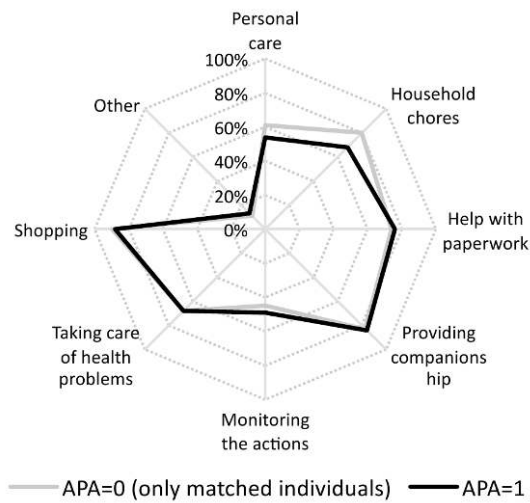


Figure B.8 : *Proportion of APA recipients receiving informal care, by care activity, among those who receive informal care*

Data: HSM (2008).

Samples: APA recipients and matched non-APA recipients who receive informal care. The non-APA recipient sample is selected using the propensity score matching method (nearest neighbour with respect to the propensity score). APA recipients who used the allowance to pay for an informal caregiver or to finance assistive technologies or home accessibility modifications are excluded.

