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## Does Long-Term Care Subsidisation Reduce Unnecessary Hospitalisations?

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# Does Long-Term Care Subsidisation Reduce Unnecessary Hospitalisations?

## Abstract

The expansion of long-term care (LTC) coverage may improve health system efficiency by reducing hospitalisations (bed-blocking), and pave the way for the implementation of health and social care coordination plans. We draw upon the quasi-experimental evidence from the main expansion of long term care increase subsidisation in Spain in 2007 to examine the causal effect of the expansion of LTC subsidisation and coordination on hospitalisations (both on the internal and external margin) and the hospital length of stay. In addition, we examine the 2012 austerity budget cuts that reduced the subsidy. We find robust evidence of a reduction in hospitalisations and the length of stay after the expansion of LTC subsidisation. However, the reduction in hospitalisations is heterogeneous to the existence of health and social care coordination plans and type of subsidy. Overall, we estimate savings related to hospitalisations of up to 11% of total hospital costs. Consistently, subsidy reduction is found to attenuate bed-blocking gains.

JEL-Codes: I180, J140, H530.

Keywords: hospitalisation, long-term care reform, Spain, bed-blocking, hurdle Poisson model.

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## 1. Introduction

Health systems in an ageing society face numerous challenges, which include the need to respond to the rise in healthcare treatments that are disproportionately taken up by older individuals (Breyer et al., 2010). At the same time, such needs increase the demand for long-term care (LTC), which unlike healthcare is not equally subsidised and often provided by local authorities (Costa-Font et al., 2015). Such mismatch in coverage and coordination can put an additional strain on the delivery of health services, and specifically hospital care. A shortage of suitable LTC - due to limited insurance or public subsidy, inadequate integration and inter-jurisdictional coordination of health and social care (Hofmarcher et al., 2007; Bodenheimer, 2008)- gives rise to 'bed-blocking', which may lead to the unnecessary use of hospital care use (Mur-Veeman and Govers, 2011). The latter can take the form of a longer stay, a both a higher probability and number of hospitalisation, and an extended length of stay. This will be the focus of the paper.

A challenging aspect when measuring the effect of LTC insurance expansion of health care use is the endogeneity of such insurance or subsidy expansion, and more precisely the presence of unobserved heterogeneity confounding such effects (e.g., common health shocks), which may lead to misleading findings. To overcome such problems, and attempt to estimate causal effects, one ought exploit an exogenous variation in LTC funding expansion, typically from a the introduction of a new funding program. Here, we examine a quasi-natural experiment, an unexpected LTC funding

expansion reform in Spain, which extends the previously means-tested funding system to anyone that qualifies after a needs test. An additional feature of the Spanish reform is that the responsibility for LTC policy befalls the same level of government as healthcare, which could arguably have led to greater health and social care coordination, or allowed exploiting pre-existing coordination plans. We are interested in identifying the effects of the hypothesised reduction in hospitalisations at both the intensive and the extensive margin (namely, the probability of hospitalisation, the number of hospitalisations, and the length of stay). An additional feature in Spain is the decline in LTC subsidies due to the 2012 austerity cuts that we identify in our data. Hence, we can test whether the reversion of the subsidy expansion deliver comparable effects on hospitalisation.

Our findings provide robust evidence of a reduction in hospitalisations (in both the intensive and the extensive margin) and in length of stay upon the introduction of the 2007 universal subsidy. However, the effect is different depending on the type of subsidy. Whilst the reduction of hospitalisations of home-help (in kind subsidy) subsidies was higher than an cash subsidy (caregiving allowance), the opposite is true for the number of hospitalisations in terms of reducing the length of stay. The effect size is heterogeneous to the prior development of health and social care coordination plans. We draw upon data from the Survey of Health, Ageing and Retirement in Europe 2004-2013, which contains a rich set of time varying controls both at individual and regional level, which we can use to measure both social and health-related needs. We are then able to produce baseline results that are robust to heterogeneity for coordination plans, and

are consistent with the effect of the decline in the subsidy after the 2012 austerity spending cuts. The paper ends with a set of expenditure estimates measuring the effects of LTC subsidy on hospitalisation, and length of stay on hospital costs.

The paper is structured as follows. The next section describes the literature to which the study contributes. Section three contains the background, data and methods. Section four contains the results and, finally, the paper ends with a discussion section containing its concluding remarks.

## **2. Literature**

This paper studies the impact subsidisation has on LTC, and specifically the effect formal home and informal caregiving has on hospitalisations. In doing so, it contributes to the literature on both the coordination of health and social care and the wider health system effects of the expansion of LTC funding. Previous research has found mixed evidence regarding the effect of different programmes over hospitalisation rates.

***Bed-blocking.*** One potential question lies in examining hospitalisation after the introduction of social care programmes, and specifically of the extensive margin (probability of hospitalisation). Here, the literature is mixed. Some studies report a reduction in hospital readmission after the introduction of a home visits programme (Hermiz et al., 2002); others find no significant reductions in the rate of hospital admissions (Balaban et al., 1988, Fabacher et al., 1994, and Stuck et al., 1995 for the US, Van Rossum et al., 1993 for the Netherlands, and Pathy et

al., 1992). Alternatively, other literature examines the effect of social care programmes on the rate of hospitalisations. Brazil et al. (1998) find a reduction in hospital admissions after the implementation of a “Quick Response Service” (QRS) consisting of visits from registered social carers and nurses. Similarly, Vas et al. (2008) find a reduction in first hospital admissions among those people with disabilities receiving preventive home visits. Hendriksen et al. (1984) find that a home visit programme reduces the number of hospital admissions and leads to shorter hospital stays in Denmark. Gonçalves and Weaver (2014) have used an instrumental variable strategy for Switzerland to report that medically related home care reduces hospitalizations and primary care visits, but the same does not apply to non-medical home care.

The studies that use a methodology closer to ours include Picone et al. (2003), and Fernández and Forder (2008). The former investigate the simultaneous determinants of the length of hospital stay and the discharge destinations of US Medicare patients following a hip fracture, stroke, or heart attack. They find that informal care increased the probability of being discharged home or to a nursing facility. The latter found that those local authorities in the UK that provide more hours of home help, and nursing and residential care beds, had a lower rate of hospital-delayed discharges and lower emergency readmission rates. However, experimental or quasi-experimental data are required for addressing some of the endogeneity and causality concerns.

***LTC Subsidisation and the Health System.*** Another group of studies assesses the evidence on coverage expansions, as we do in this paper. Rapp

et al. (2015) have measured the impact of financial assistance for non-medical provision over the probability of requiring emergency care. Their analysis is restricted to patients with Alzheimer's disease. They conclude that the beneficiaries of LTC subsidies have a significantly lower rate of emergency care than non-beneficiaries. Alternatively, Holmäs et al. (2008) have analysed the changes in the catchment areas of two large Norwegian hospitals. They found that changing from a system penalising municipalities that could not provide care services in time to another system with a coordinating unit that facilitated a smooth transfer process from hospital to LTC services involved hospital stays that were approximately 2.3 days shorter. However, a change in the opposite direction leads to hospital stays that are three days longer. Finally, Forder (2009) has used small-area data on 8000 census areas in England, and found that increasing spending on care homes by £1 reduced hospital expenditure by £0.35.

This study seeks to fill some of the gaps in the literature. We use widely representative survey data with measures of hospitalisations (in both the intensive and extensive margin) and length of stay, and measures of exposure to a unique LTC reform that subsidises LTC services, to examine the effect of LTC subsidisation alongside coordination on hospitalisations.

### **3. Background and identification**

*The Spanish model of long-term care.* Spain has traditionally exhibited limited coordination between health and social care. One of the traditional reasons for such limited coordination falls in is the asymmetric jurisdictional functional allocation, and especially the existence of chronic underfunding of social care in the presence of strong family caregiving duties. Social care is



typically a local responsibility, which is subject to a needs/means test, while healthcare is run by the governments in the autonomous regions (*Comunidades Autónomas*), and is free at the point of need, with the exception of pharmaceutical co-payments. The latter puts a strain on the management of complex chronic illnesses, although better coordination is found to improve quality of life (Hofmarcher et al., 2007) and reduce costs (Singh and Ham 2005). Overall, there is evidence to suggest that about 68% of all patients needing social care end up being treated by health services, and experiences of care management coordination find evidence of savings of up to 27% (Graces et al., 2006).

Hence, for a reform to exert an influence in the health system it should not only coordinate health and social care by making use of different policies such as a joint commissioning mechanism, but also expand the funding of underfunded social care. **Table 1** reports the different initiatives for introducing health and social care coordination plans in several Spanish regions. However, as we argue, the benefits of health and social care coordination only materialised when the LTC funding reform was introduced<sup>1</sup>.

**[Insert Table 1 about here]**

Spain implemented the LTC reform in 2007 (it is also known by the longer name ‘Promotion of Personal Autonomy and Care of Dependent People’, we refer to it using the acronym SAAD, resulting from the name of the reform in Spanish), although it was formally enacted by Law 39/2006 of 14 December 2006. The reform was effectively an unexpected expansion of public

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<sup>1</sup> In addition to the reform, the Spanish government published, but did not implement, a Care Coordination White Paper in 2011. It defined the need to transition to a ‘socio-health model’ of care based on the development of interdisciplinary teams and common budgets.

funding (resulted from a last minute agreement of a hang parliament and a minority government elected after the 2004 Madrid bombings) and the individual subsidisation of LTC contingent upon passing a stringent needs test that replaces the previous underfunded means-tested system<sup>2</sup>. After the reform, a beneficiary that qualifies after a needs test may receive an allowance to be cared for by informal caregivers, provided the home meets suitable standards of habitability in the care programme. Although the principles of the new regulation apply nationwide, its implementation was largely in the hands of the autonomous communities or regions, which proceeded at different speeds (Costa-Font, 2010; see Table A1). After SAAD, a universal entitlement to LTC was defined under equal conditions for all elderly or disabled people who need help to carry out basic activities of daily living (ADLs).

*The Spanish reform.* Unlike the pre-reform period, when care was means-tested by local authorities and by the Social Security system (e.g., non-contributory disability allowance), SAAD recognizes the universal nature of benefits and entitlement, and individual care assessment is carried out by every region to determine the services and/or benefits that best match the applicant's needs. This programme is established with the participation of the beneficiary after the family has been consulted. The subsidy is determined by needs, which are classified as moderate dependency, severe dependency, or major dependency. However, SAAD's speed of implementation was region-specific. Consequently, there was a wide variation in the percentage of beneficiaries

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<sup>2</sup> Spain's LTC reforms arose from a coalition government formed by a Parliament elected three days after the 2004 Madrid bombings (Garcia Montalvo, 2011). The new minority socialist government began to announce an agreement at the end of 2006 to implement a tax-funded subsidisation of the LTC system. It is therefore plausible to assume that the reform was not expected.

(e.g., 3.19% in Andalusia versus 1.17% per cent in the Canaries, using data for 2010)<sup>3</sup>. Similarly, the reliance on cash or in-kind benefits differs across regions, representing a high dispersion rate in the cost per dependent (e.g., €5,093 in the Murcia region versus €12,715 in the Madrid region, while the percentages of informal caregivers' benefits with respect to total benefits awarded are 68.7% and 18.6%, respectively; Barriga Martí et al., 2015).

The effect of the economic crisis on the public deficit (8.9% at the beginning of 2012) led to a reduction in the subsidy to control public expenditure. As part of the budget cuts, the generosity of the LTC subsidy was slashed in July 2012 (Royal Decree 20/2012, 13 July 2012). Specifically, the LTC subsidy for 'moderate dependency' was delayed until 2015; hence only people with severe and major dependency were supported. Among these, home care support fell from 70–90 hours/month to 56–70 hours/month for individuals with 'major dependency', and from 40–55 hours/month to 31–45 hours/month for those with 'severe dependency'. Finally, the subsidy for those receiving an equivalent cash allowance to pay for informal caregivers was reduced by between 15 and 25% conditional upon the degree of dependency, and the Social Security stopped paying social contributions for informal caregivers.

Based on the above description, the following section examines the effect of the introduction of SAAD, and specifically focuses on three sources of heterogeneity: (i) the existence of *health and social care coordination* plans in the region, (ii) the existence of *delays in the regional implementation* of the

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<sup>3</sup> Beneficiaries with respect to the population aged 18 and over. We have used this threshold given the differences in the ranking scale between the population under and over the age of 18.

reform, and (iii) the effect of the reduction in the extent of the subsidy due to the 2012 austerity subsidy reductions.

#### 4. Data

*The survey.* We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) for Wave 1 (2004), Wave 2 (2006/2007), Wave 4 (2011) and Wave 5 (2013)<sup>4</sup>. SHARE is the European equivalent of the Health and Retirement Survey, a panel dataset of interviewees born in 1960 or earlier, and their partners, covering Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, the Czech Republic, Poland and Ireland. SHARE<sup>5</sup> is the most comprehensive dataset available across Europe for examining the effects of changes in LTC subsidies among the elderly. While sample sizes vary across countries, the pooled dataset exceeds 100,000 individuals, from which only 20% have some form of dependency (defined as the ADLs or instrumental ones—IADLs- they cannot perform). We take advantage of the fact that some of the interviews in the 2006 wave were carried out in 2007, and hence they allow us to more clearly identify the initial effects of the exposure to public insurance expansion.

Our data contain records of economic benefits and public home care for waves 1, 2 and 5. However, wave 4 records only LTC benefits, as questions concerning public home care have been omitted from the questionnaire. A

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<sup>4</sup> Unfortunately, Wave 3 could not be included as it was not comparable with other waves.

<sup>5</sup> SHARE data collection has been funded primarily by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: No. 211909, SHARE-LEAP: No. 227822, SHARE M4: No. 261982). Additional funding from the German Ministry of Education and Research, the U.S. National Institute on Aging (U01\_AG09740-13S2, P01\_AG005842, P01\_AG08291, P30\_AG12815, R21\_AG025169, Y1-AG-4553-01, IAG\_BSR06-11, OGHA\_04-064), and from various national funding sources is gratefully acknowledged (see [www.share-project.org](http://www.share-project.org)).

multiple imputation procedure has been used to tackle missing data (Rubin, 2007). This technique allows predicting what the random missing values would have been using information from the whole dataset (waves 1, 2, 4 and 5). This technique requires two assumptions: (i) the data must be missing at random, which is clearly the case because observations for public home care are missing for all the individuals in wave 4, and (ii) the reasons for the missing data must be captured by other variables that do not have missing values. As the missing variable is binary, a logistic imputation method has been chosen, and the following explanatory variables have been introduced: age, gender, being married, having co-resident children, pathologies (stroke, mental illness, Parkinsonism, hip fracture), and a left-wing regional government. To test the sensitivity of our results, we have selected five different random seed values, and added five different imputations to our main dataset. The results in these alternative cases were very similar to the original estimations.

***Long-term care measures.*** SAAD provided three types of benefits that we classify by defining three binary variables:  $CB_i$  is a binary variable that takes the value 1 if the beneficiary receives cash benefits, and zero otherwise;  $HB_i$  is a binary variable taking the value 1 if the beneficiary receives public home care benefit, and zero otherwise;  $PuB_i$  is a binary variable that takes the value 1 if the beneficiary receives any public LTC benefit. Cash benefits and in-kind benefits are mutually exclusive. Therefore, nobody can receive both types of benefits at the same time.

***Hospitalisations.*** Our data contain records on whether the survey respondent has spent a night in hospital over the past twelve months (including medical, surgical, psychiatric or any other specialized wards), and the total

number of hospital overnights over the past twelve months. We use this information to define three dependent variables:

- a) *Hospitalisation* ( $H_i$ ) is a variable that takes the value 0 if the individual has not spent any nights in hospital over the past twelve months, and is equal to 1 if they have.
- b) *Hospitalisation length of stay* ( $HLS_i$ ) is a count variable taking the value 0 if the individual has not spent a single night in hospital over the past twelve months, and a positive value equal to the number of nights they have spent in a hospital over the past year.
- c) *Number of Hospitalisations* ( $HN_i$ ) is a count variable taking the value 0 if the individual has not been admitted to hospital over the past twelve months, and a positive value equal to the number of times they have been admitted over the past year. Given that Spain's LTC reform was first introduced in 2007, and hospitalisation records cover the twelve months prior to the survey, some hospitalisations recorded in 2007 may actually have occurred in 2006. To capture the reform's true effect on hospitalisations, we will assume that the pre-reform period covers waves 1 and 2 (2004, 2006, 2007), and the post-reform period covers waves 4 and 5 (2011 and 2013).

**Figure 1** examines the external margin, that is, the percentage of hospitalised individuals by type of long term care service the individual got support for. Importantly, after 2007 there is a drop in both those beneficiaries of caregiving

allowances and home care, but not among those who do not receive any benefits. In 2013, possibly due to the effect of the austerity cuts in 2012, some of these benefits were reversed. However, these are trends that need to control for a number of other misleading effects, and we do so in our econometric analysis below.

**[Insert Figure 1 about here]**

**Figure 2** shows the density function for the number of hospitalisations by receipts of LTC benefit and the time of the survey. It is noticeable that SAAD beneficiaries and non-beneficiaries tend to move in opposite directions. We find that between 2004-07 and 2011 there are higher concentrations of lower numbers of hospital overnights for beneficiaries, as opposed to a slight shift to the right for non-beneficiaries. In contrast, between 2011 and 2013, the density functions for both groups partially reverse the displacements observed in the previous sub-period (e.g., a higher concentration of a lower number of hospital overnights for non-beneficiaries, but an increase for beneficiaries).

**[Insert Figure 2 about here]**

**Table A2** in the Appendix reports the descriptive statistics for the number of hospital overnights. In nearly all the cases, the standard deviation exceeds the mean, which is a clear symptom of overdispersion. Between waves 1&2 and wave 4, the total number of hospital overnights has decreased for those receiving cash benefits (from 11.35 to 8.75) or home care (from 15.36 to 11.54). However, between the last two waves, previous hospital intensity reductions have been partially wiped out, especially for those receiving cash benefits (from 8.17 in W4 to 12.09 in W5).

***Explanatory variables.*** The SHARE questionnaire provides information on the respondents' main socio-demographic characteristics. The choice of explanatory variables has been based on previous evidence, and includes age, gender, level of education, marital status, self-reported health status, Katz's index<sup>6</sup>, net income (€2011), and net wealth (€2011). A detailed tabulation of descriptive statistics for individual explanatory variables is reported in **Table A3**. The beneficiaries of public home care are on average 10 years older than cash benefit receivers. They also record a higher concentration of women, widowed, and more dependent individuals. Regardless of beneficiary status, all the groups have suffered a sharp decrease in real net income and real net wealth between both sub-periods.

Additionally, a set of regional variables is included for region-specific unobservables at the time of the survey (see **Table A4**). First, given that hospital utilisation might be explained by resource constraints and demand pressures in the health sector rather than LTC subsidisation, we control for public health expenditure per capita (€2011) and degree of satisfaction with the public healthcare received. We find that real public health expenditure and the degree of satisfaction with the public healthcare system peaked in 2011. Second, the number of resources and the quality of care received at hospitals is approximated by the infection rate at hospitals and the number of public hospital beds per 1,000 inhabitants. We observe an increase in the infection rate at hospitals in the last two waves, and a progressive rise in the number of hospital beds per 1,000 inhabitants in publicly owned hospitals during the period.

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<sup>6</sup> Katz's index is not directly provided by SHARE, but has been obtained using data on disabilities for ADLs, following Katz (1983).



Third, as described in **Table 1**, some regions implemented health and social care coordination plans in the period. Hence, we define a binary variable (*Coord*) that takes the value 1 if that coordination programme is in place in the region at the time of the survey. Finally, Spain went through a recession during at least some of our data waves, which led to employment shocks, as well as a shock to the economy as a whole. We control for both effects.

## 5. Empirical Strategy

**Difference-in-differences.** Given the type of programme evaluation analysis we seek to perform, we compare individuals that qualified for a LTC subsidy (and its different forms), who have similar characteristics to those that did not qualify after the reform. The corresponding regression model to be estimated contains three different dependent variables, namely, the probability of a hospitalisation ( $H_{ict}$ ), the length of stay, ( $HLS_{ict}$ ), and the number of hospitalisations ( $HN_{ict}$ ) that individual  $i$  living in region  $c$  has undergone over the past twelve months. It may be expressed as the following difference-in-differences regression for the probability of hospitalisation:

$$H_{ict} = SAAD_{ict}\alpha_1 + POST_t\alpha_2 + SAAD_{ict} * POST_t\alpha_3 + X'_{ict}\beta + HC_{ct} + C_c + T_t + \varepsilon_{ict} \quad (1)$$

$$SAAD_{ict} = \{CB_{ict}, HB_{ict}, PuC_{ict}\}$$

Where  $SAAD_{ict}$  is a binary variable taking the value 1 if the individual receives public LTC benefits, and zero otherwise, and  $X'_{ict}$  is a vector of individual sociodemographic characteristics (age, gender, marital status, level of education, degree of dependency approximated by the Katz's Index, self-reported health status, real income, and real wealth).

$HC_{ct}$  includes the characteristics of the regional healthcare sector (public health expenditure per capita in real terms, number of public hospital beds per 1,000 inhabitants, infection rate at hospitals, and satisfaction with the public healthcare system);  $C_c$  and  $T_t$  denote regional and temporal dummy variables, and  $\varepsilon_{ict}$  is a random error term that also captures individual unobserved characteristics. The estimation of this model faces two important issues, namely, model specification and the existence of potentially endogenous variables.

**Model Specification.** Given that we measure the internal and external margin of hospitalisations and the length of stay with count data, we need to account for the fact that the dependent variable does not have negative values. Furthermore, a corner solution (zero hospitalisations) may be an optimal solution if an individual does need to be admitted. Hence, a linear model might have misspecified the count data generating process, and may lead to negative or non-integer predictions (King, 1988). The number of hospital overnights (or number of hospitalisations) is similar to the Poisson process because the probability of occurrence decreases as their frequency increases. Nevertheless, a Poisson specification might be too restrictive if the data variance exceeds the mean (overdispersion).

A common alternative to the Poisson model is the negative binomial model. Although the negative binomial solves the problem of overdispersion, neither of them provides a suitable fit if there is a large percentage of zero observations in the dataset. The models normally used in the empirical literature are the zero-inflated and double-hurdle ones. The zero-inflated model is sensitive to the fact that zeros may arise in two circumstances, namely, either

as a consequence of a strategic decision, or due to incidental reasons (Winkelmann, 2008). Some individuals may report zero hospitalisations because they have not suffered a serious enough health shock that requires admission. These individuals may be referred to as ‘strategic non-hospitalised’. On the other hand, an individual who does require surgery or inpatient care and does not receive it would qualify as an ‘incidental zero observation’<sup>7</sup>.

One alternative is the double-hurdle model, also referred to as the two-part model. The double-hurdle model postulates that the zeros are only the result of strategic decisions, hence all zero observations are thus generated by a mechanism separate from that of non-zeros (Mullahy, 1986; Gurmu, 1998). The first hurdle determines whether the count variable is zero or has a positive realization i.e., if the individual has been hospitalised at least once in the past 12 months). A positive value indicates that the first hurdle is met, and in this case the exact number of hospitalisation days (hospital intensity) is modelled using a truncated distribution. Both stages are independent, and the first hurdle is usually modelled with a logistic distribution, and the second hurdle as a zero-truncated negative binomial or Poisson (Cameron and Trivedi, 2013).

**Endogeneity.** Estimation by the maximum likelihood of equation (1) yields consistent and efficient estimations if  $SAAD$  and  $X'_{ict}$  are exogenous. However, if unobserved determinants of  $SAAD_{ict}$  are correlated with  $\varepsilon_{ict}$ , the estimated coefficients will be biased. Additionally, a core assumption of the difference-in-differences model is that the time trend is common to both

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<sup>7</sup> Given the characteristics of the Spanish health system, this situation seems in principle highly improbable. SHARE only provides information on unmet hospitalisation needs for wave 1: 0.29% (0.33%) of respondents reported not having received surgery or hospital treatment because they could not afford it (it was not available).

groups, whereby treatment and control individuals would behave in a parallel manner without the LTC reform, after controlling for observables.

One of the threats of the difference-in-differences strategy is that we do not account for the potential endogeneity in the implementation of the reform. For example, if we consider the situation of individuals with poor health, they will certainly have a higher than average probability of being hospitalised, and a higher than average probability of receiving LTC benefits. Furthermore, we assume that the SAAD has been implemented at a different pace in each region, and that some regions have a significantly higher propensity to award economic benefits, whereas others are more prone to award in-kind benefits. As a result, the error term of (1) could be correlated with unobservable variables that affect the implementation of the SAAD. Hence, OLS estimation of (1) would produce inconsistent parameter estimates.

Indeed we have two potential endogenous variables:  $SAAD_{ict}$  and  $SAAD_{ict} \times POST_t$ . We propose using a control function (CF) approach to consider the potential endogeneity of SAAD and SAAD  $\times$  POST. This technique, suggested by Wooldridge (2002) and Blundell and Powell (2003), is useful for estimating non-linear models. In a first stage, we perform a linear regression of the endogenous variables on all exogenous variables and instruments, and obtain the residuals. In a second stage, we use the residuals as additional control variables in the main regression. We use bootstrapping to obtain valid standard errors.

We have introduced six instruments in these regressions. The first one is the percentage of the vote for the socialist party in the last general elections ( $Soc_{ct}$ ), as the socialist party's electoral mandate included the development and

implementation of a new LTC Act<sup>8</sup> (see Table A5). Specifically, given that the reform was the ‘star social programme’ of a newly elected socialist government, and that the regions were co-financing and implementing the reform, we use regional political information to instrument reform implementation. Hence, the instrument is both theoretically relevant and empirically significant, and there is no reason to believe it impacts on the dependent variable in any other way. The second instrument is the interaction between the percentage of the vote for the socialist party and the post-reform period (*Soc<sub>ctx</sub> POST*). We also include the coverage index of public home care in 2002 and 2000, before the onset of the SAAD, to capture the effect of regional differences in the provision of formal care (see **Table A6**). The fifth instrument is the proportion of women at home, which can be interpreted as a measure of the propensity to receive informal care. Finally, we have included the place of residence, defining a binary variable if the individual lives in the countryside, and zero otherwise. This variable controls for the expected lack of social services in rural areas compared to cities.

The results of the first-stage regressions confirm the validity of our instruments. Regions with higher socialist support have a lower propensity to award cash benefits, but a significant and positive association with home care benefits (**Table A7**). The coverage index of public home care in 2000 and 2002 leads to the same results: negative for cash benefits, but positive for home care. By contrast, a higher fraction of women at home or living in a rural area is associated with a higher probability of cash benefits, but a lower one for home care benefits.

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<sup>8</sup> Hence, regions run by the socialist party would be expected to speed up the implementation of the reform, as some previous research has documented (Costa-Font, 2010).

**The Choice of Model.** A statistical exploration of the data has led us to consider a logit plus zero-truncated Poisson (double-hurdle) model to solve the overdispersion problem mentioned earlier<sup>9</sup>. The results (available upon request) point to the same conclusions for the three types of benefits. First, the significance of the overdispersion parameter (alpha) and the comparison of the AIC and BIC statistics for the Poisson and negative binomial models indicate that the negative binomial model fits the data better. Second, the likelihood ratio test between the Poisson and the hurdle Poisson indicates the suitability of a double-hurdle model. Third, the likelihood ratio test between the negative binomial and the hurdle negative binomial rejects the former. Finally, a comparison between both hurdle models rejects the hurdle binomial.

Given the potential endogeneity of SAAD, we use the control function (CF) approach in both hurdles. For the first hurdle, Petrin and Train (2010) propose the CF approach as a more flexible method than others, such as Bayesian analysis (Yang et al., 2008) or simulated maximum likelihood (Gupta and Park, 2009), because it does not impose strict distributional assumptions for the identification of parameters. For the second hurdle -the zero-truncated regression- we perform the CF approach as suggested by Wooldridge (1997) for count data models. Chen (2010) suggests that the identification of parameters in truncated models with endogeneity improves in the presence of continuous regressors. The presence of continuous variables as explanatory

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<sup>9</sup> The truncated Poisson allows us to solve the overdispersion problem of the simple Poisson model. Considering that  $W'_{it}$  includes all regressors:

$$\begin{aligned}
 H_{ict} &= W'_{it}\Omega + \varepsilon_{ict}\Omega + \varepsilon_{ict} \\
 Var[H_{ict}|\Omega] &= E[H_{ict}|\Omega] + E[H_{ict}|\Omega](e^{W'_{it}\Omega} - E[H_{ict}|\Omega]) \\
 E[H_{ict}|\Omega] &= \frac{\exp(W'_{it}\Omega)}{1 + \exp(W'_{it}\Omega)} * \frac{e^{W'_{it}\Omega}}{1 - e^{W'_{it}\Omega}}
 \end{aligned}$$

Depending on  $e^{W'_{it}\Omega}$  and  $E[H_{ict}|\Omega]$ , the mean may be bigger or smaller than the variance, and therefore, it can accommodate overdispersion and underdispersion situations.

covariates (income, wealth, and variables related to public healthcare) and continuous instruments (percentage of votes for the socialist party, coverage index of public home care, percentage of women at home) supports the validity of our results. Finally, in the double-hurdle model we bootstrap the standard errors in both hurdles.

## 6. Results

*The effect of the reform on hospitalisations* . Consistently with expectation we find evidence of a reduction of hospitalisations for those who benefit from the reform after the reform. **Table 2** reports the results for the key coefficients of the hurdle Poisson model for hospitalisation, number of hospitalisations and the length of stay as a results of the introduction of the SAAD, both for the case of cash benefits and also for the case of home help (all the other coefficients are presented for the baseline case in **Table A8**). Specifically, panel A reports the baseline case for these effects; panel B presents the coordination case emphasising the effects for those regions that have implemented coordination between healthcare and social care, and finally, panel C presents the analysis of the effect of budgetary cuts implemented in the SAAD in 2013. The first-stage residuals are not significant in the first hurdle (logit), but they are in the second one (truncated Poisson). The Hausman test rejects the endogeneity of SAAD and SAAD x POST in the first hurdle, but accepts it for the second one. However, for statistical coherency we keep and present the Instrumental Variables specification for both hurdles.

**[Insert Table 2 about here]**

**Baseline results.** Panel A in Table 2 presents the model's baseline results, with the treatment variable after the reform captured by the interaction SAAD\*POST. Our results indicate that, as expected, the reform did indeed reduce the number of hospitalisations, the probability of hospitalisation and the length of stay. However, the effect size is different for cash benefits and home help. Home help had a bigger impact on length of stay, whilst cash benefit did so on the number of hospitalisations. Our effect sizes indicate that the length of stay for cash beneficiaries (home care beneficiaries) is 0.79 (0.70) times shorter than that of similar beneficiaries in the pre-reform period. The beneficiaries of cash benefits record an increase in the number of hospitalisations (1.13 times more than non-beneficiaries). However, after the reform, their number of hospitalisations and average length of stay is 0.80 times lower compared to beneficiaries in the pre-reform period.

For home care beneficiaries, we observe that the probability of hospitalisation increases by 5.2 pp, and length of stay is 1.26 times that of non-home care beneficiaries. The interaction term (SAADxPOST) indicates that the number of hospitalisations (length of stay) in the post-reform period is 0.90 (0.69) times that of a home care beneficiary in the pre-reform period.

Therefore, cash beneficiaries have benefited more in terms of the reduction in the number of hospitalisations, but home care beneficiaries have seen a bigger decrease in the average length of stay.

When we examine the effect of all the other controls (see **Table A8** in the Appendix), we find that the number of public beds per 100,000 inhabitants does not affect either the probability of hospitalisation or hospital intensity. Apart from this, a higher infection rate and higher satisfaction with the public



healthcare system are negatively correlated with hospital intensity. In contrast, higher public healthcare expenditure is positively correlated with hospital intensity.

***The role of coordination.*** Panel B in **Table 2** reports the combined effect of coordination and LTC on hospitalisations and length of stay. As in panel A, in the post-reform period, we report the probability of hospitalization, number of hospital stays and length of stay of long-term care beneficiaries which have declined compared to the pre-reform period. The interaction term SAAD x Coordination indicates that: (i) the number of hospital stays for cash beneficiaries in coordinated regions is 1.33 times higher than similar beneficiaries in non-coordinated regions, (ii) the length of stay of home care beneficiaries in coordinated regions was 1.42 times that of similar beneficiaries in non-coordinated regions.

However, the triple interaction SAAD x Coord x POST offers a different picture. First, the probability of hospitalisation falls by 11.6 pp. among those who are entitled to receive cash benefits, and by 18.5 pp for home care in regions with coordination programmes between healthcare and LTC services. However, we do not find a significant effect of cash subsidy on length of stay, suggesting that coordination effects only reduce the length of stay require among those who are receive a home help subsidy. Therefore, it seems that coordination programs were breeding ground for the implementation of the reform (SAAD), insofar as they deliver a reduction of the number of hospitalizations and length of stay at hospital in the post-reform period.

Overall, the length of stay for patients receiving home care in regions with coordination programmes after the reform has decreased by 0.66

hospitalisations/year compared to other patients receiving home care in a region without a coordination programme. Regarding the number of hospitalisations, they have been reduced by 0.86 (0.79) for cash beneficiaries (home care beneficiaries) in coordinated regions after the reform, as compared to non-coordinated regions. As in the baseline case, the residuals corresponding to the first-stage regression for the four endogenous variables are significant in the second hurdle, but not in the first one.

***The effect of the 2012/2013 budgetary cuts.*** Finally, panel C in **Table 2** presents the effects of the austerity cuts introduced between 2012 and 2013. The interaction term SAAD x POST (2011&2013) indicates that the length of stay for receivers of cash benefits (home care) is 0.86 (0.87) times that of similar beneficiaries in the pre-reform period. Nevertheless, these reductions have been partially curtailed by opposite sign effects observed for SAAD x YEAR (2013), affecting both the length of stay and the number of hospitalisations, but not the probability of hospitalisation consistent with a bed-blocking effect. In fact, we find that the expected length of stay of receivers of cash benefits (home care) in 2013 is 1.29 (1.48) days longer than that of similar beneficiaries before that year. Finally, we also find that budgetary cuts have a significant effect on the probability of hospitalisation, particularly for those who have been hospitalised at least once during the last year, where we observe a significant increase in the number of hospitalisations (1.16 hospitalisations/year for cash beneficiaries; 1.40 hospitalisations/year for home care beneficiaries).

### ***Impact on hospitalisation cost***

As a way of synthesising our estimates, we have calculated the economic impact of the SAAD over hospital costs. To that end, we have based our estimates of the

average length and average costs of hospitalisation by region and year on official data from the Ministry of Health, Social Services and Immigration. Specifically, we have first computed the average cost per day as the ratio between total hospitalisation cost and average length of stay. Secondly, using calibrated weights provided by SHARE for each wave, we have obtained the population estimate of the number of cash beneficiaries and home care beneficiaries. Thirdly, we have applied the estimated coefficients to average length data to obtain the estimated hospital intensity (in days). Finally, we have multiplied the estimated hospital intensity by the number of beneficiaries and the average costs per day. The results are shown in Table 12.

**[Insert Table 3 about here]**

For a better understanding of the magnitude of the results, we have compared the estimated increase or decrease in hospital costs with the official data for hospital costs in **Table 3**. For the country as a whole, the implementation of the SAAD has decreased hospital costs by 11%, with 5% from a reduction in hospitalizations and 6% from a reduction in the length of stay. Moreover, in the subset of regions with specific coordination programmes between healthcare and social services, the SAAD has implied a reduction in hospital costs of 5.15%: with 2.7% from a reduction in the number of hospitalizations and 2.45% from a reduction in the length of stay. Finally, as expected, the 2012 austerity cuts in the LTC subsidy increased re-admissions by 5.7%, which is slightly more than the savings from coordination plans.

## **7. Conclusions**

This paper has drawn on quasi-experimental evidence (the introduction of the Promotion of Personal Autonomy and Care of Dependent People, or SAAD in

Spanish) to examine the effect of the universalisation of the public LTC subsidy on hospitalisation (both the internal and external margin) and length of stay in Spain. We find suggestive evidence of a reduction in hospitalisations and length of stay even after controlling for the endogeneity of the reform's implementation. We find that the effect on the number of hospitalisations is stronger among individuals receiving cash benefits, whilst the effect on the length of stay is stronger among those receiving home help. However, the results were heterogeneous to the implementation of regional health and social care coordination plans, which have been enacted after the expansion of the funding of home help. Consistently, our results suggest that part of the savings from LTC subsidies is lost by the reduction in the LTC subsidy in 2012 on the internal margin, hence a reduction of the subsidy does indeed increase hospital length of stay and the number of hospitalisations. Overall, we estimate that the implementation of the reform has decreased hospital costs by 11%.

These results suggest that an expansion of LTC funding may help to reduce otherwise pre-existing inefficiencies in the use of hospital care, and specifically the number of hospitalisations and the length of stay. Furthermore, it suggests that if the coordination of health and social care is to give rise to efficiency savings, funding responsibilities should be adequate and allocated at the same level of government as healthcare<sup>10</sup>.

## References

- Balaban, D., Goldfarb, N., Perkel, R., Carlson, B. (1988). Follow-up study of an urban family medicine home visit program. *Journal of Family Practice*, 26, 307-312.
- Barriga Martí, L., Brezmes Nieto, M.J., García Herrero, G., Ramírez Navarro, J. M. (2015). *Evolución interanual de los datos básicos de gestión de la atención a la*

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<sup>10</sup> Holmås et al. (2010) investigates the effect of fining owners of long-term care institutions who prolong length of stay at hospitals in Norway. Surprisingly, the study found that the stay is longer when fines are used, which is interpreted as an example of monetary incentives crowding-out intrinsic motivation.

*dependencia y costes y financiación del sistema por Comunidades Autónomas.*  
XIV Dictamen del Observatorio de la Asociación Estatal y de Directores y Gerentes de Servicios Sociales

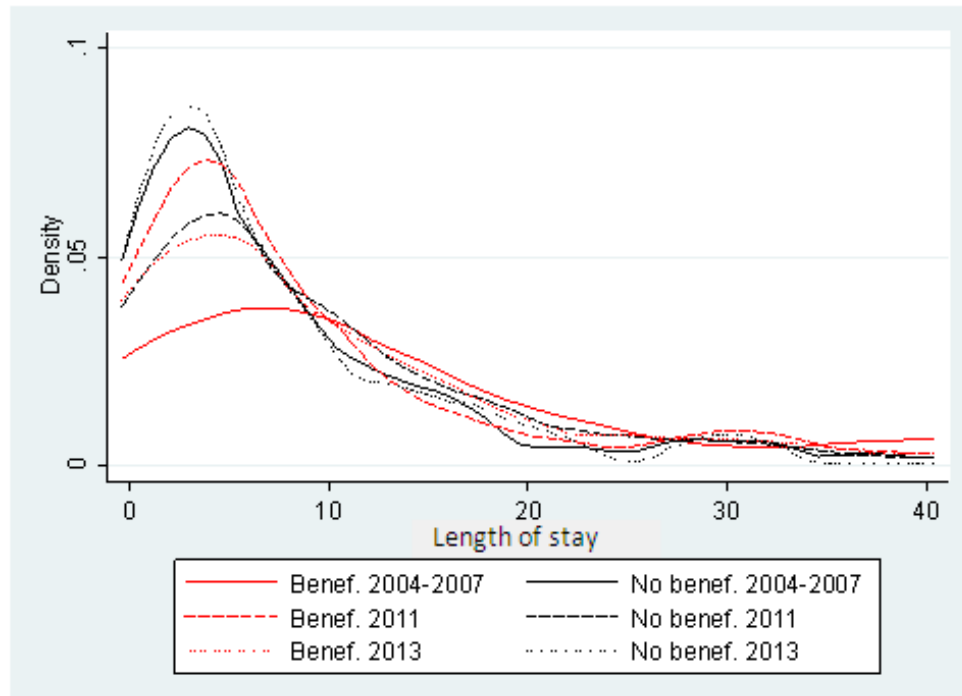
- Blundell, R., Powell, J. L. (2003). Endogeneity in nonparametric and semiparametric regression models. In Dewatripont, M., Hansen, L., Turnovsky, S. (eds.), *Advances in economics and econometrics: theory and applications*, vol. II. Cambridge University Press.
- Bodenheimer, T. (2008). Coordinating care – a perilous journey through the health care system. *New England Journal of Medicine*, 358, 1064–70.
- Brazil, K., Ulrichsen, D., Knott, C. (1998). Substituting home care for hospitalization: the role of a quick response service for the elderly. *Journal of Community Health*, 23, 29-43.
- Breyer, F., Costa-Font, J., Felder, S. (2010). Ageing, health, and health care. *Oxford Review of Economic Policy*, 26 (4), 674-690.
- Cameron, A. C., Trivedi, P. K. (2013). *Regression analysis of count data*. Cambridge: Cambridge University Press, 2<sup>nd</sup> edition
- Chen, S. (2010). Non-parametric identification and estimation of truncated regression models. *The Review of Economic Studies*, 77(1), 127-153.
- Costa-Font, J., Courbage, C., Swartz, K (2015) Financing long-term care: ex-ante, ex-post or both? *Health Economics*, 24. 45-57
- Costa-Font, J. (2010) Devolution, diversity and welfare reform: long-term care in the ‘Latin Rim’. *Social Policy and Administration*, 44 (4), 481-494.
- Davis, M., Devoe, M., Kansagara, D., Nicolaidis, C., Englander, H. (2012). Do I do as best as the system would let me? Healthcare professional views on hospital to home care transitions. *Journal of General Internal Medicine*, 27, 1649-1656.
- Fabacher, D., Josephson, K., Pietruszka, F., Linderborn, K., Morley, J., Rubenstein, L. A. (1994). An in-home preventive assessment program for independent older adults: a randomized controlled trial. *Journal of the American Geriatric Society*, 42, 630-638.
- Fernández J., Forder, J. (2008). Consequences of local variations in social care on the performance of the acute health care sector. *Applied Economics*, 40(12), 1503-1518.
- Garcés J, Ródenas, F., Sanjosé V. (2006) Suitability of the health and social care resources for persons requiring long-term care in Spain: an empirical approach, *Health Policy*, 76: 121-130.
- García-Montalvo, J. (2011). Voting after the bombings: A natural experiment on the effect of terrorist attacks on democratic elections. *Review of Economics and Statistics*, 93(4), 1146-1154.
- Golberstein, E., Grabowski, D. C., Langa, K. M., & Chernew, M. E. (2009). Effect of Medicare home health care payment on informal care. *Inquiry: The Journal of Health Care Organization, Provision, and Financing*, 46(1), 58-71
- Gonçalves, J., Weaver, F. (2014). Home care, hospitalizations and doctor visits. WPS 14-09-5. Geneva University.

- Gupta, S., Park, S. (2009). A simulated maximum likelihood estimator for the random coefficient logit model using aggregate data. *Journal of Marketing Research*, 46, 531-542.
- Gurmu, S., (1998). Generalized hurdle count data regression models. *Economics Letters*, 58(3), 263–268.
- Hendriksen, C., Lund, E., Strømgård, E. (1984). Consequences of assessment and intervention among elderly people: a three year randomized controlled trial. *British Medical Journal* 289, 1522-1524.
- Hermiz, O., Comino, E., Marks, G., Daffurn, K., Wilson, S., Harris, (2002). Randomized control trial of home based care of patients with chronic obstructive pulmonary disease. *British Medical Journal*, 325: 938-940.
- Hofmarcher, M., Oxley, H., Rusticelli, E. (2007). Improved health system performance through better care coordination. Health Working Paper No. 30. Paris: Organisation for Economic Co-operation and Development.
- Holmås, T. E., Kjerstad, E., Lurås, H., Straume, O. R. (2008). Does monetary punishment crowd out pro-social motivation? The case of hospital bed-blocking. Núcleo de Investigação em Políticas Económicas. NIPE WP 17/2008.
- Jiménez-Martín. S., Oliva, J., Vilaplana-Prieto, C., Herrera, E., Muñoz-Mayorga, I., Martín Galán, V. (2011). *Sanidad y dependencia: matrimonio o divorcio*. Círculo de Sanidad. Madrid.
- Katz, S. (1983). Assessing self-maintenance: Activities of daily living, mobility and instrumental activities of daily living. *Journal of the American Geriatric Society*, 31(12), 721-726.
- King, G. (1988). Statistical models for political science event counts: bias in conventional procedures and evidence for the exponential Poisson regression model. *American Journal of Political Science* 32, 838-863.
- Mullahy, J., (1986). Specification and testing of some modified count data models. *Journal of Econometrics*, 33(3), 341–365.
- Mur-Veeman, I., Govers, M. (2011). Buffer management to solve bed-blocking in the Netherlands 2000-2010. Cooperation from an integrated care chain perspective as a key success factor for managing patient flows. *International Journal of Integrated Care*, 11, 1-10.
- Pathy, M., Bayer, A., Harding, K., Dibble, A. (1992). Randomized trial of case finding and surveillance of elderly people at home. *Lancet*, 340, 890-893.
- Petrin, A., Train, K. (2010). A control function approach to endogeneity in consumer choice models. *Journal of Marketing Research* 47, 3-13.
- Picone, G., Wilson, R., Chou, S. (2003). Analysis of hospital length of stay and discharge destination using hazard functions with unmeasured heterogeneity. *Health Economics*, 12, 1021-1034.
- Rapp, T., Chauvin, P., Sirven, N. (2015). Are public subsidies effective to reduce emergency care? Evidence from the PLASA Study. *Social Science & Medicine*, 138, 31-37.
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: Wiley.

- Shea, J. (1997). Instrumental relevance in multivariate linear models: a simple measure. *Review of Economic Statistics*, 79, 348-352.
- Singh, D., Ham, C. (2005). *Transforming Chronic Care: Evidence about improving care for people with long-term conditions*. Birmingham: University of Birmingham, Health Services Management Centre.
- Stuck, A., Aronow, H., Steiner, A., Alessi, C., Büla, C., Gold., M., Yuhas, K., Nisenbaum, R., Rubenstein, L., Beck, J. (1995). A trial of annual in home-comprehensive geriatric assessments for elderly people in the community. *New England Journal of Medicine*, 333, 1184-1189.
- Van Rossum, E., Frederiks, C., Philipsen, H., Portengen, K., Wiskerke, J., Knipschild, P. (1993). Effects of preventive home visits to elderly people. *British Medical Journal*, 307, 27-32.
- Vas, M., Hendriksen, C., Thomsen, J., Parner, T., Avlund, K. (2008). Preventive home visits to home-dwelling older people and hospital admissions: a municipality-randomised intervention trial. *European Journal of Ageing*, 5: 67-76.
- Winkelmann, R (2008). *Econometric Analysis of Count Data*. 5th edition, Berlin: Springer.
- Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. MIT Press.
- Wooldridge, J. (1997). Quasi-maximum Likelihood Methods for Count Data. In Pesaran, H. and Schmidt, P. (Eds), *Handbook of Applied Econometrics*, vol. II. Oxford; Blackwell
- Yang, S., Chen, Y., Allenby, G. (2003). Bayesian analysis of simultaneous demand and supply. *Quantitative Marketing and Economics*, 1, 251-275.

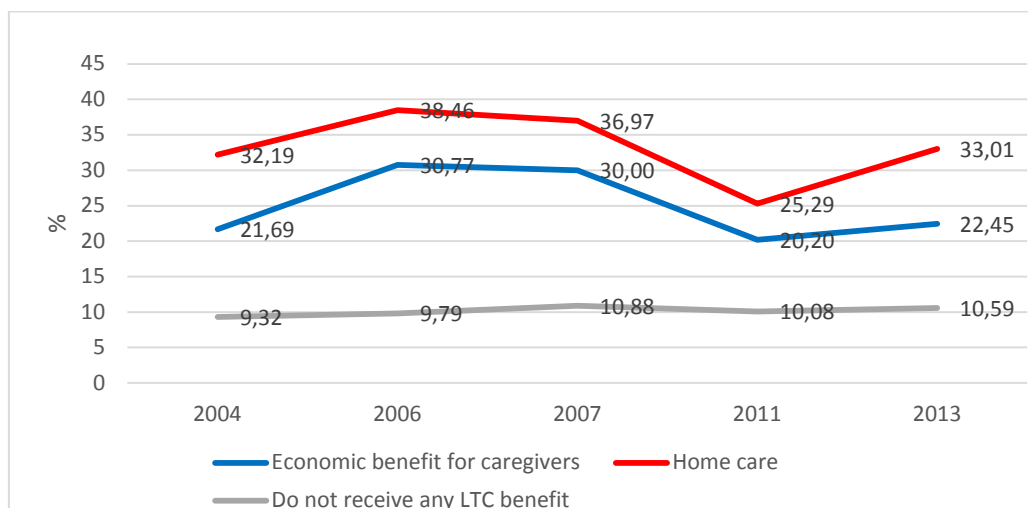
## Tables and Figures

**Figure 1. Density function of hospital length of stay by exposure to the 2007 reform and 2012 austerity cuts**



*Note:* Density function for the number of hospital overnights distinguishing between beneficiaries of LTC benefits and non-beneficiaries (not receiving either in-kind or cash benefits). Straight lines refer to pre-reform hospitalisation for both those affected (red) and those not affected (black) by the reform. Bold dotted lines refer to the post-2007 reform, and light dotted lines refer to those affected by the 2012 reform.

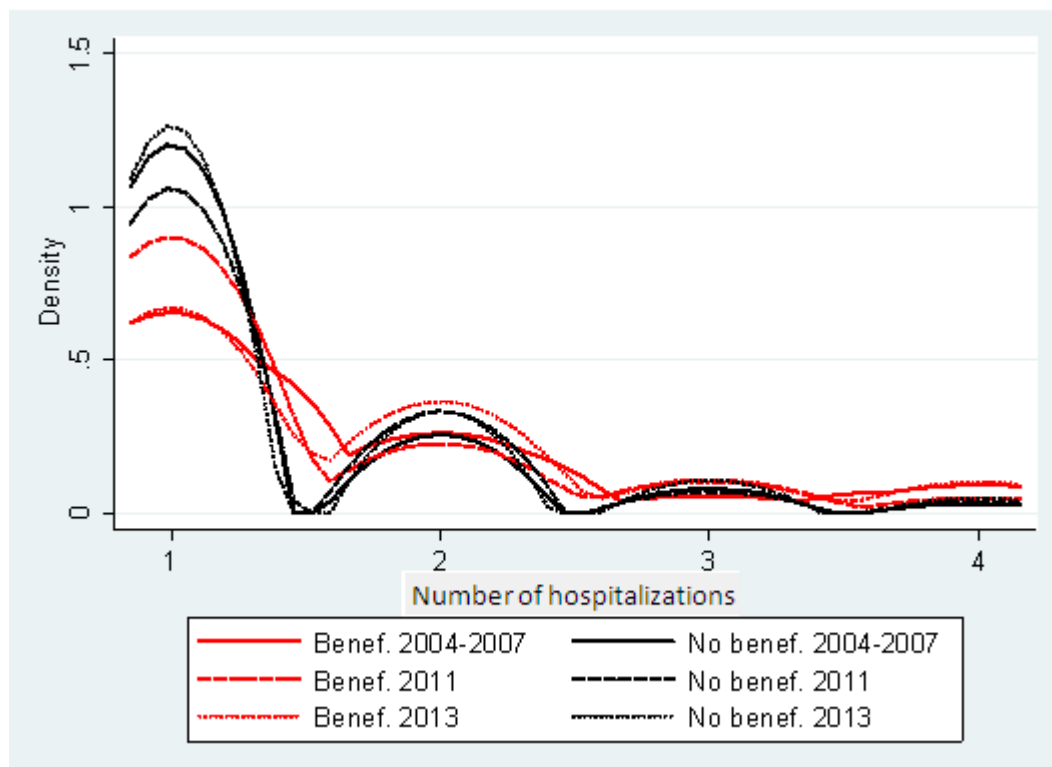
**Figure 2. Percentage of hospitalisations (extensive margin) by type of subsidy 2004-2013.**





*Note:* This figure plots the percentage of hospitalised population by three types of individuals, namely, those who do not benefit from the reform, those who receive economic benefits (caregiving allowance), and those who receive a subsidised home care service.

**Figure 3. Density function of number of hospitalisations (intensive margin) by exposure to the 2007 reform and 2012 austerity cuts**



*Note:* Density function for the number of hospital stays distinguishing between beneficiaries of LTC benefits and non-beneficiaries (not receiving either in-kind or cash benefits). Straight lines refer to pre-reform hospitalisation for both those affected (red) and those not affected (black) by the reform. Bold dotted lines refer to the post-2007 reform, and light dotted lines refer to those affected by the 2012 reform.

**Table 1. Coordination between healthcare and long-term care services**

Region of Spain	Name of the Programme or Agency	Period
Castilla y León	Plan de Atención Sociosanitario	Decree 59/2003, of 23 January Coord=1 for all waves
Castilla La Mancha	Consejería de Salud y Bienestar Social	Decree 139/2008, of 9 September Coord=1 for waves 4 and 5
Catalonia	Plan Director Sociosanitario. Programa Vida als Anys. Plan de Atención Sociosanitario 2000 Plan Director Sociosanitario 2006	Decree 242/1999, of 31 August Coord=1 for all waves
Community of Valencia	Programa Especial de la Atención Sanitaria a pacientes ancianos, a pacientes con enfermedades de larga evolución y a pacientes en situación terminal (PALET), 1995.	Coord=1 for all waves

Extremadura	Consejería de Sanidad y Dependencia	Law 1/2008, of 22 May Coord=1 for waves 4 and 5
Navarre	Plan Foral de Atención Sociosanitaria.	Agreement of the Government of Navarre of 27 June 2000 Coord=1 for all waves
Basque Country	Consejo Vasco de Atención Sociosanitaria	Coord=1 for wave 5

Source: Jiménez-Martín et al. (2011).

**Table 2. Hurdle Poisson for number ( $HN_i$ ) and length of stay of hospitalisation ( $HLS_i$ ). Logit for the first hurdle; zero truncated Poisson for the second hurdle). Marginal effects are shown for the first hurdle; estimated coefficients are shown for the second hurdle. Bootstrap with 100 repetitions. The first hurdle ( $H_i$ ) coincides for both hurdle Poisson models.**

	$CB_i$			$HB_i$			$PuB_i$		
	$H_i$	$HN_i$	$HLS_i$	$H_i$	$HN_i$	$HLS_i$	$H_i$	$HN_i$	$HLS_i$
<b>A. Baseline</b>									
SAAD	0.078*** (0.02)	0.126** (0.04)	-0.148*** (0.05)	0.052*** (0.01)	0.019 (0.09)	0.237*** (0.02)	0.086*** (0.01)	0.145*** (0.04)	-0.020 (0.03)
SAAD x POST	-0.095*** (0.02)	-0.222** (0.10)	-0.234*** (0.06)	0.014 (0.02)	-0.111** (0.04)	-0.362*** (0.04)	-0.052*** (0.02)	-0.339** (0.10)	-0.288*** (0.04)
Resid. (SAAD)	-1.009 (1.93)	24.160*** (4.34)	-17.517*** (5.53)	0.712 (0.71)	-27.375*** (7.64)	-6.014*** (2.03)	-0.674 (0.64)	13.008** (6.61)	-0.978 (1.84)
Resid. (SAAD x POST)	-0.045 (0.79)	14.005*** (3.61)	14.251*** (2.26)	1.180 (1.50)	22.485*** (5.77)	4.988 (4.28)	-0.561 (0.41)	10.093** (4.47)	6.144*** (1.21)
F-test residuals (p-value)	0.41 (0.524)	63.20 (0.000)	56.18 (0.000)	0.02 (0.890)	61.28 (0.000)	48.23 (0.000)	0.01 (0.910)	60.85 (0.000)	47.25 (0.000)
Hausman test ( $\chi^2_{45}$ ; p-value)	19.374 (0.999)	295.630 (0.000)	217.196 (0.000)	2.791 (1.000)	278.968 (0.000)	591.267 (0.000)	1.999 (1.000)	225.063 (0.000)	534.215 (0.000)
<b>B. Coordination Plans</b>									
SAAD	0.084*** (0.02)	0.576** (0.25)	-0.181*** (0.06)	0.053*** (0.01)	0.032 (0.10)	0.212*** (0.02)	0.094*** (0.01)	0.530*** (0.13)	-0.134*** (0.03)
SAAD x POST	-0.077*** (0.02)	-0.149*** (0.27)	-0.200*** (0.07)	0.016 (0.02)	-0.114** (0.05)	-0.316*** (0.04)	-0.061*** (0.02)	-0.257*** (0.16)	-0.158*** (0.04)
Coordination	0.038 (0.03)	-0.043 (0.36)	0.027 (0.08)	0.038 (0.03)	0.021 (0.35)	-0.078 (0.08)	0.044 (0.03)	0.064 (0.34)	-0.063 (0.09)
Coordination x POST	-0.095*** (0.03)	0.143 (0.33)	0.097 (0.08)	-0.089*** (0.03)	0.009 (0.32)	0.122 (0.08)	-0.090*** (0.03)	0.122 (0.31)	0.193** (0.08)
SAAD x Coord	-0.031 (0.04)	0.288*** (0.36)	0.030 (0.12)	-0.019 (0.03)	0.395 (0.26)	0.355*** (0.07)	-0.061 (0.03)	0.501* (0.27)	0.340*** (0.07)
SAAD x Coord x POST	-0.116* (0.06)	-0.148*** (0.01)	0.114 (0.18)	-0.185*** (0.02)	-0.231*** (0.05)	-0.405*** (0.17)	0.077 (0.06)	-0.363*** (0.06)	-0.450*** (0.15)
F-test for residuals	0.25 (0.615)	77.33 (0.000)	78.96 (0.000)	0.40 (0.526)	75.46 (0.000)	80.23 (0.000)	0.03 (0.871)	76.12 (0.000)	81.76 (0.000)
<b>C. Effect of budgetary cuts</b>									
SAAD	0.078*** (0.02)	-0.179 (0.18)	-0.149*** (0.05)	0.052*** (0.01)	0.014 (0.09)	0.238*** (0.02)	0.086*** (0.01)	-0.064 (0.11)	-0.020 (0.03)
SAAD x POST(2011&2013)	-0.104* (0.06)	-0.120 (0.70)	-0.145*** (0.05)	-0.028 (0.07)	-0.660 (0.97)	-0.138*** (0.21)	-0.087** (0.04)	-0.386 (0.57)	-0.140*** (0.14)
SAAD x POST(2013)	-0.288 (2.61)	0.149** (0.05)	0.252** (0.60)	0.656 (1.37)	0.336*** (0.07)	0.395** (0.29)	1.030 (1.33)	0.465*** (0.16)	0.309** (0.48)
F-test for residuals	0.59 (0.443)	87.15 (0.000)	80.91 (0.000)	0.06 (0.802)	84.87 (0.000)	87.23 (0.000)	0.00 (0.953)	83.16 (0.000)	82.65 (0.000)
N	14,766	1,705	1,705	14,766	1,705	1,705	14,766	1,705	1,705

Estimated coefficients for age, gender, marital status, level of education, self-reported health status, Katz's index, real income, real wealth, per capita public healthcare expenditure, number of public hospital beds per 100,000 inhabitants, satisfaction with public healthcare system, infection rate at hospital, year and regional dummies are not shown. \*\*\* means significance at 1% level, \*\* at 5% level, \* at 10% level.

Baseline: F-test of residuals is distributed according to F(2,14726) for the logit model, F(2,1665) for the truncated Poisson.

Coordination case: F-test of residuals is distributed according to F(4,14724) for the logit model, F(4,1663) for the truncated Poisson.

Effect of budgetary cuts: F-test of residuals is distributed according to F(3,14725) for the logit model, F(3,1664) for the truncated Poisson.

**Table 3. Estimation of the effect of the SAAD over hospital costs (Figures in euros)**

	Reduction/increase in hospital costs due to			Hospital costs*	(1)+(2) w/r
				2007	to hospital costs
	$CB_i$	$HB_i$	Total		
	(1)	(2)	(1)+(2)		
Number of hospitalisations					
Base case	-609,147,824	-120,235,688	-729,383,512	14,727,559,994	-4.95
Coordination	-160,527,318	-34,122,441	-194,649,758	7,063,627,888	-2.76
SAAD Effect 2013	239,468,171	290,442,486	529,910,657	14,727,559,994	3.60
Hospital length of stay					
Base case	-600,824,472	-314,387,318	-915,211,790	14,727,559,994	-6.21
Coordination	No signif,	-112,975,580	-173,439,479	7,063,627,888	-2.46
SAAD Effect 2013	233,564,656	71,077,192	304,641,847	14,727,559,994	2.07
Total effect					
Base case	-1,209,972,296	-434,623,006	-1,644,595,302	14,727,559,994	-11.17
Coordination	-160,527,318	-147,098,021	-368,089,237	7,063,627,888	-5.21
SAAD Effect 2013	473,032,827	361,519,678	834,552,504	14,727,559,994	5.67

Note: \*Hospital Notes: costs data refer to Spain for the base case. For the other cases, hospital costs are computed taking into account the sum of hospital costs of the affected regions.

Data on hospital costs from the Ministry of Health, Social Issues and Immigration.

<http://pestadistico.inteligenciadegestion.msssi.es/publicoSNS/comun/DefaultPublico.aspx>

## Appendix A

**Table A1. Number of days elapsed between application to the SAAD and determination of dependency level**

	# days elapsed between application to the SAAD and determination of dependency level	
	Wave 4	Wave 5
Andalusia	162	167
Aragón	160	135
Asturias	269	361
Balearic Isles	223	201
Canary Islands	322	133
Cantabria	146	120
Community of León	158	100
Community of La Mancha	250	156
Catalonia	174	115
Community of Valencia	265	219
Extremadura	250	178
Galicia	270	174
Madrid	337	227
Murcia	183	-
Navarre	214	-
Basque Country	146	101
La Rioja	91	88
Ceuta Melilla	83	-
Spain	205	155

Auditor's report on economic-financial management and the application of Law 39/2006, of 14 December, on the Promotion of Personal Autonomy and Care for Dependent People. No. 977

Auditor's report on the management and control measures adopted by the Autonomous Communities for the due application of Law 39/2006, of 14 December, on the Promotion of Personal Autonomy and Care for Dependent People. No. 1035

<http://www.tcu.es/tribunal-de-cuentas/es/>

**Table A2. Descriptive statistics for total number of hospitalisations and length of stay during the last year**

	Wave 1 & 2	Wave 4	Wave 5
Hospital length of stay			
Non-beneficiaries	10.23 (16.80)	12.38 (14.52)	10.33 (18.37)
Beneficiaries SAAD benefit			
Cash benefit ( $CB_i$ )	11.35 (19.98)	8.75 (7.07)	12.09 (13.03)
Home care ( $HB_i$ )	15.36 (24.75)	11.54 (13.19)	11.78 (14.81)
Total ( $PuB_i$ )	15.33 (24.62)	10.75 (11.81)	11.82 (14.49)
Number of hospitalisations			
Non-beneficiaries	1.70 (1.64)	1.80 (1.72)	1.60 (1.34)
Beneficiaries SAAD benefit			
Cash benefit ( $CB_i$ )	2.04 (1.88)	1.62 (1.56)	2.13 (1.72)
Home care ( $HB_i$ )	1.86 (1.67)	1.75 (1.45)	1.92 (1.12)
Total ( $PuB_i$ )	2.01 (1.49)	1.71 (1.53)	2.01 (1.82)

Source: SHARE, several years.

Total number of individuals hospitalised: 1,389 for non-beneficiaries, 185 for  $CB_t$ , 170 for  $HB_t$ , 355 for  $PuB_t$

Total number of observations: 13,512 for non-beneficiaries, 751 for  $CB_t$ , 503 for  $HB_t$ , 1,256 for  $PuB_t$

**Table A3. Descriptive statistics for explanatory variables**

	$CB_i$	$HB_i$	$PuB_i$	No SAAD benefit
Male	51.93	33.28	44.02	44.88
Age	65.13 (10.03)	77.05 (10.83)	70.30 (12.01)	67.09 (11.05)
Marital status				
Married/cohabiting	72.97	58.54	66.51	77.72
Separated/divorced	4.39	2.09	3.35	2.86
Single	13.58	7.49	10.77	5.37
Widowed	7.59	31.01	18.10	12.95
Missing marital status	1.46	0.87	1.28	1.10
Education				
No schooling	25.97	31.71	28.31	18.62
Elementary	52.46	42.16	48.72	53.97
High School	6.79	5.75	6.22	9.31
College	14.78	20.38	16.75	18.10
Self-reported health				
Excellent	0.80	0.35	0.64	3.36
Good	3.33	2.26	2.87	13.89
Fair	17.44	13.59	16.03	35.82
Poor	78.43	83.80	80.46	46.93
Dependency degree				
Katz0	69.77	49.83	62.04	89.25
Katz1	13.32	21.60	16.91	6.26
Katz2	7.46	11.15	9.09	2.05
Katz3	9.45	17.42	11.96	2.44
Real wealth (€2011)	219,620 (592,726)	267,752 (979,304)	243,281 (799,507)	299,106 (740,467)
Real income (€2011)	19,549 (19,325)	16,519 (18,262)	18,399.2 (19,221)	21,792 (26,805)
N	751	503	1,256	13,512

Standard deviation between brackets.

**Table A4. Regional variables**

	2004	2006	2007	2011	2013
Infection rate at hospital <sup>c</sup>	1.16	1.19	1.18	1.26	1.32
Number of public hospital beds per 1,000 inhabitants <sup>c</sup>	2.22	2.15	2.30	2.42	2.53
Degree of satisfaction with public healthcare <sup>c</sup> (1: minimum satisfaction; 10: maximum satisfaction)	6.25	5.62	6.36	6.57	6.31
Public health expenditure per capita (€2011) <sup>c</sup>	1,152	1,333	1,390	1,392	1,248

<sup>a</sup> Regional Accounts (National Institute of Statistics)

<sup>b</sup> Active Population Survey (National Institute of Statistics)

<sup>c</sup> Indicators of the National Health System (Ministry of Health, Social Services and Equality)

**Table A5. Voting percentages to the socialist party in regional elections.**

	Wave 1 2004	Wave 2 2006	Wave 2 2007	Wave 4 2011	Wave 5 2013
Andalusia	51.07	51.07	51.07	48.41	39.52
Aragón	37.91	37.91	41.03	41.03	21.41
Asturias	40.30	40.30	42.04	42.04	26.45
Balearic Isles	24.60	24.60	31.75	31.75	18.94
Canary Islands	25.50	25.50	34.72	34.72	19.96
Cantabria	29.91	29.91	24.33	24.33	14.01
Community of León	36.74	36.74	37.49	37.49	37.77
Community of La Mancha	57.81	57.81	51.92	51.92	36.11
Catalonia	31.16	31.16	27.38	18.32	14.43
Community of Valencia	46.92	46.92	34.49	34.49	20.30
Extremadura	51.62	51.62	52.90	52.90	41.50
Galicia	22.20	33.64	33.64	31.02	20.61
Madrid	33.46	33.46	33.47	33.47	25.44
Murcia	34.03	34.03	31.81	31.81	23.96
Navarre	21.14	21.14	22.40	22.40	13.43
Basque Country	17.90	22.68	22.68	30.70	19.14
La Rioja	38.29	38.29	40.47	40.47	26.70
Ceuta	8.76	8.76	8.71	8.71	11.70
Melilla	11.92	11.92	18.49	18.49	8.44

Source: author's own work using <http://www.congreso.es/consti/elecciones/autonomicas/>

Aragón, Asturias, Balearic Isles, Canary Islands, Cantabria, Castilla León, Castilla La Mancha, Community of Valencia, Extremadura, Madrid, Murcia, Navarre, La Rioja, Ceuta and Melilla:

- Results from regional elections May 25<sup>th</sup> 2003 have been applied to waves 1 and 2.
- Results from regional elections May 27<sup>th</sup> 2007 have been applied to wave 4.
- Results from regional elections May 22<sup>nd</sup> 2011 have been applied to wave 5.

Andalusia:

- Results from regional elections March 14<sup>th</sup> 2004 have been applied to waves 1 and 2.
- Results from regional elections March 9<sup>th</sup> 2008 have been applied to wave 4.
- Results from regional election March 25<sup>th</sup> 2012 have been applied to wave 5.

Catalonia

- Results from regional elections November 16<sup>th</sup> 2003 have been applied to wave 1 and wave 2 (only 2006).
- Results from regional elections November 1<sup>st</sup> 2006 have been applied to wave 2 (only 2007).
- Results from regional elections November 28<sup>th</sup> 2010 have been applied to wave 1
- Results from regional elections November 25<sup>th</sup> 2012 have been applied to wave 5.

Basque Country

- Results from May 13<sup>th</sup> 2001 have been applied to wave 1.
- Results from regional elections April 17<sup>th</sup> 2005 have been applied to wave 2.
- Results from regional elections March 1<sup>st</sup> 2009 have been applied to wave 4.
- Results from regional elections October 21<sup>st</sup> 2012 have been applied to wave 5.

Galicia

- Results from October 21<sup>st</sup> 2001 have been applied to wave 1.
- Results from regional elections June 19<sup>th</sup> 2005 have been applied to wave 2.
- Results from regional elections March 1<sup>st</sup> 2009 have been applied to wave 4.
- Results from regional elections October 21<sup>st</sup> 2012 have been applied to wave 5



**Table A6. Coverage index of public home care**

	2000	2002
Andalusia	1.79	2.04
Aragón	2.52	2.44
Asturias	1.51	1.79
Balearic Isles	2.28	2.78
Canary Islands	1.9	1.88
Cantabria	1.51	1.55
Community of León	2.54	2.48
Community of La Mancha	2.13	2.55
Catalonia	1.23	1.3
Community of Valencia	0.78	2.16
Extremadura	4.69	4.86
Galicia	1.16	1.35
Madrid	1.98	1.89
Murcia	1.44	1.60
Navarre	3.33	3.02
Basque Country	2.3	2.85
Rioja	2.76	2.84
Ceuta	2.79	1.76
Melilla	1.82	2.07

Coverage index: ratio of number of home care beneficiaries divided by population aged 65 and over and multiplied by 100.

Source: "Las personas mayores en España" (IMSERSO, 2000, 2002)

**Table A7. First-stage regression**

	<i>CB</i>	<i>CB*POST</i>	<i>HB</i>	<i>HB*POST</i>	<i>PuB</i>	<i>PuB*POST</i>
Socialist support (%)	-0.045*** (0.01)	-0.057*** (0.01)	0.088** (0.03)	0.097*** (0.01)	0.037* (0.01)	0.038** (0.01)
Socialist support (%)*POST	-0.028* (0.01)	-0.047*** (0.01)	0.128** (0.05)	0.084** (0.02)	0.095*** (0.02)	0.040*** (0.01)
Home Care (2000)	-0.016** (0.00)	-0.006* (0.00)	0.025* (0.01)	0.031** (0.01)	0.008 (0.01)	0.020** (0.00)
Home Care (2002)	-0.035** (0.01)	-0.044** (0.02)	0.051* (0.03)	0.072*** (0.02)	0.018** (0.00)	0.028** (0.00)
Fraction women at home	0.044** (0.01)	0.046*** (0.01)	-0.023* (0.01)	-0.018* (0.01)	-0.019* (0.00)	-0.026* (0.00)
Rural area	0.022** (0.00)	0.021** (0.00)	-0.016* (0.00)	-0.014* (0.00)	-0.005* (0.00)	-0.005* (0.00)
F-test instrumental variables	234.56	154.07	160.41	150.46	149.95	139.80
F(6,14722)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	14,766	14,766	14,766	14,766	14,766	14,766

Estimated coefficients for age, gender, marital status, level of education, self-reported health status, Katz's index, real income, real wealth, year and regional dummies are not shown. \*\*\* means significance at 1% level, \*\* at 5% level, \* at 10% level.

**Table A8. Hurdle Poisson (logit for the first hurdle; zero-truncated Poisson for the second hurdle). Base case. Marginal effects are shown for the first hurdle; estimated coefficients are shown for the second hurdle. Bootstrap with 100 repetitions.**

	$H_i$	$CB_i$		$HB_i$			$PuB_i$		
		$HN_i$	$HLS_i$	$H_i$	$HN_i$	$HLS_i$	$H_i$	$HN_i$	$HLS_i$
Male	0.056 (0.04)	1.341*** (0.40)	0.321*** (0.11)	0.050*** (0.02)	0.454*** (0.16)	0.035 (0.04)	0.045*** (0.01)	0.506*** (0.12)	0.025 (0.03)
Age	-0.001 (0.00)	-0.092*** (0.04)	-0.020** (0.01)	-0.002 (0.00)	-0.031 (0.03)	0.009 (0.01)	0.001*** (0.00)	-0.004 (0.00)	0.002** (0.00)
Married/cohabiting	-0.006 (0.01)	0.082 (0.12)	0.282*** (0.03)	-0.006 (0.01)	-0.242** (0.11)	0.151*** (0.03)	-0.015 (0.01)	-0.303*** (0.11)	0.194*** (0.03)
Separated/divorced	-0.001 (0.03)	0.292 (0.32)	0.017 (0.09)	-0.034 (0.03)	-0.509 (0.33)	-0.052 (0.09)	0.006 (0.03)	-0.089 (0.30)	-0.169* (0.09)
Single	0.059	2.678**	0.861***	-0.013	-0.293*	0.092**	0.049	0.547	-0.008

	(0.11)	(1.14)	(0.31)	(0.02)	(0.17)	(0.05)	(0.05)	(0.54)	(0.15)
Missing marital status	-0.083	-2.491**	-0.283	-0.048	-0.377	0.422*	-0.067	-0.837	0.383*
	(0.10)	(1.25)	(0.31)	(0.06)	(0.96)	(0.22)	(0.07)	(0.99)	(0.23)
No schooling	-0.022**	0.141	0.111***	-0.018*	0.160	0.098***	-0.021*	0.148	0.115***
	(0.01)	(0.12)	(0.03)	(0.01)	(0.12)	(0.03)	(0.01)	(0.12)	(0.03)
Elementary education	-0.027	-0.528**	-0.111*	-0.006	0.081	0.047	-0.026**	-0.150	0.070*
	(0.02)	(0.22)	(0.06)	(0.01)	(0.15)	(0.04)	(0.01)	(0.13)	(0.04)
Secondary education	-0.038	-1.567***	-0.424***	-0.019	-0.364*	-0.067	-0.029	-0.581**	-0.033
	(0.05)	(0.51)	(0.14)	(0.02)	(0.20)	(0.05)	(0.02)	(0.24)	(0.07)
Health status: excellent	-0.147***	-1.176***	-1.094***	-0.171***	-1.192***	-1.057***	-0.144***	-1.159***	-1.093***
	(0.03)	(0.33)	(0.16)	(0.03)	(0.33)	(0.16)	(0.03)	(0.33)	(0.16)
Health status: good	-0.151***	-2.001**	-0.843***	-0.157***	-2.029**	-0.827***	-0.148***	-2.023**	-0.854***
	(0.01)	(0.99)	(0.07)	(0.01)	(0.99)	(0.07)	(0.01)	(0.99)	(0.07)
Health status: fair	-0.094***	-0.336***	-0.350***	-0.080***	-0.346***	-0.337***	-0.092***	-0.335***	-0.355***
	(0.01)	(0.10)	(0.03)	(0.01)	(0.10)	(0.03)	(0.01)	(0.10)	(0.03)
Dependency: Katz1	0.137	3.011***	1.159***	-0.040	-0.365	0.902***	0.193*	2.164*	0.287
	(0.11)	(1.13)	(0.31)	(0.10)	(1.10)	(0.30)	(0.12)	(1.20)	(0.33)
Dependency: Katz2	0.233	4.349***	0.773	-0.081	-0.957	0.696	0.354*	3.617	-0.532
	(0.16)	(1.71)	(0.47)	(0.19)	(1.99)	(0.53)	(0.21)	(2.22)	(0.62)
Dependency: Katz3	0.223	5.249***	1.719***	-0.159	-1.330	1.405*	0.338	4.005*	0.176
	(0.18)		(0.53)	(0.25)	(0.85)	(0.72)	(0.21)	(1.95)	(0.62)
Real wealth (€1,000,000 )	-0.001	-0.438***	-0.018	0.009	-0.157	0.041**	-0.003	-0.306***	0.059***
	(0.01)	(0.12)	(0.02)	(0.01)	(0.11)	(0.02)	(0.01)	(0.10)	(0.02)
Real income (€1,000 €)	-0.214	12.440***	-7.731***	0.130	-2.212	-6.251***	-0.246	-6.888**	-5.040***
	(0.36)	(3.93)	(1.12)	(0.18)	(2.24)	(0.66)	(0.26)	(2.90)	(0.86)
Public healthcare expenditure. (1,000€)	-0.083	-2.025**	0.572***	-0.076	-1.886**	0.328***	-0.089	-2.108**	0.484***
	(0.08)	(0.91)	(0.22)	(0.08)	(0.89)	(0.22)	(0.08)	(0.92)	(0.22)
Infection rate	0.011	-0.997**	-0.387***	0.024	-0.918**	-0.440***	0.009	-1.087**	-0.428***
	(0.04)	(0.43)	(0.12)	(0.04)	(0.46)	(0.13)	(0.04)	(0.44)	(0.12)
Satisfaction with public healthcare system	0.001	0.004	-0.014***	0.001	0.002	-0.015***	0.001	0.004	-0.015***
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Public beds (1,000 inhabitants)	0.005	-0.045	0.021	0.000	-0.020	0.007	0.007	0.023	0.028
	(0.02)	(0.18)	(0.05)	(0.02)	(0.18)	(0.05)	(0.02)	(0.18)	(0.05)
Constant		11.302***	1.294		4.892**	-0.413		4.851***	-0.493
		(3.14)	(0.85)		(1.98)	(0.50)		(1.50)	(0.39)
N	14,766	1,705	1,705	14,766	1,705	1,705	14,766	1,705	1,705

Year and regional dummies are not shown. \*\*\* means significance at 1% level, \*\* at 5% level, \* at 10% level.  
F-test of residuals is distributed according to F(2,14726) for the logit model, F(2,1665)