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Differences in the Use of Formal and Informal Care Services among Older Adults after the Implementation of the Dependency Act in Spain*

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Abstract

Using data from the Survey of Health, Ageing and Retirement in Europe (SHARE), the aim of this study is to infer the impact that the Spanish System for Personal Autonomy and Dependency might have on formal and informal care use through the performance of logit random-effects regression models by applying a differences-in-differences approach. Dependency levels were created depending on the limitations on the performance of instrumental and basic activities of daily living. Formal care consisted on home help and nursing home care, whereas informal care referred to the reception of care by relatives or friends, from inside or outside the household. Additional covariates, such as socioeconomic characteristics and health status variables, were included.

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Our results show that the negative dependency effects on informal care reception are intensified after the implementation of the Dependency Act, as the interaction between being a moderate dependent and wave 4 (year 2010) is significant and positive. In case of formal care, the joint assessment of the implementation of the DA and the different dependency levels did not report a significant effect, although they were significantly associated with formal care use independently. Bearing in mind the demographic ageing, our results highlight the need for the efficient planification of long-term care systems and social support services, especially for informal caregivers, in order to satisfy the care demands and reduce the caregiving burden.

Keywords: Dependency, Long-term care, Formal care, Informal care, Spain.

JEL Classification: I14, 138, J14.

1. Introduction

Many countries are facing a consistent growth in the number and proportion of elderly people in their populations. This significant social transformation is likely to have implications for the health and social protection systems, extended to virtually all sectors of society (Christensen *et al*., 2009; European Commission, 2017). Moreover, population aging in developed countries has created new challenges to improve the well-being of individuals at different age cohorts. This issue is especially significant for European countries, where aging societies have worse health and less socio-economic resources (Cantarero *et al*., 2018). Population ageing increases care costs and long-term care expenditures (Fernández *et al*., 2009), being Long-Term Care (LTC) defined as a range of services and assistance required by people with a reduced degree of functional capacity, physical or cognitive, and who depend for an extended time period on help with basic activities of daily living or with need of some permanent nursing care (Colombo *et al*., 2011).

Public spending on LTC in the Organization for Economic Cooperation and Development (OECD) was, on average, 1.7% of GDP in 2017, although huge differences exist between countries (OECD Health Statistics, 2018). For example, the highest spender was the Netherlands, whose average expenditure on LTC was 3.7%, followed by Norway (3.3%) and Sweden (3.2%). On the other hand, the expenditure on LTC in Spain represented a 0.7%, with some countries such as Hungary or Estonia allocating 0.2% of their GDP. Moreover, those numbers are estimated to more than double by 2050 (Colombo and Mercier, 2012; OECD Health Statistics, 2018). The expected growth in LTC expenditures as a share of GDP and of public and private spending can be explained by the increasing demand for LTC services due to the population ageing, the greater probability of survival to older age, and the decline in the supply of informal caregiving. The latter is closely related to some major social changes, such as new family structures, declining household size, increased prevalence of unstable partner relationships and lower marriage rates, greater geographical mobility that may hinder children in taking care of dependent parents, or higher female labour market participation (Pezzin and Steinberg Schone, 1999; Costa-Font *et al*., 2015).

Furthermore, the interrelationship between the different components of long-term care (mainly formal and informal care) have been widely studied in the literature, with some

authors traditionally concluding that informal and formal care are substitutes (Cantor, 1979; Greene, 1983), depending on the disease and the degree of disability of the care receiver, as well as on the services provided (Greene, 1983; Chapell and Blandford, 1991; Muramatsu *et al*., 2007; Viitanen, 2007; Bonsang, 2009; Jiménez-Martín and Prieto, 2012). Furthermore, variation with respect to the use of long-term care is quite large within European countries, not only due to population distribution and population ageing, but also due to the design of welfare programs in Europe, and the existing programs and the availability of support to caregivers. For example, in Mediterranean countries, as Spain is, where informal care tradition is common, the benefits and support that informal caregivers receive for their services are quite low. On the other hand, in Northern European countries, informal care is not so extended, but social benefits and support are higher. Finally, in Central Europe, caregivers are provided with widely spread social support programs, benefits that vary within and across regions, but informal care is not so relevant (Kraus *et al*., 2010; Mot and Biró, 2012).

Bearing in mind the aforementioned demographic changes as well as the interchangeably use of both formal and informal care services, the relevance of long-term care services for ensuring the future sustainability of health and social services, different policy options have been proposed, although they can be synthesized into two groups: private sector solutions or universal systems that cover the entire population at significantly higher costs (Saltman *et al*., 2006). In the case of Spain at the end of 2006, a new System for Promotion of Personal Autonomy and Assistance for Persons in a Situation of Dependency was released in Spain through the approval of the Act 39/2006 of 14th December (the Dependency Act). The Dependency Act (DA) recognised the universal entitlement of Spanish citizens to social care services according to their degree of dependency. One of the aims of the DA was to reduce the burden of family members who undertake the role of primary caregiver, which has traditionally been organized within Spanish families, mainly provided by women, being sometimes complemented by formal care (Rogero-García, 2010; Spijker and Zueras, 2020). The main caregiver could additionally be benefited from being registered within the Social Security System, recording their employment status as non-professional carers. Furthermore, the new system aimed to guarantee an adequate amount of resources and services to satisfy the growing demand and use of long-term care (PERFAR, 2020). Still, public bodies were only limited to provide LTC services only in case household income was not enough to cover such needs and if the older adult in need for care had a high grade of functional limitations (Gutiérrez *et al*., 2010).

Nevertheless, the recent economic crisis added more uncertainty to several dimensions of the system process, mainly due to existing inequality in access to LTC services between regions. Several modifications and improvements need to be made on the state of the Spanish Dependency System, ranging from the governance quality and transparency to a more intensive coordination between healthcare and social services, as well as greater recipients' engagement in decision-making (Peña-Longobardo *et al*., 2016).

The aim of this study is to assess the impact that the implementation of the Spanish System for Personal Autonomy and Dependency might have had in the use of formal and informal care, which will be defined later in this work, attending to several characteristics of the Spanish population.

The structure of this study is as follows. In Section 2, we briefly describe the 2006 Dependency Act implementation and current situation. Then, in Section 3, we provide a description of the dataset used as well as the description of the selected variables that are part of our analysis. Moreover, the econometric model is set within the context of our data. Empirical results are presented in Section 4, which will be discussed and compared with the existing literature in Section 5 that also concludes.

2. The 2006 Dependency Act

The System for Promotion of Personal Autonomy and Assistance for Persons in Situation of Dependency (SAAD) entered as the fourth pillar of Spain's Welfare State (García-Armesto *et al*., 2010) after the approval of the Act 39/2006 on the 14th December from 2006 (Dependency Act or DA) (BOE, 2006). The DA granted universal entitlement to social services according to the degree of dependency of the individual, supposing a deep change in the organization of LTC in Spain.

Three levels of dependency were defined by the DA (mild, moderate, severe) with dependents classified according to an official scale (BOE, 2007a; 2011), which consisted of 47 tasks later grouped into ten activities of daily living (feeding, control of physical needs, toileting, other physical care, dressing, maintaining one's health, mobility, moving inside and outside the household, and being able to do housework). According to the score obtained in those 47 domains, the severity of the dependency was classified as: not eligible (0 - 24 points); mild level 1 (25 - 39 points) and level 2 (40 - 49 points); moderate level 1 (50 - 64 points) and level 2 (65 - 74 points); and severe level 1 (75 - 89 points) and level 2 (90 - 100 points). Although the classification of individuals was established from the beginning of the implementation of the DA in 2006, the Royal Decree 727/2007 began to determine the intensity of services provided to the beneficiary according to the dependency level (BOE, 2007b). However, other new regulations reduced the intensity of in-kind and cash benefits (BOE, 2012).

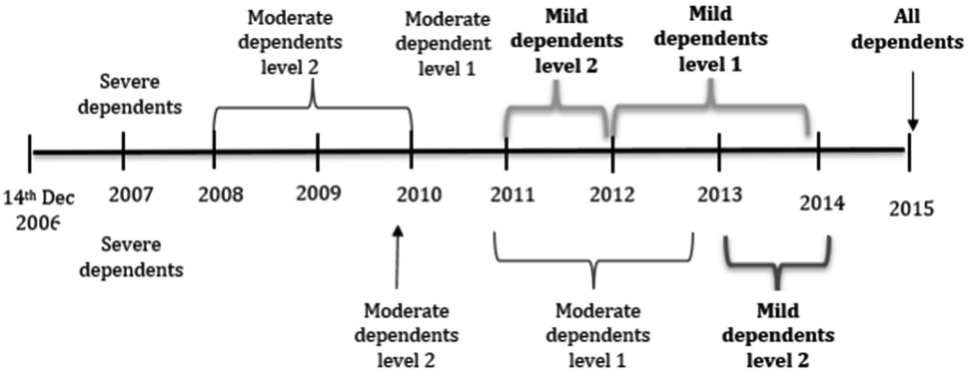
At the end of the year 2013, 1,644,284 applications had been received. From these, around 60% (944,345 requests) were eligible, but only 753,842 were actually receiving their benefits by December 2013 (BOE, 2018). Moreover, despite the SAAD's design to provide universal coverage to dependents, users still share the associated costs through co-payments, reaching one third of the total financing contribution towards the SAAD (Ministry of Labour and Social Services, 2006) and with large differences in the magnitude of the copayments across regions and the economic status of the beneficiaries (Ministry of Labour and Social Services, 2005). In fact, when the SAAD was fully active in 2015, the financial contributions would be supported by the autonomous communities by a 42.6%, 23.7% by the central government and 33.7% through co-payments afforded by the individuals who benefited from the DA (Consejo Territorial del SAAD, 2012).

However, in spite of the initial forecasts, the actual implementation of the DA was altered, as Figure 1 shows, by several issues (Peña-Longobardo *et al*., 2016): firstly, three Roy-

al Decrees delayed the execution of the act in three-four years approximately, even blocking the requests from potential eligible dependents.

Also, the economic crisis led to huge cuts in national budgets and a decrease in services intensity reducing, for example, the number of hours of home helping support. Finally, what was called the "dependency limbo", which referred to people who were announced to be granted with the benefits provided according to the DA, but finally received none. According to Figure 1, mild dependents level 2 suffered from a delay of two years, approximately, as well as mild dependents level 1, who entered the system in July 2015, but the time during which all mild dependents will be covered by the SAAD was not established.

Figure 1
IMPLEMENTATION OF THE DEPENDENCY ACT, COMPARING THE INITIAL AND THE ACTUAL TIMING



Note: Over the line: initial planning on the timing of the implementation of the Dependency Act; under the line: actual implementation of the Dependency Act.

Source: Our own modified from Peña-Longobardo *et al*., 2016.

3. Data and methods

3.1. Sample data

The data used for the current analyses comes from the Survey of Health, Ageing and Retirement in Europe (SHARE). It is a longitudinal survey with information on more than 120,000 individuals aged 50 years old and above from 27 European countries plus Israel. SHARE consists of twenty different modules which collect information on household characteristics (number of people living the household, number of children), socio demographic variables (age, gender, marital and employment status, household income), health status, lifestyle factor (smoking, drinking, physical exercise), cognitive impairment, mental health, social support and use of healthcare and non-healthcare resources.

The period of analysis will cover the years 2004 (wave 1), 2006/07 (wave 2), 2010 (wave 4), 2013 (wave 5), 2015 (wave 6) and 2017 (wave 7)[1].

Given the aim of the study, we select the Spanish subjects with a minimum follow-up of three waves, which should be: the time before the DA (wave 1, year 2004), in the year of the introduction (wave 2, year 2006/07) and after the DA (wave 4, year 2010; wave 5, year 2013; wave 6, year 2015; or wave 7, year 2017). Hence, the original sample size of the Spanish population in the SHARE database was 23,977 observations. However, when we selected the observations with information on at least three waves (being two of them wave 1 and 2 and then, at least, wave 4, 5, 6 or 7), the sample was further reduced to 5,809 observations. Furthermore, after selecting the individuals with non-missing values in any of the variables considered in our analysis, our sample further decreased to 4,414 observations.

3.2. Selection of variables

Dependent variables

Three dependent variables comprise the outcomes of the current study: formal care and informal care use, as well as the reception of any type of long-term care service. In case of the former, information will be taken from the questionnaire on whether the individual has received professional help at home, as well as nursing home use, either permanent or temporarily, in the previous twelve months. Professional help at home can be identified as the questionnaire contains information on whether the individual has received professional help at home with different matters, such as personal care, domestic tasks, meals-on-wheels and other activities. Additionally, information on nursing home care, which was defined as *institutions sheltering older persons who need assistance in activities of daily living, in an environment where they can receive nursing care, for short or long stays*, was also included as formal care reception. However, it should be noted that the question related to home care was excluded in the questionnaire of Wave 4. Hence, Wave 4 was excluded from the statistical analysis of formal care, although information on nursing home was indeed reported within the descriptive statistics.

For informal care, SHARE allows for the identification of whether a non-professional caregiver, from inside or outside the household, has helped the survey respondent due to any limitation in the activities of daily living during the previous twelve months.

Lastly, a binary variable was generated based on the either use of any type of long-term care, which takes value 1 if the respondent received formal or informal care or both and 0 if none.

Independent variables

As Table A1, Supplementary material, shows, the definition of "dependency" as an older adult in need for personal care in the Dependency Act was based on the limitations in the basic and the instrumental activities of daily living. SHARE does contain responses to the Katz Activities of Daily Living (ADL) Index (Katz *et al.*, 1970; Katz, 1983). This index, usually referred to as the Katz ADL, evaluates functional status as a measurement of the person's ability to carry out six activities of daily living independently. These are bathing,

dressing, toileting, transferring, continence and feeding. Moreover, SHARE also includes information on the number of limitations in the Instrumental Activities of Daily Living (IADL). This scale, usually referred to as the Lawton's IADL scale, evaluates the individual's ability to perform eight instrumental activities of daily living (Lawton and Brody, 1969): telephone use, shopping, cooking, housekeeping, laundry, transportation, preparation of own medication and financing. Considering the weight assigned to it and the different categories within each of them, we generated our dependency score, given the availability of questions in SHARE.

According to the scored obtained following the weights and points in Table A1, Appendix, which are derived from the Dependency Act classification according to the individual's limitations in both ADLs and iADLs, the severity of the functional limitation dependency was classified as: not eligible (0 - 24 points); mild (25 - 49 points); moderate (50 - 74 points); and severe (75 - 100 points).

Other independent variables

Other variables were also considered as need or predisposing factors towards the demand of formal and/or informal care. These were age, gender, level of education (no education, low, medium and high according to ISCED-97 codes), marital and employment status, household income, number of children and grandchildren, whether any children live in the household, and distance of these children to the respondent's household and body mass index categories (underweight, normal weight, overweight and obesity according to the calculation of the weight in kilograms divided by the square of height in metres).

With respect to health status, different variables entered the analysis. First, the self-assessed health status has widely been used in the health economics literature (Hernández-Quevedo *et al*., 2005; Miilunpalo *et al*., 1997). Respondents are then asked to rate their health status, from excellent to poor. We also consider the number of chronic conditions that a person has ever been diagnosed or told by a doctor to suffer from. Since mental health diseases are not included within the number of chronic conditions, we also included a dummy variable for depression, according to the EUROD scale for depression.

Moreover, a detailed description of the variables included in the analysis can be found in Table A2, in Appendix.

3.3. Statistical analyses

In this project, and in order to evaluate the effect of the Dependency Act, we applied a Differences in Differences (DID) approach. It aims to focus on the differential effect of a treatment on the "treatment group" versus the "control group" at two different periods: before "treatment", which would be the implementation of the SAAD, and after "treatment". We will test if there is an incremental effect of the use of formal and informal care as derived from the introduction of the corresponding law. DID is a useful quasi-experimental design based on treatment and control groups to estimate causal effects (Heij *et al*., 2004; Rabe-Hesketh

and Skrondal, 2008). It is usually used to estimate the effect of specific treatments in a broad sense: laws, policies, programs, etc. In fact, it allows study changes in outcomes over time between people that participate in a program (the intervention group) and population that is not (the control group).

Hence, let the variable w be a binary treatment indicator, where $w = 1$ denotes treatment and $w = 0$ otherwise. Thus, the average treatment effect on the treated group can be defined as follows (Rosenbaum and Rubin, 1983):

$$ATE_1 = E(Y_1 - Y_0|w = 1) = E(y_1|w = 1) - E(Y_0|w = 1) \quad (1)$$

where Y_0 and Y_1 represent formal (or informal) care for individuals who do not use or do use, respectively, formal (or informal) care services.

DID assumes that, in absence of treatment, the unobserved differences between treatment and control groups are the same overtime. Sometimes, the control and the treatments groups are not entirely comparable because they differ in some unobservable characteristics related to the outcomes (Wooldridge, 2009). When we have data prior to the start of the program evaluation and data when the program was over, then we can compare the treatment group before and after the program but to avoid problems of time series, such as the tendency, the differences-in-differences method is the most appropriate one (Arellano, 2006). Hence, DID is a useful technique to use when randomization on the individual level is not possible, as it is the case in our analysis. DID requires data from the pre- and post-intervention time periods. Thus, controlling for the aforementioned covariates, we can infer two main fixed effects: the first one for the new Dependency Act (λ) and another one for the use of formal care or informal care according to the dependency level (δ), as well as the interaction between them (γ). The regression model would then be the following one:

$$FC_{it} = \alpha + \delta dependency_{it} + \lambda t_i + \gamma_i(dependency * t) + \beta' X_{it} + \epsilon_{it} \quad (2)$$

where FC_{it} denotes the use of formal care services by individual i in time t; $dependency_{it}$ represents a categorical variable for the different levels of dependency of individual i in time t; t_i is the time point; and X_{it} denotes a set of individual characteristics. ϵ_{it} is the error term.

Model 1, thus, included dummy time variables, a categorical variable for the different dependency levels and the interaction between the time dummies and dependency levels. The set of sociodemographic characteristics referred to age, gender, education and marital status. In order to correct for the effect that other covariates might pose, Model 2 added to Model 1 socioeconomic status, in which we included employment status and household income. Then, in Model 3, we additionally controlled for other living conditions (i.e. living in a rural area and the number of children or grandchildren and whether any of these children live within the household). Finally, in model 4, variables related to the health status (self-assessed health status, number of chronic conditions and depression) and the healthy lifestyles (body mass index categories) are added to model 3. Hence, the fourth regression model would have the following form:

$$FC_{it} = \alpha + \delta dependency_{it} + \lambda t_i + \gamma_i(dependency * t) + \beta' X_{it} + \theta' SE_{it} + \rho' livingcond_{it} + \tau' healthstat_{it} + \varphi' healthylife_{it} + \epsilon_{it} \quad (3)$$

where SE_{it} denotes the vector of socioeconomic conditions of individual i in time t (labour status and household income); $livingcond_{it}$ represents the set which refer to the living conditions, such as living in a rural area or having children or grandchildren close by; $healthstat_{it}$ is the set of health status related variables; and $healthylife_{it}$, which includes the body mass index categories.

The same procedure was followed for our second and third outcomes of interest, to receive informal care, either within or outside the household, as well as the reception of any type of long-term care service.

4. Results

4.1. Summary statistics

Table 1 shows the summary statistics of the sample for the set of covariates included in the analysis by year. The proportion of people using formal care was lower in the year 2006/07 (5.69% of the sample), when the DA was announced, than in the year 2004 (5.92%), but the proportion of formal care receivers increased in the following years after the implementation of the DA[2], which even reached more than 10% of the sample by the year 2015. However, the increase in the use of formal care services between years seems to be driven by homecare rather than nursing home care. On the other hand, the proportion of people receiving informal care (inside or outside the household) increased between years, attaining almost one quarter of the sample by the year 2013, but decreased in 2015 (19% of the sample declared to use some type of informal care) and increased in the year 2017 up to 23%. The same trend was followed for both types of informal care, inside and outside the household.

Table 1
DESCRIPTIVE STATISTICS BY YEAR IN SPAIN, N=3,905

Variables	Wave 1, year 2004 (N=961)	Wave 2, year 2006/07 (N=69949)	Wave 4(1), year 2010 (N=816)	Wave 5, year 2013 (N=769)	Wave 6, year 2015 (N=410)	Wave 7, year 2017 (N=509)	Comparison of means p-value
Formal care	5.92	5.69	0.84	8.89	10.51	8.79	0.000***
Nursing home	0.31	0.21	0.84	0.51	0.23	0.43	0.183
Homecare	5.62	5.48	—	8.77	10.28	8.73	0.000***
Informal care	16.14	18.82	20.50	23.51	18.93	22.83	0.004***
Informal care from outside the household	11.95	12.72	15.59	16.90	15.19	17.04	0.008***

(Continued)

Variables	Wave 1, year 2004 (N=961)	Wave 2, year 2006/07 (N=70949)	Wave 4[(1)], year 2010 (N=816)	Wave 5, year 2013 (N=769)	Wave 6, year 2015 (N=410)	Wave 7, year 2017 (N=509)	Comparison of means p-value
Informal care from inside the household	5.31	7.86	8.27	10.42	6.78	8.68	0.003***
Age categories							
Age 50 to 65	51.38	44.47	28.90	25.79	15.19	13.89	0.000***
Age 65 to 80	43.21	46.23	52.88	53.11	58.18	59.72	0.000***
Age 80+	5.41	9.31	18.22	21.09	26.63	26.39	0.000***
Gender: female	58.02	58.32	57.79	59.72	78.51	69.31	0.000***
Education							
No education	22.15	21.6	22.44	19.69	21.88	22.84	0.029**
Low education	64.21	64.69	63.81	65.47	67.53	64.23	0.782
Medium education	6.46	6.65	6.51	7.42	6.12	6.53	0.000**
High education	7.18	7.06	7.24	7.42	4.47	6.4	0.187
Marital status							
Married	84.16	82.22	77.11	74.09	66.32	63.92	0.000***
Registered partnership	0.31	0.21	0.24	0.25	0.23	0.22	0.041**
Separated	1.74	1.65	1.32	1.52	0.70	0.78	0.000***
Never married	0.92	1.03	0.84	1.14	0.71	0.79	0.038**
Divorced	1.33	1.45	1.31	2.03	2.34	2.53	0.042**
Widowed	11.54	13.44	19.18	20.97	29.91	31.76	0.000***
Current job situation							
Retired	34.91	40.64	50.36	54.76	49.06	53.27	0.000***
Employed or self-employed	19.82	16.75	10.79	8.39	4.44	7.02	0.000***
Unemployed	4.09	2.17	2.40	2.80	1.17	2.23	0.008***
Permanently sick or disabled	4.10	4.14	3.48	3.30	3.74	4.11	0.062*
Homemaker	37.08	36.30	32.97	30.75	41.59	33.37	0.000***
Household net income (SD)	24,331.03 (26,155.39)	20,617.95 (29,514.6)	20,664.69 (27,475.82)	17,630.19 (12,944.29)	15,238.37 (10,137.66)	16,083.22 (10,872.63)	0.000***
Living in a rural area	46.52	48.96	49.18	49.25	54.02	51.42	0.003**
Number of children (SD)	2.91 (1.52)	2.91 (1.52)	2.90 (1.47)	2.87 (1.45)	2.80 (1.46)	2.83 (1.42)	0.591
Number of grand-children (SD)	2.76 (3.27)	3.08 (3.51)	3.56 (3.28)	3.62 (3.39)	3.86 (3.47)	4.12 (3.58)	0.000***
Children living in household	59.35	51.29	43.88	40.79	37.15	35.21	0.000***

(Continued)

Variables	Wave 1, year 2004 (N=961)	Wave 2, year 2006/07 (N=71949)	Wave 4[(1)], year 2010 (N=816)	Wave 5, year 2013 (N=769)	Wave 6, year 2015 (N=410)	Wave 7, year 2017 (N=509)	Comparison of means p-value
Dependency level							
No dependency/ Not eligible	97.02	96.16	90.13	90.26	88.38	89.91	0.043**
Mild dependency	2.36	2.28	5.42	3.46	6.40	3.85	0.000***
Moderate dependency	0.41	0.73	2.89	2.95	1.90	2.60	0.000***
Severe dependeny	0.21	0.83	1.56	3.33	3.32	3.64	0.000***
Self-perceived health							
Excellent	4.29	3.00	2.41	3.23	2.11	4.21	0.000***
Very good	14.50	8.79	10.08	9.40	7.94	16.37	0.000***
Good	40.45	40.64	35.17	36.09	36.45	34.69	0.031**
Fair	30.95	33.82	36.01	35.45	35.28	28.20	0.004***
Poor	9.81	13.75	16.33	16.90	18.22	16.39	0.000***
Number of chronic conditions (SD)	1.14 (1.16)	1.10 (1.07)	1.39 (1.23)	1.45 (1.29)	1.46 (1.17)	1.99 (1.70)	0.000***
Depression	35.51	32.14	36.23	32.58	37.34	39.54	0.902
Body Mass Index categories							
Underweight	0.31	0.52	0.84	0.89	0.93	1.17	0.218
Normal weight	25.23	24.20	24.82	24.27	26.87	29.08	0.086*
Overweight	47.80	47.36	46.76	48.03	46.03	40.75	0.074*
Obesity	26.66	27.92	27.58	26.81	26.17	18.46	0.182

(1) The question about home care was excluded in the questionnaire of wave 4. Hence, the only measure of formal care available in wave 4 is nursing home care. The results from wave 4 should then be interpreted with caution.

With respect to the functional and health status, individuals seem to be less healthy in later years than at the beginning of SHARE, as the proportion of people being identified as mild dependent was 2.36% at the beginning of the time period of the analysis and represented 6.40% in the year 2015. On the other hand, the percentage of people classified as non-dependent dropped from 97% in 2004 until 90% in 2017. Furthermore, the percentage of people reporting their health status as excellent decreased from about 4.29% to 2.11% from 2004 to 2015, when it reached its minimum, while the percentage of people rating their health as poor raised from 9.81% to 18.22%. Moreover, the prevalence of obesity increased.

Table 1 also shows some differences in the socio demographic characteristics and living conditions of the individuals. People are older in later years, more likely to be female and with low education. The percentage of people married decreases from the year 2004 to 2015 (from 84% to 66%), whereas the percentage of widowers increases (from 11.5% in the year 2004 to nearly 30% in 2015). A similar trend is observed in employment status, switching from employed (from 19% in the year 2004 to 4.44% in 2015) to retired (from 35% in the

year 2004 to 49% in 2015). Mean household income decreases from €24,330, approximately, in 2004 to €15,238 in 2015. The percentage of people living in rural areas decreases between the years observed, as well as the percentage of children living in the same household than their parents. Moreover, the number of grandchildren has increased.

4.2. Regression results

Estimates for the differences-in-differences (DID) results on the use of formal care services can be found in Table 2, whereas the estimation results for informal care are displayed in Table 3 and the results for both types of long-term care are shown in Table 4. It should be noted that the coefficients from the first model correspond to equation (2) and that the coefficients from Model 4 correspond to equation (3). Moreover, although the parameter of highest interest is γ, which measures the change in the effect of the different dependency levels on formal and informal care use after the implementation of the DA compared to 2006/07, other results will also be mentioned. The parameter δ shows the change in each of the long-term care use variables due to the different dependency levels. The parameter λ accounts for the effects of the time periods on formal and informal care use.

Table 2
RESULTS FROM THE DIFFERENCES-IN-DIFFERENCES ANALYSIS ON THE USE OF FORMAL CARE SERVICES

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Waves				
Wave 1 (year 2004)	0.139	0.174	0.230**	0.262**
	(0.114)	(0.113)	(0.115)	(0.122)
Wave 5 (year 2013)	-0.0604	-0.0647	-0.0874	-0.0978
	(0.118)	(0.119)	(0.125)	(0.135)
Wave 6 (year 2015)	-0.0484	-0.0423	-0.00832	0.0192
	(0.144)	(0.144)	(0.147)	(0.156)
Wave 7 (year 2017)	-0.0231	-0.0202	-0.0171	0.0092
	(0.113)	(0.121)	(0.124)	(0.132)
Dependency level				
Mild dependency	0.623	0.505	0.558	-0.150
	(0.412)	(0.398)	(0.406)	(0.634)
Moderate dependency	1.300***	1.280**	1.242**	1.300**
	(0.480)	(0.511)	(0.532)	(0.579)
Severe dependency	1.183**	0.716	0.941*	0.662
	(0.560)	(0.538)	(0.509)	(0.611)
Wave # dependency				
Wave 1 # mild dependency	-0.192	-0.0894	-0.215	0.193
	(0.559)	(0.541)	(0.568)	(0.729)
Wave 5 # mild dependency	-0.248	-0.157	-0.271	-0.436
	(0.551)	(0.544)	(0.572)	(0.822)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Wave 6 # mild dependency	0.234	0.247	0.286	0.312
	(0.520)	(0.517)	(0.536)	(0.747)
Wave 7 # mild dependency	0.342	0.339	0.331	0.302
	(0.458)	(0.452)	(0.447)	(0.489)
Wave 1 # moderate dependency	-0.239	-0.525	-0.543	-0.260
	-1.049	-1.163	-1.214	-1.168
Wave 5 # moderate dependency	0.400	0.378	0.423	-0.0926
	(0.555)	(0.586)	(0.618)	(0.683)
Wave 6 # moderate dependency	-0.439	-0.718	-0.597	-0.794
	(0.738)	(0.721)	(0.739)	(0.921)
Wave 7 # moderate dependency	-0.290	-0.282	-0.246	-0.200
	(0.581)	(0.562)	(0.531)	(0.499)
Wave 1 # severe dependency	—	—	—	—
Wave 5 # severe dependency	-0.0117	0.327	0.115	0.271
	(0.656)	(0.644)	(0.630)	(0.751)
Wave 6 # severe dependency	0.251	0.618	0.276	—
	(0.694)	(0.677)	(0.662)	
Wave 7 # severe dependency	0.171	0.148	0.139	0.107
	(0.713)	(0.687)	(0.685)	(0.692)
Age categories				
Age 65 to 80	0.394***	0.373***	0.325**	0.295**
	(0.113)	(0.128)	(0.138)	(0.148)
Age 80+	1.002***	0.983***	0.979***	0.988***
	(0.157)	(0.166)	(0.175)	(0.191)
Gender: female	0.278***	0.210	0.206	0.109
	(0.104)	(0.129)	(0.132)	(0.146)
Education				
Low education	0.0424	0.0643	0.0204	0.0726
	(0.110)	(0.109)	(0.116)	(0.130)
Medium education	0.198	0.289	0.248	0.353
	(0.199)	(0.199)	(0.208)	(0.231)
High education	0.364*	0.451**	0.371	0.504**
	(0.206)	(0.218)	(0.231)	(0.246)
Marital status				
Registered partnership	—	—	—	—
Separated	-0.294	-0.310	-0.298	-0.276
	(0.365)	(0.365)	(0.365)	(0.396)
Never married	—	—	—	—
Divorced	0.144	0.113	0.0955	0.171
	(0.307)	(0.318)	(0.316)	(0.365)
Widowed	0.139	0.0966	0.105	0.147
	(0.125)	(0.124)	(0.131)	(0.135)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Employment status				
Employed or self-employed		-0.0880	-0.0729	-0.0118
		(0.207)	(0.218)	(0.234)
Unemployed		—	—	—
Permanently sick or disabled		0.813***	0.861***	0.714***
		(0.197)	(0.203)	(0.214)
Homemaker		0.0422	0.0382	0.0432
		(0.128)	(0.131)	(0.138)
Household net income		-1.29e-06	-8.05e-07	5.61e-07
		(2.08e-06)	(2.08e-06)	(2.28e-06)
Living in a rural area			-0.188**	-0.246**
			(0.0909)	(0.0990)
Number of children			-0.00813	-0.0117
			(0.0425)	(0.0468)
Number of grandchildren			0.0145	0.00848
			(0.0203)	(0.0225)
Children in the household			-0.178*	-0.165
			(0.102)	(0.109)
Self-perceived health status				
Very good				-0.399*
				(0.230)
Good				-0.400**
				(0.164)
Fair				-0.222
				(0.137)
Poor				—
Number of chronic conditions				0.102**
				(0.0404)
Depression				0.360***
				(0.112)
Body Mass Index categories				
Underweight				0.486
				(0.331)
Overweight				-0.00320
				(0.118)
Obesity				-0.0350
				(0.142)
N (Observations)	3,484	3,484	3,484	3,484
N (Individuals)	1,085	1,085	1,085	1,085
Log-pseudolikehood	-799.94	-677.01	-661.38	-620.91
Prob > chi2	0.000***	0.000***	0.000***	0.000***

Clustered standard errors at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Reference categories: wave 2 (years 2006/07), not dependent/not eligible for receiving benefits from the Dependency Act, age 50 to 65, male, no education, married, retired, excellent self-perceived health status and with normal weight.

As shown in Table 2, the results suggest that the implementation of the Dependency Act did not modify the probability of receiving formal care services, as no wave dummy denoting time points after 2006 was significantly associated with the outcome. However, wave 1 (year 2004) was indeed significantly related to a higher probability of using formal care before the introduction of the DA, although only in Models 3 and 4 (the coefficients ranged from 0.23 in Model 3 until 0.26 in Model 4). Moreover, the dependency level did have a significant and positive effect on the probability of using formal care services, especially for the moderate dependents, whose coefficients slightly varied from 1.24 up to 1.30. However, the main parameter of interest which resulted from the interaction between the time dummies and the dependency levels was never significant, showing, moreover, no clear patterns with respect to its positive or negative effect in terms of sign. Other variables, such as being older, or a poorer health status seemed to be positively related with the odds of receiving formal care services.

With respect to the probability of informal care reception, Table 3 shows that the implementation of the Dependency Act had a significant and positive effect (at 95% confidence level) for the moderate dependents in the year 2010 on the likelihood of using any type of informal care. As the interaction term between being moderate dependent and wave 4 (year 2010) is positive and significant (coefficient = 2.017), such result suggests that negative dependency effects on informal care reception are intensified after the implementation of the Dependency Act. Moreover, such result is only observed in the full model, even after controlling for health status variables. Individual coefficients for the time points and the dependency levels showed that the longer the time since the introduction of the DA, the lower the probability of receiving informal care, and that the less and the more severe dependents were associated with higher odds of receiving informal care (coefficients ranged from 1.3 up to 1.7 in case of mild dependents and were around 1.6 in case of severe dependents). Being older, living in a rural area and worse health status were significant predictors of a higher probability of informal care use; higher levels of education were protective factors against informal care use.

Table 3
RESULTS FROM THE DIFFERENCES-IN-DIFFERENCES ANALYSIS ON THE USE OF INFORMAL CARE

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Waves				
Wave 1 (year 2004)	-0.0525	-0.0465	-0.00754	0.0237
	(0.0799)	(0.0798)	(0.0833)	(0.0872)
Wave 4 (year 2010)	-0.131	-0.130	-0.142	-0.195**
	(0.0847)	(0.0848)	(0.0879)	(0.0922)
Wave 5 (year 2013)	-0.0237	-0.0358	-0.00177	-0.0216
	(0.0868)	(0.0869)	(0.0902)	(0.0943)
Wave 6 (year 2015)	-0.383***	-0.383***	-0.410***	-0.461***
	(0.113)	(0.113)	(0.118)	(0.125)
Wave 7 (year 2017)	-0.361**	-0.348**	-0.347**	-0.332*
	(0.119)	(0.117)	(0.111)	(0.117)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Dependency level				
Mild dependency	1.699***	1.683***	1.653***	1.336***
	(0.353)	(0.349)	(0.365)	(0.368)
Moderate dependency	1.002*	1.019*	0.887	0.309
	(0.575)	(0.575)	(0.602)	(0.687)
Severe dependency	1.623***	1.587***	1.597***	0.626*
	(0.514)	(0.514)	(0.530)	(0.373)
Wave # dependency				
Wave 1 # mild dependency	-0.213	-0.204	-0.467	-0.571
	(0.458)	(0.454)	(0.477)	(0.482)
Wave 4 # mild dependency	-0.685*	-0.665	-0.566	-0.492
	(0.407)	(0.406)	(0.419)	(0.423)
Wave 5 # mild dependency	-0.678	-0.652	-0.681	-0.923*
	(0.422)	(0.422)	(0.435)	(0.528)
Wave 6 # mild dependency	-0.571	-0.597	-0.337	0.249
	(0.466)	(0.463)	(0.492)	(0.555)
Wave 7 # mild dependency				
Wave 1 # moderate dependency	0.965	0.840	0.932	1.241
	(0.940)	(0.928)	(0.951)	-1.156
Wave 4 # moderate dependency	0.876	0.794	1.129*	2.017**
	(0.649)	(0.652)	(0.642)	(0.952)
Wave 5 # moderate dependency	0.856	0.815	1.165	1.575*
	(0.617)	(0.620)	(0.759)	(0.835)
Wave 6 # moderate dependency	1.401	1.269	1.302	1.663
	(0.935)	(0.935)	(0.974)	-1.100
Wave 7 # moderate dependency	-0.0217	-0.0334	0.0267	0.0411
	(0.409)	(0.417)	(0.419)	(0.452)
Wave 1 # severe dependency	-1.083	-1.116	-1.195	—
	-1.019	-1.007	(0.995)	
Wave 4 # severe dependency	0.0596	0.116	-0.0462	0.184
	(0.736)	(0.721)	(0.762)	(0.693)
Wave 5 # severe dependency	0.0508	0.0537	-0.0176	—
	(0.597)	(0.597)	(0.613)	
Wave 6 # severe dependency	—	—	—	—
Wave 7 # severe dependency	0.092	0.083	0.077	—
	(0.542)	(0.527)	(0.538)	
Age categories				
Age 65 to 80	0.149**	0.120	0.113	0.0541
	(0.0729)	(0.0864)	(0.0897)	(0.0917)
Age 80+	0.702***	0.670***	0.655***	0.559***
	(0.104)	(0.115)	(0.125)	(0.130)
Gender: female	0.0911	0.0530	0.0883	-0.0288
	(0.0720)	(0.0911)	(0.0947)	(0.0978)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Education				
Low education	-0.360***	-0.352***	-0.348***	-0.237**
	(0.0817)	(0.0818)	(0.0882)	(0.0952)
Medium education	-0.849***	-0.816***	-0.855***	-0.656***
	(0.179)	(0.181)	(0.200)	(0.210)
High education	-0.686***	-0.628***	-0.566***	-0.351**
	(0.152)	(0.154)	(0.166)	(0.176)
Marital status				
Registered partnership	—	—	—	—
Separated	0.505*	0.502*	0.590**	0.660**
	(0.275)	(0.274)	(0.277)	(0.275)
Never married	0.128	0.147	-0.128	-0.0845
	(0.326)	(0.320)	(0.357)	(0.404)
Divorced	0.332	0.328	0.407*	0.358
	(0.248)	(0.245)	(0.241)	(0.253)
Widowed	0.165*	0.143	0.167	0.177*
	(0.0965)	(0.0963)	(0.103)	(0.107)
Employment status				
Employed or self-employed		-0.157	-0.0926	-0.00794
		(0.133)	(0.138)	(0.140)
Unemployed		0.164	0.199	0.248
		(0.199)	(0.202)	(0.213)
Permanently sick or disabled		0.175	0.284*	-0.00238
		(0.159)	(0.159)	(0.165)
Homemaker		0.0343	0.0554	0.0337
		(0.0945)	(0.0989)	(0.0994)
Household net income		-8.39e-07	3.94e-08	9.39e-07
		(1.67e-06)	(1.78e-06)	(1.54e-06)
Living in a rural area			0.212***	0.237***
			(0.0669)	(0.0704)
Number of children			0.000972	0.000464
			(0.0294)	(0.0311)
Number of grandchildren			0.00372	0.00188
			(0.0138)	(0.0145)
Children in the household			-0.0936	-0.116
			(0.0678)	(0.0705)
Self-perceived health status				
Very good				-0.0597
				(0.243)
Good				0.0349
				(0.221)
Fair				0.188
				(0.225)
Poor				0.778***
				(0.238)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Number of chronic conditions				0.0595**
				(0.0295)
Depression				0.300***
				(0.0745)
Body Mass Index categories				
Underweight				0.0298
				(0.343)
Overweight				-0.0118
				(0.0823)
Obesity				0.0476
				(0.0962)
N (Observations)	4,414	4,414	4,414	4,414
N (Individuals)	1,491	1,491	1,491	1,491
Log-pseudolikehood	-773.15	-751.71	-680.23	-647.62
Prob > chi2	0.000***	0.000***	0.000***	0.000***

Clustered standard errors at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Reference categories: wave 2 (years 2006/07), not dependent/not eligible for receiving benefits from the Dependency Act, age 50 to 65, male, no education, married, retired, excellent self-perceived health status and with normal weight.

Finally, Table 4 shows that the introduction of the DA had a significant, but negative effect (at 95% confidence level) on the probability of receiving any type of long-term care for the mild dependents in the year 2013. As the interaction term between being being mild dependent and wave 5 (year 2015) is negative and statistically significant (its coefficient ranges from -0.90 up to -1.15, depending on the covariates included in the regression model), such result suggests that the burden of having a mild dependency level is strengthened after the implementation of the Dependency Act. As it was observed as well for the probability of informal care reception, the individual coefficients for the wave dummies showed that the longer the time since the introduction of the DA, the lower the probability of receiving long-term care (for example, in the full model, Model 4, -0.361 in case of wave 4 and -0.379 if wave 6). Finally, in Models 1 to 3, the results showed that the worse the dependency level, the higher the probability of using any type of long-term care. However, when clinical-related variables entered (Model 4), only being mild and severe dependents were still significant, but the highest coefficient was obtained in case of being mild dependent, suggesting that the individuals with a lower level of dependency were more likely to receive any type of long-term care.

Table 4
RESULTS FROM THE DIFFERENCES-IN-DIFFERENCES ANALYSIS ON THE USE OF ANY TYPE OF LONG-TERM CARE SERVICE

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Waves				
Wave 1 (year 2004)	-0.0117	-0.00104	0.0467	0.0787
	(0.0763)	(0.0762)	(0.0793)	(0.0823)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Wave 4 (year 2010)	-0.282***	-0.279***	-0.307***	-0.361***
	(0.0815)	(0.0814)	(0.0859)	(0.0892)
Wave 5 (year 2013)	-0.0483	-0.0625	-0.0528	-0.0681
	(0.0822)	(0.0822)	(0.0852)	(0.0881)
Wave 6 (year 2015)	-0.348***	-0.352***	-0.366***	-0.379***
	(0.105)	(0.105)	(0.109)	(0.113)
Wave 7 (year 2017)	-0.334**	-0.328**	-0.304**	-0.288*
	(0.109)	(0.118)	(0.129)	(0.131)
Dependency level				
Mild dependency	1.765***	1.737***	1.716***	1.421***
	(0.373)	(0.371)	(0.384)	(0.385)
Moderate dependency	1.799***	1.804***	1.646**	1.204
	(0.668)	(0.658)	(0.714)	(0.766)
Severe dependency	2.037***	2.006***	2.040***	0.817**
	(0.687)	(0.687)	(0.704)	(0.415)
Wave # dependency				
Wave 1 # mild dependency	-0.503	-0.495	-0.760	-0.909*
	(0.467)	(0.462)	(0.490)	(0.489)
Wave 4 # mild dependency	-0.707*	-0.674	-0.635	-0.566
	(0.424)	(0.423)	(0.435)	(0.437)
Wave 5 # mild dependency	-0.899**	-0.870**	-0.883**	-1.148**
	(0.439)	(0.441)	(0.441)	(0.536)
Wave 6 # mild dependency	-0.112	-0.151	0.502	0.635
	(0.511)	(0.511)	(0.582)	(0.670)
Wave 7 # mild dependency	-0.0588	-0.0592	-0.0571	-0.0493
	(0.567)	(0.590)	(0.582)	(0.548)
Wave 1 # moderate dependency	-0.0394	-0.209	-0.110	0.0355
	(0.976)	(0.948)	(0.971)	-1.110
Wave 4 # moderate dependency	0.249	0.149	0.623	1.086
	(0.812)	(0.816)	(0.857)	(0.999)
Wave 5 # moderate dependency	—	—	—	—
Wave 6 # moderate dependency	0.369	0.180	0.189	0.395
	(0.995)	(0.988)	-1.034	-1.122
Wave 7 # moderate dependency	0.332	0.280	0.253	0.241
	(0.866)	(0.859)	(0.841)	(0.832)
Wave 1 # severe dependency	-1.664	-1.754*	-1.838*	—
	-1.096	-1.063	-1.047	
Wave 4 # severe dependency	-0.398	-0.367	-0.494	-0.0304
	(0.862)	(0.841)	(0.887)	(0.717)
Wave 5 # severe dependency	-0.107	-0.126	-0.218	—
	(0.770)	(0.770)	(0.790)	
Wave 6 # severe dependency	—	—	—	—
Wave 7 # severe dependency	-0.076	-0.088	-0.096	—
	(0.822)	(0.841)	(0.857)	

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Age categories				
Age 65 to 80	0.209***	0.180**	0.142	0.0972
	(0.0687)	(0.0819)	(0.0865)	(0.0869)
Age 80+	0.831***	0.794***	0.746***	0.663***
	(0.101)	(0.111)	(0.120)	(0.122)
Gender: female	0.154**	0.135	0.168*	0.0531
	(0.0694)	(0.0874)	(0.0913)	(0.0935)
Education				
Low education	-0.319***	-0.314***	-0.298***	-0.188**
	(0.0803)	(0.0799)	(0.0868)	(0.0908)
Medium education	-0.647***	-0.610***	-0.583***	-0.377**
	(0.164)	(0.165)	(0.176)	(0.181)
High education	-0.473***	-0.421***	-0.364**	-0.138
	(0.142)	(0.146)	(0.162)	(0.167)
Marital status				
Registered partnership	—	—	—	—
Separated	0.430	0.419	0.490*	0.552**
	(0.269)	(0.266)	(0.269)	(0.264)
Never married	-0.0228	-0.0121	-0.340	-0.300
	(0.315)	(0.314)	(0.343)	(0.393)
Divorced	0.412**	0.406**	0.458**	0.435*
	(0.201)	(0.200)	(0.206)	(0.223)
Widowed	0.221**	0.189**	0.200**	0.199**
	(0.0904)	(0.0904)	(0.0979)	(0.0994)
Employment status				
Employed or self-employed		-0.135	-0.0764	-0.00596
		(0.130)	(0.136)	(0.136)
Unemployed		0.0608	0.0905	0.141
		(0.195)	(0.199)	(0.207)
Permanently sick or disabled		0.275*	0.398**	0.145
		(0.157)	(0.156)	(0.162)
Homemaker		-0.000630	0.0128	-0.00409
		(0.0899)	(0.0943)	(0.0943)
Household net income		-9.85e-07	-2.23e-07	6.32e-07
		(1.54e-06)	(1.66e-06)	(1.47e-06)
Living in a rural area			0.129**	0.145**
			(0.0650)	(0.0665)
Number of children			-0.00182	-0.0114
			(0.0285)	(0.0303)
Number of grandchildren			0.0166	0.0113
			(0.0135)	(0.0138)
Children in the household			-0.162**	-0.165**
			(0.0663)	(0.0679)

(Continued)

Variables	Coefficients Model 1	Coefficients Model 2	Coefficients Model 3	Coefficients Model 4
Self-perceived health status				
Very good				0.139
				(0.235)
Good				0.198
				(0.218)
Fair				0.375*
				(0.222)
Poor				0.868***
				(0.235)
Number of chronic conditions				0.0653**
				(0.0282)
Depression				0.322***
				(0.0718)
Body Mass Index categories				
Underweight				-0.190
				(0.307)
Overweight				0.0344
				(0.0789)
Obesity				0.0859
				(0.0901)
N (Observations)	4,414	4,414	4,414	4,414
N (Individuals)	1,491	1,491	1,491	1,491
Log-pseudolikehood	-822.30	-809.76	-732.59	-681.24
Prob > chi2	0.000***	0.000***	0.000***	0.000***

Clustered standard errors at the individual level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Reference categories: wave 2 (years 2006/07), not dependent/not eligible for receiving benefits from the Dependency Act, age 50 to 65, male, no education, married, retired, excellent self-perceived health status and with normal weight.

5. Discussion and Conclusions

In this study, we aim to evaluate the impact that the implementation of the SAAD might have had in the use of formal and informal care using six waves of the SHARE, which is a longitudinal survey. We attempt to contribute to the existing literature in several dimensions. Firstly, we have extended the results for the overall sample by considering individuals who might be identified as being dependent, according to different severity levels following the classification of the DA. By doing so, we transmit a distinction on previous contributions, and we provide new highlights for chronic functional limitations in Spain. Secondly, we provide with evidence on the effects of the implementation of the Dependency Act on the reception of formal and informal care among older adults in Spain during ten years, beginning before the introduction of the DA (year 2004) up to eleven years after (year 2017).

Our results showed that the implementation of the Dependency Act had a significant and positive effect on the probability of informal care reception, but only for the moderate dependents in the year 2010, additionally pointing towards the fact that the negative dependency effects on the informal care reception are strengthened after the introduction of the DA due to the significance of the interaction term, regardless of the covariates included. Although the individual coefficients for the dependency levels were positively related to the use of informal care services, the aforementioned finding would be of special relevance for policymakers since informal caregiving has adverse consequences on all the domains of the life of those providing informal assistance and it calls for flexible policies that can adjust to adequately meet the carer's needs (Bauer and Sousa-Pouza, 2015). Although the DA considered cash benefits for informal caregivers, these were not eventually satisfied, as a recent study showed that only 10% of the informal care time provided was covered by the government (Del Pozo-Rubio *et al*., 2020). Hence, other dimensions might also be considered within the benefits for informal carers, such as higher availability of respite services or psychological support to put up with the caregiving burden. In fact, Wagner and Brandt (2017) show that spousal caregivers' well-being, proxied by life satisfaction, loneliness and depression, is positively related to the availability of public LTC services.

Contrary to what has been found for informal care, our estimates highlight the non-significant effect of the Dependency Act in Spain on the probability of formal care use after its implementation, suggesting that, although one of the benefits from the DA was the reception of professional care for those in care need, such care reception was actually unchanged instead of intensified. Moreover, being moderately dependent did have a significant and positive effect on the probability of using formal care services. However, when jointly assessed, the interaction between the dependency levels considered and the time since the introduction of the DA was never significant, providing inconsistent results in terms of sign. Actually, the effect on the use of formal care seems to rule out the effect on informal care reception when both types of long-term care are analyzed together (results from Table 4), as it seems that the implementation of the Dependency Act did not increase the use of long-term care but actually reduced it, although only for the least severe dependents during the fifth wave (year 2013).

Our results suggest that the introduction of the Dependency Act, instead of alleviating the burden assumed by informal caregivers in the care provision, posed an even greater burden, heavily increasing its use, which was not parallel to the increase in formal care at all. The reasoning behind the significant results found only for informal care use might be due to the economic downturns that emerged parallel to the implementation of the DA, which might have caused families to take on more of the care responsibilities, particularly for the oldest-old (Correa and Jiménez-Aguilera, 2016). Hence, governments should take into account that although informal care promotion is tempting from a public policy perspective due to its free provision, the heavy borne by informal caregivers should not be neglected, as its impact on national expenditures is vast enough (Oliva-Moreno *et al*., 2015), policymakers should answer to the dramatic situations that informal caregivers might face and design the appropriate respite policies, additionally promoting the use of formal care services.

Although the current analysis is mainly focused in the case of Spain only, the international evidence on the use of long-term care shows that differences between countries might be driven by eligibility criteria, household characteristics, among others (Bakx *et al*., 2015; Casanova *et al*., 2017). Bakx *et al*. (2015) conclude that LTC use is strongly affected by country-specific eligibility criteria for public LTC coverage and comprehensiveness of the public LTC system. In fact, the differences between the Netherlands and Germany are largely explained by differences in eligibility rules and social preferences. Ilinca *et al*. (2017) analysed differences in home care utilization between community-dwelling Europeans in nine countries based on concentration indexes and horizontal inequality indexes for each country. These authors conclude that households' characteristics are an important contributor to inequality, while education and geographical locations hold less explanatory power.

Some limitations should also be mentioned. First of all, it is not possible to identify whether the individuals included in the study have applied to the DA benefits and, if so, whether they have received any favorable notification and, finally, any benefit to cover their care demands. Secondly, as the data that corresponds to 2008 (wave 3) refers to individuals´ childhood conditions, we could not analyze the effect in the first wave right after the declaration of the DA. Hence, the first-time reference of observation is 2010, four years after the DA, when the immediate effects might have smoothed. We consider that having three points in time after 2006 provides with consistent and trustworthy estimates, but we are aware of the lack of information that we are facing in terms of short-term associations. Thirdly, several concerns should be taken into account regarding formal care: i) no result could be provided for 2010 (Wave 4), as information on home care was excluded in the questionnaire of Wave 4 and, thus, we excluded the fourth wave from the analysis; ii) when generating the professional care variable, we pooled the formal care-related variables that were available in the dataset used: nursing or personal care (3.61% of the Spanish individuals declared to receive any), domestic tasks (3.72%), meals-on-wheels (0.11%) and nursing home care (0.58%). However, a recent report from IMSERSO shows that the coverage rate of home help reached 5% of the population aged 65 years old or above (IMSERSO, 2018). We are also aware about the use of other formal care services (i.e. telecare, daycare centers), which might be more prevalent among the Spanish population, but these were not available in the data. Lastly, the appropriateness of the use of SHARE data for the analysis performed in this work might be discussed. However, it should be taken into account that no dataset has been designed with the aim to answer to the question analyzed in this work and SHARE is not an exception as it was not designed for the assessment of the introduction of different laws on several indicators, such as the implementation of the Dependency Act in the use of formal and informal care services in Spain. Although it might not be representative of the dependent population who might be entitled to benefit from the DA, we do think it can be a useful dataset to provide with new evidence on the evolution of long-term care use after the implementation of the DA and to enhance the generation of data with the actual beneficiaries to be able to respond to our hypotheses, amongst others.

The results included in this study might open new lines for further research and, since, in addition to the provision of formal care services, cash benefits were another type of subsidy considered within the DA. Further research could aim to disentangle whether income

increased after the implementation of the dependency act. Moreover, another point of interest for future analyses could be the association between the provision of LTC services and caregiver's quality of life, once the DA had been introduced. For example, Verbakel (2014) compared 18 European countries and, from their conclusions, it can be observed that there is less difference in well-being between informal carers and non-carers in countries with more generous LTC systems. However, their findings vary across countries because policy instruments designed to support informal caregivers do not significantly improve well-being. In this regard, the new population structure (ageing population, combined with increased life expectancy and falling birth rates), the weakened family ties and increased participation of women in the labor market and withdrawal of early retirement policies have shrunk the provision of informal care, which is likely to increase the demand for formal LTC (Siciliani, 2013). Moreover, taking into account the effect of the recent financial crisis on relevant drops in health and care services, as long-term care is, high unemployment rates (which raised 27% in 2014 in Spain) in addition to a higher risk of social exclusion (Deusdad *et al*., 2016; Zueras *et al*., 2018), new analyses could be performed on a longer time frame. After the worst crisis times, new regulations led to a substantial reduction of public expenditure and a higher promotion of co-payments, home help shortcuts, and a relevant delay in the evaluation of benefit applications under the DA, mainly those affecting moderate and mild levels of limitations, deriving into the existence of the so-called "dependency limbo", for those who were actually entitled to receive the benefits observed by the DA but eventually received none (Spijker and Zueras, 2020).

In conclusion, within the next future, the population of Europe will reflect a greater share of older people that push up social services expenditure, but their extent will depend on whether there will be a reorganization of morbidity and disability in the elderly. Moreover, the increase in the older population in Europe will continue in the coming years and will pose new challenges in terms of the reorganization of both formal and informal dependency care (Solé-Auró and Crimmins, 2014), in addition to better information on the factors that determine them for a coordination of social services in terms of efficiency and equity. Nevertheless, research on LTC must fill data gaps and coordination of health and social services should be improved to enhance the efficiency and equity in their joint provision.

Appendix

Table A1
COMPARISON OF RATING SCALE OF DEPENDENCY ACT AND INFORMATION FROM THE SURVEY OF HEALTH, AGEING AND RETIREMENT IN EUROPE (SHARE)

Rating Scale of Dependency Act		SHARE	
1. *Eating and drinking*	16.8	1. *Eating and drinking*	16.8
– Recognize and/or reach the food served	0.25	Eating and drinking tasks	1
– Cut food into pieces	0.20		
– Use folk and knife to bring	0.30		
– The beverage container to the mouth	0.25		
2. *Personal hygiene related to urination/defecation*	14.8	2. *Personal hygiene related to urination/defecation*	14.8
– Go to appropiate place	0.20	– Using the toilet, including getting up or down	1
– Manage clothing	0.15		
– Move properly	0.30		
– Move properly	0.35		
– Clean yourself			
3. *Bathing*	8.8	3. *Bathing*	8.8+2.9(1)
– Open and close the tap	0.15	Bathing or showering	1
– Washing the hands	0.20		
– Go to the bath	0.15		
– Wash the upper part of the body	0.25		
– Wash the down part of the body	0.25		
4. *Doing other corporal tasks*	2.9	4. *Doing other corporal tasks*	0
– Comb	0.30	Not available in our data. We imputed the weight of "doing other corporal tasks" to "bathing"	
– Cut the nails	0.15		
– Wash the hair	0.25		
– Wash the teeth			
5. *Dressing*	11.9	5. *Dressing*	11.9
– Manage the property clothing	0.15	Dressing and undressing, including shoes and shocks	1
– Put the shoes	0.10		
– Buttoning	0.15		
– Dressing the clothing in the down part of the body	0.30		
– Dressing the clothing in the upper part of the body	0.30		
6. *Health*	2.9	6. *Health*	2.9
– Ask for therapeutic assistence	0.15	– Taking medications	0.55
– Applied the tereupertic recommendations	0.10	– Use the telephone	0.5
– Avoid risks into home	0.25		
– Avoid riks out of home	0.25		
– Ask for help in case of urgence	0.25		

(Continued)

Rating Scale of Dependency Act		SHARE	
7. *Change and move the possition*	9.4	7. *Change and move the possition*	9.4
– Change the body from laid to sit down in bed	0.10	– Getting in or out of bed	1
– Change the body from sit down in stand up	0.10		
– Change the body from stand up in sit down in a chair	0.10		
– Transfer while sit down	0.10		
– Transfer while laid	0.10		
– Chang the gravitatory point while sit down	0.20		
– Sit down	0.15		
– Stand up	0.15		
8. *Move into home*	12.3	8. *Move into home*	12.3
– Move to dress	0.25	– Walking across a room	1
– Move to eat	0.15		
– Move to wash	0.10		
– Move not related to self-care	0.25		
– Move thing in the room	0.10		
– Move around the romms	0.15		
9. *Move out of home*	12.2	9. *Move out of home*	12.2
– Move out of building	0.25	– Leaving the house independently/accessing transportation	1
– Move around of building	0.25		
– Move shortly in known-enviroment	0.20		
– Move shortly in unknown-enviroment	0.15		
– Move far away in known-enviroment	0.10		
– Move far away in unknown-enviroment	0.05		
10. *Housemake tasks*	8	10. *Housemake tasks*	8
– Prepare meal	0.45	– Prepare meal	0.45
– Do the shopping	0.25	– Shopping for groceries	0.25
– Clean the house	0.20	– Doing work around the house or garden	0.20
– Wash clothing	0.10	– Doing personal laundry	0.10

(1) Since limitations in doing other corporal tasks is not available in SHARE, its weight was imputed to "bathing".

Source: Adapted from Oliva-Moreno *et al*. (2015) and by our own using SHARE and la Resolución de 29 de junio de 2010 por la que se publica el Acuerdo del Consejo Territorial del Sistema para la Autonomía y Atención a la Dependencia sobre modificación del baremo de valoración de la situación de dependencia establecido en el Real Decreto 504/2007, de 20 de abril.

Table A2
LIST OF VARIABLES AND CODING

Variable	Label	Coding
Formal care	Whether the individual has received professional help at home or has been in a nursing home in the previous twelve months.	1: respondent has received professional help at home or has been institutionalized; 0: otherwise.
Nursing home admission	"During the last twelve months, have you been in a nursing home overnight?"	1: respondent has been to a nursing home in the last twelve months, temporary or permanently; 0: otherwise.
Home care	Whether the individual has received professional help at home with different matters, such as personal care, domestic tasks, meals-on-wheels and other activities.	1: respondent has received professional help at home; 0: otherwise.
Informal care	Whether a non-professional caregiver, from inside or outside the household, has helped the survey respondent due to any limitation in the activities of daily living during the previous twelve months.	1: respondent has received non-professional help inside or outside the household; 0: otherwise.
Informal care inside the household	Whether a non-professional caregiver, from inside the household, has helped the survey respondent due to any limitation in the activities of daily living during the previous twelve months.	1: respondent has received non-professional help from inside the household; 0: otherwise.
Informal care outside the household	Whether a non-professional caregiver, from outside the household, has helped the survey respondent due to any limitation in the activities of daily living during the previous twelve months.	1: respondent has received non-professional help from outside the household; 0: otherwise.
Age50to65	Age of respondent.	1: age of respondent is between 50 to 65; 0: otherwise.
Age65to80	Age of respondent.	1: age of respondent is between 65 to 80; 0: otherwise.
Age80plus	Age of respondent.	1: age of respondent is older than 80 years old; 0: otherwise.
Female	Gender of respondent.	1: female; 0: male.
Education	ISCED-97 coding of education.	0: no education; 1: low education; 2: medium education; 3: high education.
Marital status	Current marital status.	1: married; 2: with a registered partner; 3: separated; 4: never married; 5: divorced; 6: widowed.

(Continued)

Variable	Label	Coding
Employment status	"How would you describe your current situation?"	1: respondent is retired; 2: employed or self-employed; 3: unemployed; 4: permanently sick or disabled; 5: homemaker.
Household income	Household income	
Rural	Area of location (residence).	1: respondent lives in a large or small town or in a rural area or village; 0: respondent lives in a city.
Number of children	Number of children that are still alive.	
Number of grandchildren	Number of respondents' grandchildren.	
Children in household	Whether at least one child lives in the same household or the same building as respondent.	1: child lives in the same household or building as respondent; 0: otherwise.
Dependency level	Dependency level according to the number of limitations in Activities of Daily Living (ADLs) and in Instrumental Activities of Daily Living (IADLs), following the classification established in the Dependency Act.	0: not eligible (0 - 24 points); 1: mild (25 - 49 points); 2: moderate (50 - 74 points); 3: severe (75 - 100 points)
Self-perceived health	Self-perceived health status.	1: excellent; 2: very good; 3: good; 4: fair; 5: poor.
Number of chronic conditions	Number of chronic illnesses.	
Depression	Being depressed according to the EURO-D scale	1: depressed; 0: not depressed.
Body Mass Index categories	Body Mass Index, according to weight in kg divided by the square of height in metres.	1: underweight; 2: normal weight; 3: overweight; 4: obesity.
Wave 1	Whether the data collected belongs to wave 1.	1: data was collected from wave 1; 0: otherwise.
Wave 2	Whether the data collected belongs to wave 2.	1: data was collected from wave 2; 0: otherwise.
Wave 4	Whether the data collected belongs to wave 4.	1: data was collected from wave 4; 0: otherwise.
Wave 5	Whether the data collected belongs to wave 5.	1: data was collected from wave 5; 0: otherwise.
Wave 6	Whether the data collected belongs to wave 6.	1: data was collected from wave 6; 0: otherwise.
Wave 7	Whether the data collected belongs to wave 7.	1: data was collected from wave 7; 0: otherwise.

Notes

1. Wave 3 was excluded due to a change in the questionnaire (the SHARELIFE questionnaire), which registered information on individuals' childhood health and, hence, the information provided in Wave 3 was not useful for our analysis.

2. The result from year 2010 (Wave 4) should be interpreted with caution, as information on home care was excluded in the questionnaire of Wave 4. Hence, the only measure of formal care available in wave 4 is nursing home care.

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Resumen

Utilizando datos de la Encuesta de Salud, Envejecimiento y Jubilación en Europa (SHARE - *Survey of Health, Ageing and Retirement in Europe* por su denominación en inglés), el objetivo de este estudio

es inferir el impacto que el Sistema español para la Autonomía y la Atención a la Dependencia (SAAD) ha podido tener en la utilización de servicios de cuidado formales e informales a través de modelos de regresión logísticos con efectos aleatorios aplicando un enfoque de diferencias en diferencias. Los niveles de dependencia se crearon en función de las limitaciones al realizar las actividades básicas e instrumentales de la vida diaria. El cuidado formal consistía en ayuda domiciliaria y atención en residencias, mientras que el cuidado informal se refería a la recepción de cuidado por parte de familiares o amigos, ya fuera desde dentro o fuera del hogar. Se incluyeron también co-variables adicionales, como características socioeconómicas y variables relacionadas con el estado de salud.

Nuestros resultados muestran que los efectos negativos de la dependencia en la recepción de cuidado informal se intensificaron tras la introducción del acto de dependencia, ya que la interacción entre un nivel de dependencia moderada y la oleada 4 (año 2010) es significativa y positiva. En caso de los cuidados formales, el análisis conjunto del marco temporal relativo a la introducción del SAAD y los diferentes niveles de dependencia no reportaron resultados significativos, aunque estaban asociados de manera significativa e independiente con la utilización de cuidados formales. Teniendo en cuenta el envejecimiento demográfico, nuestros hallazgos resaltan la necesidad de una planificación eficiente de los sistemas de cuidados de larga duración y los servicios de apoyo social, especialmente para los cuidadores informales, con el fin de satisfacer la demanda de cuidados y reducir la carga de los cuidadores.

Palablas clave: dependencia, cuidados de larga duración, cuidado formal, cuidado informal, España.

Clasificación JEL: I14, 138, J14.