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Joan Costa-Font, Cristina Vilaplana-Prieto

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Investing in Care for Old Age? An Examination of Long-Term Care Expenditure Dynamics and Its Spillovers

Abstract

We study the dynamic drivers of expenditure on long-term care (LTC) programs, and more specifically, the effects of labour market participation of traditional unpaid caregivers (women aged 40 and older) on LTC spending. Next, we examine the spillover effects of a rise in LTC expenditure on health care expenditures (HCE) and the economy (GDP). Our estimates draw from a panel of more than a decade worth of expenditure data from a sample of OECD countries. We use a panel Vector Auto-regressive (panel-VAR) system that considers the dynamics between the dependent variables. We find that LTC expenditure increases with the rise of the labour market participation of the traditional unpaid caregiver (women over 40 years of age), and that such expenditures rise exerts large spillover effects on health spending components. We find that a 1% increase in female labour participation gives rise to a 1.48% increase in LTC expenditure and a 0.88% reduction in HCE. The effect of LTC spending over HCE is mainly driven by a reduction in inpatient and medicine expenditures, exhibiting large country heterogeneity. Finally, we document significant spillover effects of LTC expenditures on per capita GDP.

JEL-Codes: I180, J100.

Keywords: long-term care spending, panel-VAR, dynamic panel data, female labour market participation, health spending, care spillovers.

*Joan Costa-Font**
Department of Health Policy
London School of Economics
Houghton Street
United Kingdom – WC2A 2AE London
j.costa-font@lse.ac.uk

Cristina Vilaplana-Prieto
University of Murcia / Spain
cvilaplana@um.es

*corresponding author

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1. Introduction

The efficient design of long-term care (LTC) programs, providing support to older age disabled individuals in need of support, are a forefront economic policy reform problem in many European countries (European Commission, 2015). The constrained supply of traditional (unpaid or informal) care (Pezzin and Steinberg Schone, 1999), and the expansion of the labour market participation of traditional unpaid caregivers is increasing the demand of formal LTC services. More specifically, it is possible to observe an increase in the demand for home care services, and to a lesser extent, nursing home care. However, how does the reduction in the supply of informal care, (measured by the increasing labour market participation of traditional caregivers, women over 40 years of age), impact the demand and, especially, long-term care expenditure? Further long-term care spending use might in turn reduce the use of public and private health care. Hence, an important question that follows is whether the expansion of LTC spending resulting from new programs expansion, exerts spillover effects on health care spending.

The introduction of LTC programs can impact health care as health care programs are designed to fund only limited intensity of post-acute care following a hospital stay (Hermit et al., 2002; Weaver and Weaver, 2014; Sands et al., 2006), and hospital utilisation is sensitive to inadequate subsidisation of LTC, which can be a source of inefficiencies such as bed blocking (Costa-Font et al., 2018; Rapp et al., 2015). Yet, to date, we still know little about the spillover effects of public LTC spending.

This paper is the first to examine the cross-country variation of the dynamic determinants of LTC expenditure (and its social and health components), and to study the aggregate spillover effects on health care expenditure, as well as its different expenditure categories (such as outpatient, inpatient and medicine spending). The availability of cross-national time-series data from OECD countries offers the possibility of studying the expansion of LTC expenditures. So far, the current estimates of LTC expenditure determinants are mostly descriptive (Colombo and Mercier, 2012), and they tend to disregard the important persistence in expenditure, as well as causality claims (Costa-Font et al, 2016; De la Maisonneuve and Martins, 2013).

We exploit the effect of changes in the labour participation of traditional unpaid caregivers (women over 40 years of age) on LTC spending and Gross Domestic Product (GDP) per capita, alongside the subsequent spillover effects on health expenditure. Our estimates are drawn from a panel-VAR (panel-VAR) GMM model on a sample of OECD countries for the period 2002 to 2015. Unlike previous studies, we consider several dynamic pathways, the endogenous interaction between female labour participation (of women over 40 years of age), LTC expenditure, as well as the effect of LTC expenditure on both HC expenditure, and GDP per capita. The main advantage of the panel-VAR model is that all variables are treated as endogenous and considers unobserved individual heterogeneity including country specific fixed effects, which improves the consistency of the model (Love and Zicchino, 2006)[2]. Finally, we complete our analysis with the

[2] Furthermore, we consider a Granger causality analysis to assist in the identification of the direction of the link between each pair of variables, and the estimation of impulse response functions which are suitable to illustrate how the response of each endogenous variable differs according to the nature of shocks affecting them.

estimation of Bayesian panel-VAR with partial pooling for the groups of Northern and Southern countries. This approach allows us to deal with the reduced panel dimension as well as with interdependencies among countries[3].

Our main results reveal the following. First, we find a significant effect of labour market participation of traditional unpaid caregivers (women over 40 years of age) on LTC expenditures. We estimate that a 1% increase in female labour participation leads to an increase of LTC expenditure by 1.48% in the subsequent period. Second, we find evidence of caregiving spillovers', on health spending which are driven by a reduction in inpatient and medicine expenditure. Third, we document the effect of LTC expenditure on health spending on per capita GDP. We document that a 1% increase in LTC expenditures in one period increases per capita GDP by 0.20% in the next period but reduces HCE by 0.6% in such a period (mainly due to a reduction in medicine expenditure by 0.86% and inpatient expenditure by 0.50%).

Next, we relate our paper to the existing literature. Section three describes the data and empirical strategy. Section four reports the results and a final section concludes with a discussion and policy implications.

[3] Unlike other mean-based estimators (OLS, pooled ordinary least squares, fully modified ordinary least squares, dynamic ordinary least squares, vector error-correction model), the panel-VAR estimator gives both mean-based and trend findings, allowing the series' behavior to be monitored (Love and Zicchino, 2006).

2. Related Literature

2.1 Health and Long-Term Care Expenditure Estimates.

LTC services share some characteristics with heavily subsidised health care, yet unlike health care, personal LTC can be delivered by unpaid household members informally[4]. However, evidence suggests large heterogeneity across the OECD countries in both caregiving duties and formal care provision of services. Descriptive analysis suggests that long-term care spending is associated with population ageing, female labour market participation, and the institutionalization of the care service system (Olivares-Tirado et al., 2011; Costa-Font et al, 2015; Huei-Ru et al., 2016)[5].. Costa-Font et al., (2015) estimate an income elasticity of 3.2, indicating a high sensitivity of per capita public LTC expenditure to a change in a country's per capita GDP[6].

2.2 Female Labour Market Participation.

Given that informal care is still the most common form of care for old age in almost all countries, if formal and informal care are substitutes (Picone and Wilson 1999, Stern 1995; Carmichael and Charles, 2003; Carmichael et al., 2010; Nizalova, 2012), a contraction in the supply of informal care (resulting from the expansion of labour market participation of traditional caregivers) can rise the demand for paid care[7].

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[4] A public subsidy for formal LTC increases the demand for it, even when an informal caregiver is available (Coughlin *et al*., 1992).

[5] As a share of GDP, LTC spending varies from 3.7% in the Netherlands (which relies heavily on institutional care), and 0.2% in Portugal (which relies mainly on informal care by family members), with the OECD average at 1.5% of GDP.

[6] This magnitude is approximately three times higher than that observed in acute health care expenditures (Costa-Font *et al*., 2011).

[7] The availability of a spouse caregiver, measured by male-to-female ratio among the elderly, is associated with a $28,840 (1995 U.S. dollars) annual reduction in formal LTC expenditure per additional elderly male (Yoo *et al*., 2004).

2.3 Health system spillovers.

A higher LTC utilisation can exert spillover effects on the health systemand, especially on costlier hospital care utilisation (Hofmarcher et al., 2007; Bodenheimer, 2008; Mur-Veeman and Govers, 2011). Some evidence already documents that the introduction of home care programs reduced delays in hospital discharges and emergency readmissions (Hermit et al., 2002; Sands et al. 2006; Weaver and Weaver, 2014)[8]. Hence, the expansion of LTC services can give rise to a reduction in health care utilisation.

2.4 Spillovers on to the Economy

The expansion of public LTC spending can give rise to a subsequent effect on economic activity by boosting the 'care sector'. Previous studies such as De Henau et al., (2016) show that the care economy may raise GDP growth more than investment in construction [9]. The next section describes the empirical strategy used to estimate the determinants of LTC expenditure and its determinants.

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[8] Holland *et al.* (2014) compare data of LTC beneficiaries and non-beneficiaries residing in California at the end of their lives. They find that LTC claimants experience significantly lower health care costs at end of life, including 14% lower total medical costs, 13% lower pharmacy costs, 35% lower inpatient admission costs, and 16% lower outpatient visit costs. Feng *et al.* (2020) examined the effect of LTC on hospital utilization and expenditures among the elderly in China. LTC significantly reduced the length of stay by 41%, inpatient expenditures by 17.7% and outpatient visits by 8.1%. Additionally, Rapp *et al.* (2015) report that the extension of LTC subsidies lowers the use of emergency care, and Costa-Font *et al.* (2018) find an 8% reduction in hospitalisation after the insurance extension to finance LTC.

[9] Indeed, De Henau *et al.* (2016) estimate that the contribution to employment of an investment in the care economy (equivalent to 2% of GDP) is higher than a similar investment in construction.

3. Empirical strategy and Data

3.1 Empirical Strategy

The identification of the determinants of LTC expenditure, such as labour market participation of traditional unpaid caregivers (women over 40 years of age), and its spillover effects on health care expenditures faces several methodological challenges, including potential reverse causality and omitted variables bias, as well as both time and cross-sectional correlation, and such dynamic effects need to be modelled. Relative to conventional time series modelling, the panel-VAR model considers the heterogeneity of the cross-sectional dynamics, which provides more information about the sources of heterogeneity in the system. The panel-VAR exploits the temporal and cross-section dimension of the data to be able to infer dynamic relations between the dependent variables[10], allowing all covariates to be treated as fully endogenous while simultaneously modelling the unobservable heterogeneity through fixed effects (which account for time invariant characteristics intrinsic to each country), resulting in an improvement in the consistency of the estimation (Love and Zicchino, 2006).

So far, no previous study has used a sample of panel data over a considerable period for 27 countries, considering that the presence of cross-sectional dependence in panel data may compromise the stationarity of the variables[11]. To our knowledge, no

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[10] Although previous studies have used a single-equation method that relies on a cointegrated relationship, the main assumption of cointegration is the independence of the error term, which is likely violated in the present context.

[11] These problems will be addressed using recently developed estimation techniques for unit roots (Im-Pesaran-Shin test) and Dumitrescu-Hurlin causality test for heterogeneous panels.

previous study examined the impact of healthcare expenditure and GDP after LTC shocks[12].

In a panel-VAR model specification each variable is explained by its own lag, the lagged values of the other system variables and individual country-specific terms. Treating all variables as endogenous prevents us from using weak instruments. An additional advantage of a panel-VAR models is that it allows goodness of fit analysis and observing the reaction to different shocks. The specification of a panel-VAR model of p order proposed by Canova and Cicarrelli (2004) is as follows[1]:

$$Y_{i,t} = A(l)_{i0} + A(l)_{i1}\, Y_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

where all variables of vector Y_t are considered endogenous, allowing for a joint dynamic analysis. If we denote for q the number of endogenous variables, then vector Y_t has dimension qx1. In turn, Y_t contains a cross-section dimension, $y_{i,t} = (y'_{1,t}, y'_{2,t}, \dots, y'_{N,t})$, where i=1,2,….,N indicates the number of countries and t=1,2,…,T indicates the number of years observed for each country. The fixed effects ($A(l)_{i0}$) are captured by a qx1 vector, where l is a polynomial in the lag operator such that $A(l)_{i0} = \sum_{i=0}^{N} A_i l^j, j = 1,2, \dots, p$.

The term $A(l)_{i1}$ is a qxN matrix of lagged coefficients and $\varepsilon_{i,t} = (\varepsilon_{1,t}, \varepsilon_{2,t}, \dots, \varepsilon_{N,t})'$ is the error term with a zero-mean, with variance-covariance matrix independent of t and such that $\varepsilon_{i,t}$ of different periods are independent of each other: $\varepsilon_{i,t} \sim iid(0, \Sigma)$. In this paper, we estimate the following two panel-VAR models to measure the effect of labour market participation on long-term care expenditure, and a second specification for the effect of long-term care expenditure spillovers on health care spending.

[12] We use impulse response function and forecast error variance decomposition (FEVD) tests to find information transmission in a dynamic panel analysis, and specifically to understand the responsiveness of healthcare expenditure and GDP to shocks in LTC.

Estimating LTC expenditures and female labour market effects. A first specification considers three equations for which the dependent variables are $Y_{i,t} = \{FemPart_{i,t}$, $LTC_{i,t}$, $GDPpc_{i,t}\}$. ($FemPart_{i,t}$) measures female participation rate (women 40 years and older), ($LTC_{i,t}$) refers to public long-term care (LTC) expenditures in per capita terms, and ($GDPpc_{i,t}$) measures gross domestic product per capita. Besides, LTC categories can exert heterogeneous effects on different health care spending categories. Hence, we distinguish between the three types of LTC expenditures available (total, health-related services, and social-related services)[13].

The underlying assumption is that female labour participation (of women over 40 years of age) increases LTC expenditures (via higher use of formal care), which in turn expands GDP pc. However, such effects might differ across countries. In our data we can, consistently with Reher (1998) and Kohli et al. (2005), differentiate between Southern European countries (with strong family ties) from Northern European countries (with weak family ties).The direct relationship between LTC expenditures and GDP pc results from the combination of community-based services, residential care and support to informal caregivers (e.g., respite services), which can constitute an important source of employment, and consequently, of economic growth in the years to come (Spasova et al., 2018). Ikkaracan and Kim (2019) performed a macroeconomic simulation study with data from 45 countries to compute the amount of employment needed to meet specific Sustainable Development Goals by 2030. They found that the long-term care sector would require the creation of 29.6 million jobs. Specific country projections suggest that the

[13] Monetary variables are expressed in constant prices, constant PPPs, 2010 US Dollars.

demand for formal caregivers (home care and residential homes) would increase by 980,000 new workers in 2050 for Australia (Mavromaras et al., 2017) and would lie between 16 and 26 thousand employees in 2030 for Poland (Golinowska et al., 2014).

Estimating health and long-term care expenditure. We formulate a second specification consisting of three equations in which the dependent variables are $Y_{i,t} = \{LTC_{i,t}, HC_{i,t}, GDPpc_{i,t}\}$, considering public LTC expenditures in per capita terms ($LTC_{i,t}$), public healthcare expenditures in per capita terms ($HC_{i,t}$), and gross domestic product per capita ($GDPpc_{i,t}$). The previous empirical literature has shown that spending may help reduce the onset of unmet needs for formal care of dependent individuals, and hence, reduces health utilisation (Allen and Moor, 1997; Desai et al., 2001; Lima and Allen, 2001). Similarly, an early post-discharge period after hospitalisation results in approximately 20% of complications that involve re-hospitalisation (Foster et al., 2003; Naylor et al., 2007), although these adverse effects can be avoided with more formal support (home care). LTC spending can prevent unmet caregiving needs and facilitate a smoother transition from hospital to home. Likewise, health care expenditures (HCE) can impact on per capita GDP given that some effective interventions improve health, which in turn can exert subsequent effects on labour supply and productivity, boosting GDP[14].

Our panel data model imposes as a restriction that the coefficients $A(l)_{i1}$ are equal for all countries, though we add country fixed effects ($A(l)_{i0}$) to our specification to control for time variant cross-country effects. Nevertheless, one of the limitations of

[14] Wang (2015) analyses data for 34 OCDE countries and finds that appropriate spending on healthcare improves human capital and contributes to economic growth through higher productivity. Erdil and Yetkiner (2009) examine the effect of HCE and per capita (GDPpc) in a sample of 75 countries that ranged from low to high income.

including the fixed effects is that they are usually correlated with the regressors throughout the lag of the dependent variables (Blundell and Bond, 1998). The Helmert transformation, which consists of applying forward mean differencing[15], is used to maintain the orthogonality between the regressors and their lags, allowing the mentioned lags to be used as instruments. Furthermore, GMM method is used for efficiency purposes (Holtz-Eakin et al., 1988). To determine whether a lag structure is correct, we draw on Hansen's J statistic[16] and Andrews and Lu (2001) who proposed the use of consistent Moment and Moment Selection Criteria (MMSC). Additionally, we verify the stability condition of the model (Hamilton, 1994)[17] and perform a battery of Granger-causality tests to determine whether variable $\mathrm{Y}_{1\mathrm{t}}$ has any information about another variable ($\mathrm{Y}_{2\mathrm{t}}$). The results of these tests help us to establish a causal order of the variables in the system[18].

Finally, we distinguish between Northern and Southern countries, considering the interdependencies among countries in each group. The latter reduces considerably the dimension of the panel. To overcome this limitation, we rely on the estimation of Bayesian

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[15] Forward means differencing can be considered as a combination of first differences and generalised least squares (Arellano and Bover, 1995).

[16] Its null hypothesis is that the included instruments are valid in the sense that they are uncorrelated with the error term. Simultaneously, the excluded instruments are properly excluded. A fundamental issue in the estimation of a panel-VAR model is to determine the optimal lag order (p). A higher number of lags tends to provide more efficient estimates because they ensure that $\mathrm{E}[\varepsilon_{\mathrm{i,t}}] = 0$; however, at the same time, as the number of lags increases, fewer observations are available to calculate the model.

[17] The stability condition of the panel-VAR model requires that the unit of all roots of matrix A are within the unit circle. This condition guarantees the invertibility of the model and allows it to be expressed as an infinite-order moving average of the innovations ($\varepsilon_{i,t}$).

[18] We assume that variables that first appear in the system must be more exogenous, and that those appearing afterwards are more endogenous, such that the variables appearing first affect the others simultaneously and with lags, whereas the variables that appear at the end, only affect the ones before throughout the lags. The enforcement of these restrictions allows uncorrelated residuals to be obtained, which are known as Orthogonalised Impulse Response Functions (OIRF). The OIRF serves as the basis to obtain a variance decomposition of the forecast error, which indicates the relative importance of the variation of a variable when faced with a shock in another, holding all other shocks constant at zero.

panel-VAR model (Doan et al., 1984; Canova and Ciccarelli, 2004; Koop and Korobilis, 2016). In the Bayesian panel-VAR model, the parameters are assumed to be random variables, characterized by an underlying probability distribution (Doan et al., 1984). To consider the full interdependencies between Northern and Southern European countries (in their respective panels), we draw upon a partial pooling analysis (Canova and Ciccarelli, 2013).

3.2 Data

We use a panel dataset that covers 27 countries for the period 2002-2015[19]. We exploit time and cross-country variation, whereas the estimations for the group of Northern and Southern countries have been computed for the sub-period 2009-2015, due to data limitations for the group of Southern countries[20]. The country sample has been selected to maximize the number of years with available information (see Table A2). All variables used in the econometric analysis come from the OECD Health Data and Social Protection Data for OECD countries and are listed in Table A3. All economic variables are measured in US dollars, constant prices, are adjusted for purchasing power parities (PPP) and refer only to public expenditure (e.g., government or compulsory schemes). We use GMM panel-VAR with one lag and one to four instruments for estimations using the whole

[19]Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Korea, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United States

[20] The underlying intuition about the estimation of the models for the two groups of European countries is to observe whether significant differences exist, given the fact that the countries that form part of each group have important similarities (cultural values, consideration of women's role, consideration of family, or whether the state is responsible for the caregiving of dependent people).

sample, but due to the reduced time dimension of the panel for Northern and Southern countries we have employed Bayesian panel-VAR estimation.

Dependent variables (see Table A1)

a) LTC expenditure per capita consist of a range of medical and personal services that are consumed with the primary goal of alleviating pain and reducing or managing deterioration in health status in patients with a degree of long-term dependency OECD, 2018)[21]. We distinguish between total, medical[22] and social LTC spending[23].
b) Health care expenditure per capita (OECD, 2017). We differentiate between total health care expenditure excluding LTC (related to health services)[24], inpatient and outpatient care, and pharmaceuticals.
c) GDP per capita (seasonally adjusted), female labour participation (40 years and older).

[21] The definition of health-care expenditure and long-term care expenditure, as well as their components, follows the System of Health Accounts methodology. Statistical information with this methodology is highly reliable and reputable and has been widely used. For example, data on health and long-term care expenditure have been used to evaluate health care system performance and its impact on the living conditions of EU citizens.
https://ec.europa.eu/economy_finance/publications/occasional_paper/2010/pdf/ocp74_en.pdf.
Nevertheless, the reports OECD (2017, 2018) recognize that separate guidelines may be important for national analysis in lower-income countries. However, we are not concerned by this heterogeneity because the group of low-income countries is not included in our sample.

[22] Medical or health-related LTC expenditure per capita: includes medical or nursing care (e.g. wound dressing, administering medication, health counselling, palliative care, pain relief and medical diagnosis with relation to a LTC condition), preventive activities to avoid deterioration in long-term health conditions and personal care services which provide help with activities of daily living (ADL) such as eating (support with food intake), bathing, washing, dressing, getting in and out of bed, getting to and from the toilet and managing incontinence.

[23] Social LTC expenditure per capita, which consists of assistance services that enable a person to live independently. They relate to help with instrumental activities of daily living (IADL) such as shopping, laundry, cooking, performing housework, managing finances, and using the telephone.

[24] Which includes curative care (inpatient and outpatient), rehabilitative care, preventive care and consumption of medical goods.

The coverage and comparability of LTC spending estimates have improved with the implementation of a "System of Health Accounts 2011" (OECD, 2017) which provides a framework for the measurement of health and LTC spending. However, in-depth analyses of data submissions suggested that full comparability of LTC spending data across OECD countries is still hampered to some extent (Mueller and Morgan, 2017)[25].

[Insert Figures 1 to 3 about here]

Figure A1 (Appendix A) depicts a linear association between per capita GDP and LTC spending, with a flattening out effect explained by two country outliers, namely Luxembourg and Norway. This evidence is consistent with the hypothesis that LTC is a normal good, and its investment increases with a country's economic development. Figure A2, shows that, consistent with expectations, female labour market participation exerts a steep effect on LTC spending. Finally, in Figure A3 we find evidence of a positive association between health spending and LTC spending, though it tails up at higher levels of spending.

Pre-estimation tests. To estimate a panel-VAR model, an important condition is for the variables to be stationary[26]. Accordingly, we employ two-unit root tests for panel data to test for stationarity, namely the Harris-Tzavalis (1999) and Im-Pesaran-Shin (2003) tests. The null hypothesis is that panels contain unit roots and are stationary. Importantly,

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[25] Analysis of long-term care spending performed by Mueller *et al*. (2020) suggests a close cross-country alignment of cost items for inpatient long-term care and there is a high consensus that costs for the frail elderly and elderly with dementia living in institutions are included under long-term (health) care. However, there are some differences across countries in the consideration of medicines consumed in residential facilities. Furthermore, there has been identified a group of countries that have under-reported long-term care spending elements (Australia, Denmark, Greece, Iceland, Poland, the Slovak Republic, and the United States).

[26] The presence of unit roots could give rise to a spurious association, indicating persistence in response to innovations when, in fact, there is none.

the results of both tests (see Table B1) strongly suggest that all the variables (LTC expenditures, HCE, female labour participation and GDP pc expressed in logarithms) do not follow a unit root process. Hence, non-stationarity is not a concern in our estimates. However, one potential concern is the presence of possible cross-section autocorrelation resulting from common factors (Levin et al., 2002). In those cases, we subtract the average of the group at each time for each time series.

4. Results

4.*1 Determination of panel-VAR length*

The decision on the order length of the panel-VAR is based on the tests of MMSC proposed by Andrews and Lu (2001)[27].Table B2 illustrates the results of the MMSC and Hansen's J statistic using four instruments for each of the endogenous variables (from the first to the fourth lagged dependent for both models). The results are shown using one, two, and three lags respectively. In all cases, the model with one lag is the one that simultaneously minimises the three criteria and corroborates the suitability of the instruments used.

4.2. Validation of the panel-VAR model

After performing the Granger causality Wald tests for each equation of the underlying panel-VAR model we examine the stability condition of panel-VAR. The results

[27] However, before considering them and as a starting point, a specification has been sought to satisfy the test of overidentification proposed by Hansen (1982), keeping in mind that this is an indispensable requirement before searching for the lag length that minimises MMSCAIC, MMSCBIC, and MMSCHQIC.

of the Granger causality test are displayed in Table B3, although predicted associations should be considered with reservation and tested with additional analysis.

4.3. Variance decomposition of forecast error

Tables B5 and B6 show the variance decomposition of the forecast error for the two proposed models (including different variants depending on the use of the different types of LTC expenditures and HCE) and different groups of countries.

Variance error decomposition for long-term care expenditures. We find that female labour participation (of women over 40 years of age) explains about 80% of Forecast Error Variance (FEV) of LTC expenditures in Nordic countries for both total and health- and social-related expenditures. This percentage is much higher than the one observed for all countries (1.9% for total LTC, 6.5% for health LTC, and 16.7% for social LTC) and especially for Southern countries (3.8%, 15.7%, and 14.9%, respectively). In contrast, social LTC expenditures explain 12.1% of the FEV of female labour participation in Nordic countries, compared with a percentage lower than 1% in the group of all countries and Southern countries. Finally, when we examine total LTC expenditures we find that it explains 23.9% of the FEV of total health expenditures for the group of all countries – an amount below the 70.3% of Nordic countries. For the entire sample, LTC expenditures explain 19.71% of the FEV, in contrast to 3.91% for social LTC expenditures[28].

[28] Regarding GDPpc, we find that it can explain up to 34.3% of the FEV of the total LTC expenditures in Southern countries, which is three times higher than in Nordic countries and ten times higher than in the group of all countries. In contrast, total LTC expenditures can explain 13.44% of the FEV of GDPpc in Nordic countries, considerably different from the other cases (5.73% for all countries and 3.04% for Southern countries).

Variance error decomposition for caregiving spillovers. We find that total HCE explains 5.77% of the FEV of total LTC expenditures, and 3.47% in Southern countries, but it is not significant for all countries. On the other hand, an LTC shock accounts for 5.11% of the variation of HCE for all countries (19.71% in Nordic countries, 4.48% in Southern countries). Similarly, LTC shocks explain a higher percentage of the variation in outpatient, inpatient and medicine expenditure in Nordic countries. A result of particular interest is the higher contribution of LTC shock to the variance of GDP pc: 18.88% for all countries, 27.63% for Nordic countries and 15.35% for Southern countries (as compared to the effect of HCE shock: not significant for all countries, 2.61% for Nordic countries and 3.32% for Southern countries).

4.4. Model estimates

4.4.1. Female labour participation effects on LTC expenditure and per capita GDP (GDP pc).

Table 1 reports the results of the panel-VAR model for the female participation rate, LTC expenditures (total, health, and social) and GDP pc. We display the estimates for all countries in the first column, Northern countries in the second one and Southern countries in the last one. We find that a 1% increase in the female participation rate in one period raises total LTC expenditures by 1.48% during the following period. However, in Northern countries, the response of LTC expenditures is almost four times as large (3.96%), whilst it is not significant in Southern countries.

Next, we distinguish between health and other components, and we document that a 1% increase in female labour market participation increases the health component of LTC spending by 1.5% and the social component by 1.42% for the group of all countries. Finally, and consistent with the evidence of 'care economy effects', we document that a 1% increase in LTC total expenditures give rise to a 0.2% GDP pc increase in the next period for the entire sample, yet this effect is larger among in Northern countries (1.05%) than in Southern countries (0.59%). Such results are explained by the presence of supply constraints in several countries as caregivers' wages fall at the lower end of the pay distribution. Yet, a rise in caregivers' wages gives rise to a subsequent GDP rise. Although the magnitude of these figures may seem large, the results are consistent when compared with those of De Henau et al. (2016), who examine the multiplier effect of increased spending in the care sector on the economy. If 2% of GDP was invested in the care industry, total GDP would grow between 7.7% (US) to 4.8% (Denmark).

The health component of LTC drives the overall effect, and that of Northern countries, but in Southern countries, it is channelled mainly through the LTC social component. Finally, we find that an increase of 1% in LTC expenditures in one period raises the female participation rate by 0.051% in the subsequent period in Northern countries, although it is not significant for the total of the sample or for Southern countries.

[Insert Table 1 about here]

4.4.2. LTC expenditure effects on health and per capita GDP

Table 2 provides the results of the panel-VAR model for total LTC expenditures, HC expenditures, and per capita GDP. We find that a 1% increase in LTC expenditure during one period gives rise to a 0.6% reduction in HCE in the subsequent period. The reduction for the group of Nordic European countries is almost three times the average (1.78%). In contrast, the effect is estimated to be slightly smaller, 0.55% among the group of Southern European countries.

When we disentangle the effect by types of care, we find that social LTC expenditures is the main driver of HCE reductions in the entire sample and for Southern countries. In contrast, we do not find large reverse effects: a 1% increase in HCE in one period reduces total LTC expenditures in the following period by a small amount (–0.31%) in Northern countries, and comparatively, this reduction is six times lower than the effect of total LTC expenditures on HCE. The opposite occurs in Southern countries, for whom an increase of 1% in HCE reduces total LTC expenditures in the subsequent period by 0.6569%, which is more than the opposite effect.

Finally, and consistently with the productive effects of a care economy, we document that a 1% increase in total LTC expenditure increases GDP pc by 0.20% in the next period. This increase is mainly driven by health component of LTC expenditure in all countries and Northern countries, and by social LTC expenditure in Southern countries. In contrast, a 1% increase in HCE does not affect GDP pc in the next period for the total sample[29].

[Insert Tables 2 to 5 about here]

[29]We find a small effect for Northern and Southern countries (0.82% and 0.30%, respectively).

a) Inpatient expenditure

Table 3 reports the results for the panel-VAR model that includes LTC expenditures, inpatient health care expenditures, and per capita GDP. We document that a 1% increase in LTC expenditures reduces inpatient expenditures by 0.5% for all countries, which is driven by social LTC expenditures.

In contrast, an increase of 1% in inpatient expenditures leads to a smaller reduction in total LTC expenditures by 0.31% for the entire sample. As for GDP pc, we find that a 1% increase in total LTC expenditure increases GDP pc in the next period by roughly 0.2% for all countries, but an increase in inpatient expenditure does not affect per capita GDP. Yet, the effect in Northern (Southern) countries is 1.5 (1.41) times higher compared to an equivalent increase in inpatient expenditure.

b) Outpatient expenditure

The results of the panel-VAR model for outpatient expenditures are reported in the Table 4. They suggest that a 1% increase in LTC expenditures only delivers small and significant effects in Northern European countries (a reduction in outpatient expenditures by 0.26% in the subsequent period). When we distinguish the type of LTC spending, we find that a 1% increase in health LTC expenditures leads to a reduction in outpatient expenditures by 0.12% in Northern countries and 0.12% in Southern countries. Similarly, we find that a 1% increase in outpatient expenditures reduces health LTC expenditures in Southern countries (–2.73%), and in social LTC expenditures in Northern countries (–1.93%). As expected, we find that both LTC and outpatient expenditure exert a positive effect on GDP pc, but the effect of the former is 2.65 times higher than the latter. Health LTC expenditure is the main responsible driver of the boost in GDP pc in Northern countries, whereas social LTC expenditure is the main driver in Southern countries.

c) Medicine expenditure

Table 5 reports the results of the panel-VAR model for LTC expenditures, medicines expenditures and GDP pc. We find that a 1% increase in LTC reduces medicinespending by 0.867% in the whole sample and by 1.12% in Northern countries. This reduction is driven mainly by social LTC expenditures (0.8956% and 1.0675%, respectively). In contrast, a 1% increase in medicine expenditures exerts negligible effects on LTC expenditures (–0.01% for all countries and –0.04% for Northern countries). As for economic growth, the effect of a 1% increase in LTC expenditure over GDP pc is almost 5 times (0.2778% vs. 0.0580%) higher than an equivalent increase in medicine expenditure. Such a difference rises by 8 times when evaluated only among the sample of Northern countries.

4.5. Impulse response functions

An important visual examination is that of examining the impulse response functions (IRF) of the response variable (in logs) to a one standard deviation shock in an impulse variable (in logs). Each figure represents the dynamics of the response, as well as the lower and upper confidence intervals at a 95% significance level[30].

[30] Given that the IRFs are computed using the estimated panel-VAR coefficients, the standard errors of these coefficients are retrieved from Monte Carlo simulations, in which the parameters of the model are

Figure 1 plots the IRF of a one standard deviation shock in the female labour participation over LTC expenditures (total, health, and social) for all countries and for the group of Northern and Southern countries. Response functions depict the evolution of the response variable during the subsequent periods (years) resulting from a change in the impulse variable (female labour participation) by one standard deviation. We find that an increase in female labour participation in one period leads to a decrease in the total LTC expenditures in the subsequent period. When we examine the specific effects of health and social LTC expenditures, the described pattern suggests an initial increase (of 0.03% and 0.02% respectively).

In Northern countries, we find that an increase in female labour participation gives rise to an increase in total LTC expenditures by 0.04%, which subsequently increases until it reaches 0.25% after five periods. For health LTC expenditures, a V-shaped pattern is observed with an increase of 0.2% in the first period, followed by a decrease in the next period. In contrast, in Southern countries, the effect on total and social LTC expenditures is imperceptible, and the increase in health LTC expenditures is the only item that deserves noting (0.01% in the first period, with an increasing tendency).

[Insert Figure 1 about here]

Figure 2 compares the IRF of total LTC expenditure over GDP pc in the two models. A one standard deviation increase of total LTC expenditure increases GDP pc between

re-calculated 200 times using the estimated coefficients and their variance-covariance matrices as underlying distribution.

1.25% (model 1) and 1.5% (model 2) after 5 years and would reach almost 2.5% for Northern countries. GDP pc growth appears to stabilize in the last two years for the all-country sample, whereas for the Northern and Southern countries it still shows a steep slope.

[Insert Figure 2 about here]

Figure 3 shows the IRF of total LTC expenditure over HCE and its components. One standard deviation increases of total LTC expenditure leads to a reduction in total HCE by 0.5% after five periods (-0.5% for Northern countries and -0.2% for Southern countries). Yet, the impact over inpatient expenditure is higher than for outpatient expenditure. Finally, a one standard deviation increase of LTC expenditure reduces medicines expenditure by almost 0.2% in Northern countries, even though the overall impact is roughly -0.1%.

[Insert Figure 3 about here]

4.6. Robustness checks

4.6.1 Alternative Granger causality tests.

As an additional approach to gauge the predictive power of the variables in the baseline panel-VAR model, in addition to the Granger causality tests in line with Abrigo and Love (2016), we also have performed a sequence of pairwise Dumistrescu and Hurlin (2012) Granger causality tests for all model variables. This test is developed for heterogeneous panels based on individual Wald statistics of Granger non-causality computed for each cross-section unit and then averaged over all cross-section units in the sample[31].

4.6.2 Unit root tests.

We estimate evidence of panel stationarity. This result adds to the long debate on the stationarity of GDP per capita[32]. Hence, as a robustness test, we have performed the test proposed by the Carrión-Silvestre et al. (2005), which has the advantage of allowing multiple structural breaks in panel data. The results (available upon request) strongly reject the null hypotheses of unit root and as the test statistics is based on the use of bootstrap critical values, it is robust to the presence of cross-section dependence.

5. Conclusion

This paper has conducted the first large-scale cross-country analysis of dynamic determinants of LTC spending, and its impact on health care and economic performance (GDP pc). We draw on a panel-VAR (Abrigo and Love, 2016) that exploits evidence from a panel for 25 industrialised countries from the period 2002–2015.

We have empirically examined the effect of changes in the labour market participation of traditional caregivers (women over 40 years of age) alongside the dynamic effect of LTC spending on health expenditures and GDP per capita to document the presence of 'caregiving spillovers'. Certainly, our estimates may be affected by measurement error, which is likely to be an important component of the income shock

[31] The null hypothesis states that there is no causal relationship for any of the units of the panel, whereas under the alternative hypothesis there is a causality relationship for at least one cross-sectional unit.
[32] While Cheung and Chinn (1996), Rapach (2002), and Ozturk *et al.* (2008) have obtained results against the stationarity of GDP for several OECD panels, Fleissig and Strauss (1999) and Chang *et al.* (2009) have obtained results in favour of the hypothesis of stationarity.

considered in the panel-VAR system. As we examine only unanticipated shocks to female labour participation, healthcare and LTC expenditure, one could consider other shocks such as disability and other health-related shocks.

Our findings suggest that a 1% increase in the labour market participation of the traditional caregiver (women over the age of 40) leads to a 1.48% increase in LTC expenditure yet reveal significant heterogeneity in its effect size among countries (reaching a maximum of 3.96% in Northern European countries, but no effect in Southern European countries). This effect is explained by the differential availability of both care and cash subsidies in Southern European countries (Spasova et al., 2018). An increase of approximately one percentage point of female labour participation leads to an increase in LTC expenditures of 0.03% (which reaches 0.25% in Nordic European countries).

The relevance of this result increases when related to the claims of De Henau and Himmelweit (2021) who state that in the post-Covid 19 environment, one would need to more than double the supply of care in the EU-28 and the US. Investment in LTC can give rise to a much stronger caring economy, generating jobs not only in the care sector, but also in related industries, which would stimulate economic performance through the spending generated by new workers. In the short term, this government stimulus may be partially amortized by generating higher tax revenues and reducing the net cost of the stimulus.

Consistent with the 'caregiving spillover hypothesis', we find that a 1% increase in LTC expenditures gives rise to a reduction in HCE by 0.6% in the subsequent year. This percentage is slightly lower in the group of Southern European countries (0.55%) but is almost three times as large in the sample of Northern European countries (1.78%). These estimates are explained by the fact that in Northern countries the provision of health and LTC is the responsibility of municipal governments (Iversen et al., 2016). Yet, the effects differ depending on the type of both health and LTC spending examined. Hence, proposals considering the extension of the subsidisation of LTC should specifically consider the potential returns at least in the range of 0.5€ invested in LTC.

Finally, our results document that spending in public LTC does not reduce GDP pc; the latter results from the effects of training formal caregivers and expanding employment in the sector. This positive effect of public LTC over GDP pc is in turn channelled through the effect of health-related services in Nordic European countries but is channelled through social-related services in the group of Southern European countries.

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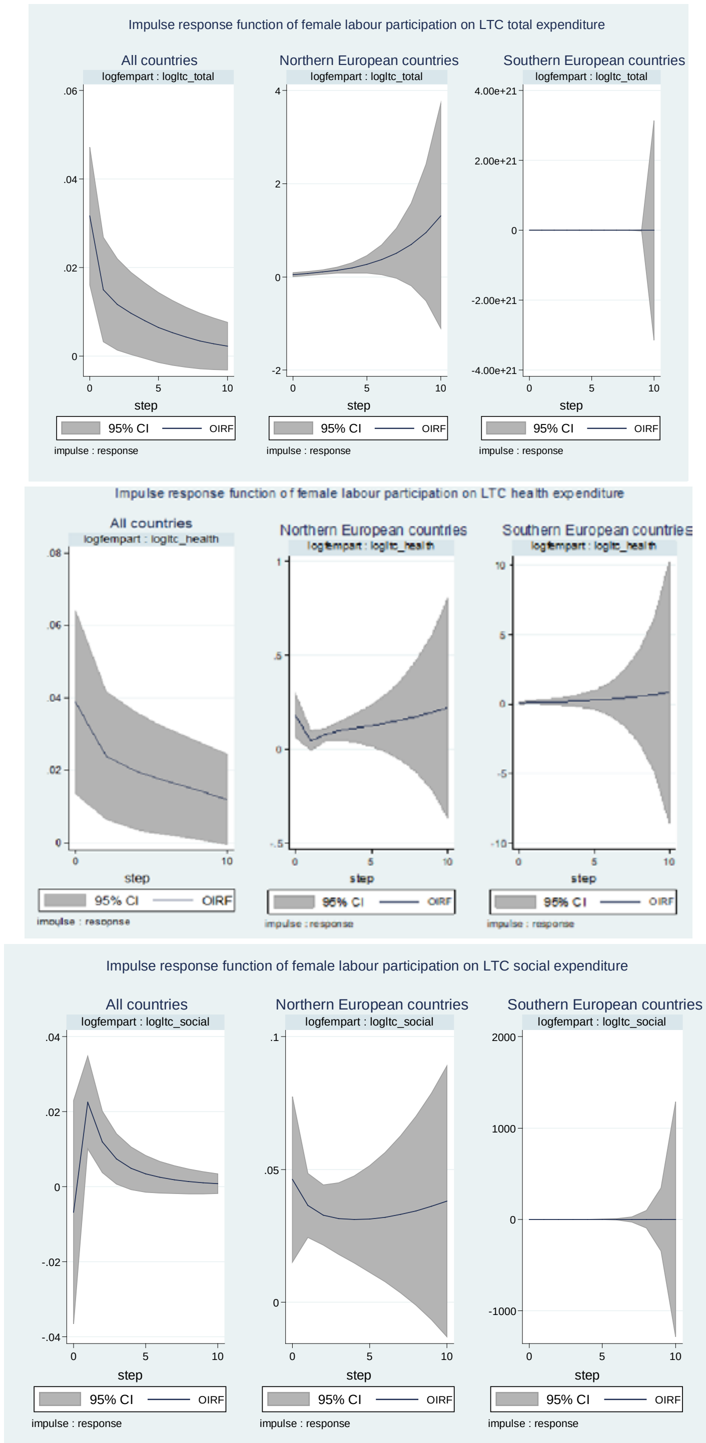
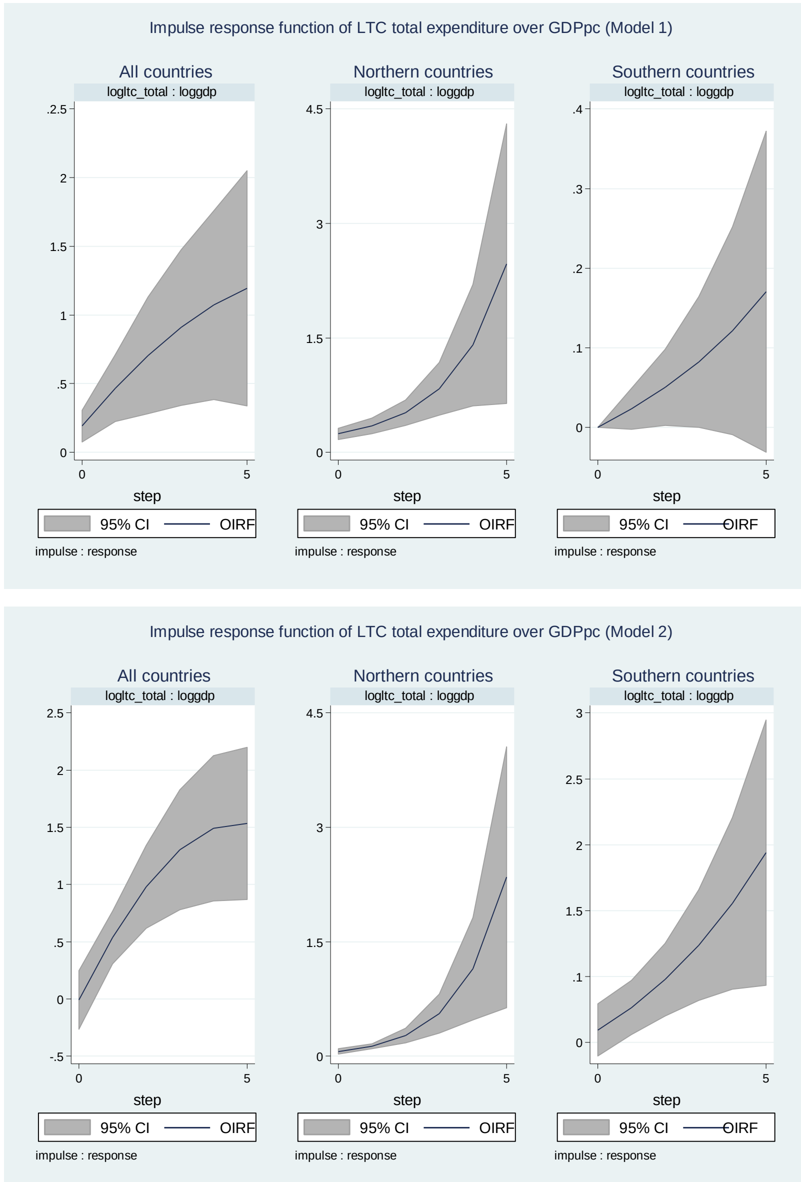
Figures and Tables

Figure 1. Impulse response function of female labour participation



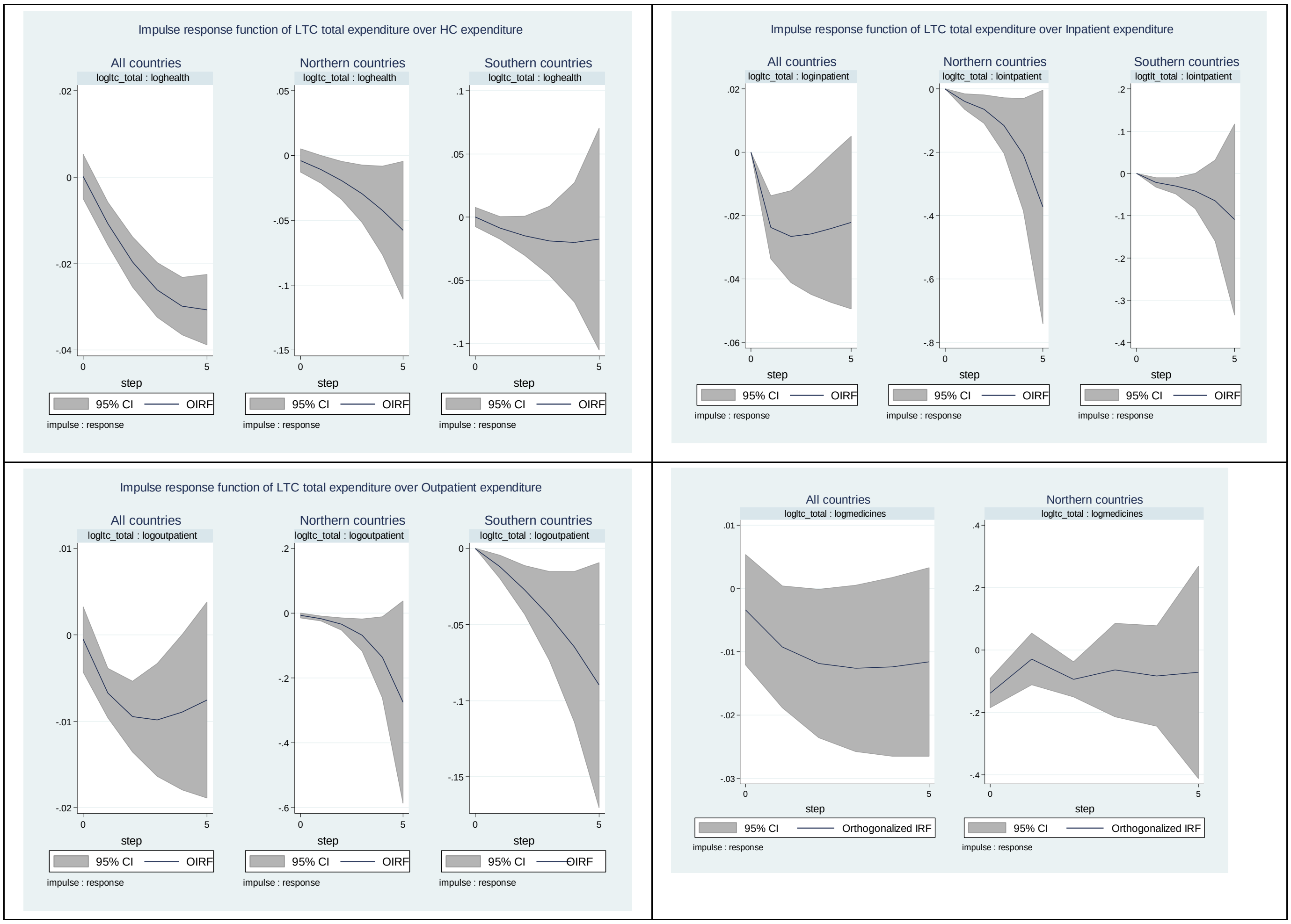
Figures show the ortogonalized impulse response functions (OIRF) along with 95% confidence intervals ("impulse variable" in logs; "response variable" in logs) based on 200 Monte Carlo simulations with 200 repetitions. In each figure the horizon (5 periods) is set on the x-axis and the percentage change in the response variable is on the y-axis. Estimation of GMM panel-VAR for all countries and Bayesian panel-VAR for Northern and Southern countries. Step: time unit equivalent to one year.

Figure 2. Impulse response function of LTC expenditure over GDP pc



Figures show the ortogonalized impulse response functions (OIRF) along with 95% confidence intervals (“impulse variable” →“response variable”) based on 200 Monte Carlo simulations with 200 repetitions. In each figure the horizon (5 periods) is set on the x-axis and the percentage change in the response variable is on the y-axis. Model 1 (FemPart, LTC, GDP pc) and Model 2 (LTC, HC, GDP pc). Estimation of GMM panel-VAR for both models with one lag and one to four lags in the endogenous instruments has been estimated. Step: time unit equivalent to one year.

Figure 3. Impulse response function of LTC expenditure over HC expenditure



Figures show the ortogonalized impulse response functions (OIRF) along with 95% confidence intervals ("impulse variable" in logs; "response variable" in logs) based on 200 Monte Carlo simulations with 200 repetitions. In each figure the horizon (5 periods) is set on the x-axis and the percentage change in the response variable is on the y-axis. Estimation of GMM panel-VAR for all countries and Bayesian panel-VAR for Northern countries. Step: time unit equivalent to one year.

Table 1. Panel-VAR for Female labour participation, LTC expenditure and GDP pc

	LTC Expenditure (in logs)			Health LTC Expenditure (in logs)			Social LTC Expenditure (in logs)		
	All countries	Northern European Countries	Southern European countries	All countries	Northern European Countries	Southern European countries	All countries	Northern European Countries	Southern European countries
Eq: LogFempart									
LogFempart(-1)	0.651***	1.677***	0.812	0.642***	1.363***	0.825***	0.684***	1.207***	0.847*
	(0.063)	(0.121)	(1.362)	(0.058)	(0.194)	(0.087)	(0.062)	(0.122)	(0.500)
LogLTC(-1)	0.007	0.051***	1.373	0.008***	0.039	0.047*	-0.004	0.008***	0.056
	(0.005)	(0.015)	(7.338)	(0.003)	(0.028)	(0.027)	(0.003)	(0.003)	(0.034)
LogGDP pc(-1)	0.127***	0.047**	0.294	0.129***	0.077**	0.098	0.127***	0.016	0.079
	(0.024)	(0.022)	(1.545)	(0.023)	(0.031)	(0.185)	(0.025)	(0.024)	1.456)
Eq: LogLTC									
LogFempart(-1)	1.479**	3.957***	3.426	1.514***	3.810***	0.818	1.420***	4.888***	3.575**
	(0.438)	(0.874)	(3.162)	(0.434)	(1.730)	(0.603)	(0.527)	(0.812)	(1.589)
LogLTC(-1)	0.188***	-0.510***	1.079***	-0.036	-0.179	0.560***	0.298***	-0.244***	0.920***
	(0.057)	(0.115)	(0.364)	(0.064)	(0.699)	(0.099)	(0.089)	(0.042)	(0.292)
LogGDP pc(-1)	0.810***	3.213***	7.462*	0.357*	1.863**	2.415**	1.009***	7.472***	4.281**
	(0.226)	(0.373)	(3.966)	(0.210)	(0.786)	(0.996)	(0.261)	(0.307)	(1.873)
Eq: LogGDP pc									
LogFempart(-1)	0.186*	0.643***	0.053	0.141	0.688***	0.674	0.320***	0.329***	0.213
	(0.110)	(0.228)	(0.141)	(0.095)	(0.190)	(0.429)	(0.114)	(0.119)	(0.132)
LogLTC(-1)	0.238***	1.053***	0.590**	0.172***	0.859***	0.0820***	0.055**	0.114***	0.488***
	(0.013)	(0.014)	(0.035)	(0.038)	(0.0209)	(0.004)	(0.021)	(0.024)	(0.120)
LogGDP pc(-1)	0.514***	0.069**	0.241	0.550***	0.050	1.308	0.516***	0.322***	0.153
	(0.061)	(0.028)	(0.304)	(0.074)	(0.046)	(1.225)	(0.077)	(0.028)	(0.158)
N	350	28	28	350	28	28	350	28	21
Criterion function	0.234	0.606	0.398	0.238	0.604	0.498	0.230	0.702	0.454
Hansen's J statistic	53.616	21.818	8.763	52.923	21.758	12.443	52.647	25.267	9.988

Note: Dependent variables in logarithms. Helmert transformation applied before estimation. Heteroscedasticity and serial correlation robust standard errors between parenthesis. ***, ** and ** denote significance at the 1%, 5% and 10% significance level, respectively. Estimations for all countries: 2002-2015. Estimation of GMM panel-VAR with one lag and one to four lags in the endogenous instruments.Estimations for Northern countries and Southern countries: 2009-2015. Northern countries include Denmark, Finland, Norway and Sweden. Southern countries include Greece, Italy, Portugal and Spain. LTC_Social not available for Greece. Estimation of Bayesian panel-VAR. Standard errors are obtained after 100 Monte Carlo repetitions.

Table 2. Panel-VAR for Total HC expenditure

	LTC Expenditure (in logs)			Health LTC Expenditure (in logs)			Social LTC Expenditure (in logs)		
	All countries	Northern European Countries	Southern European countries	All countries	Northern European Countries	Southern European countries	All countries	Northern European Countries	Southern European countries
Eq: LogLTC									
LogLTC(-1)	0.8648***	1.5684***	2.3241*	0.9691***	0.9448***	0.8064***	0.5635***	2.1541***	0.8769***
	(0.0698)	(0.1083)	(1.603)	(0.0756)	(0.0723)	(0.0496)	(0.1460)	(0.7493)	(0.1226)
		-	-					-	
LogHC total(-1)	-0.0336	0.3076***	0.6569***	-0.2005	-0.0464	-0.5699**	-0.0378	2.2273***	-0.7037**
	(0.0240)	(0.0303)	(0.2162)	(0.1793)	(0.1149)	(0.2785)	(0.0235)	(0.398)	(0.3242)
LogGDP pc(-1)	0.0327	0.4499***	0.2750*	0.0429	0.1949	0.4068	0.0318	3.4885***	2.1150**
	(0.0381)	(0.0516)	(0.1537)	(0.3134)	(0.1577)	(0.5796)	(0.0343)	(0.6606)	(1.2213)
Eq: LogHC total									
	-	-		-	-	-	-	-	-
LogLTC(-1)	0.6033***	1.7852***	-0.5558**	0.2352***	1.6909***	0.1530***	0.3941***	0.1017***	0.3988***
	(0.1851)	(0.6076)	(0.2404)	(0.0636)	(0.5055)	(0.0189)	(0.0969)	(0.0238)	(0.1350)
LogHC total(-1)	0.5377***	2.2399***	0.4728***	0.8229***	1.2554***	0.7442***	0.8791***	0.7584***	-0.9736*
	(0.0765)	(0.1950)	(0.1212)	(0.0888)	(0.0166)	(0.1099)	(0.0991)	(0.1275)	(0.5604)
LogGDP pc(-1)	0.4731***	2.1770***	0.0424	0.0775	0.8929***	0.1844	0.0042	0.5827***	1.0492*
	(0.0780)	(0.2013)	(0.2589)	(0.1844)	(0.1378)	(0.2233)	(0.2054)	(0.0494)	(0.5819)
Eq: LogGDP pc									
LogLTC(-1)	0.2034***	1.0891**	0.6111***	0.1856***	0.8480***	0.0831***	0.0536***	0.1312***	0.5018***
	(0.0569)	(0.4504)	(0.1258)	(0.0534)	(0.0497)	(0.0222)	(0.0149)	(0.0346)	(0.0680)
LogHC total(-1)	0.0294	0.8222***	0.3006***	0.0062	0.3032***	0.4611*	0.0544	0.2781	-.2052
	(0.0703)	(0.1447)	(0.0570)	(0.0569)	(0.0581)	(0.2595)	(0.0386)	(0.1932)	(0.2421)
LogGDP pc(-1)	0.5331***	0.0711**	0.3427	0.5650***	0.0707	1.3234	0.5472***	0.3331***	0.2019
	(0.0632)	(0.0314)	(0.3047)	(0.0651)	(0.0558)	(2.3201)	(0.0812)	(0.0367)	(0.2150)
N	350	28	28	350	28	28	336	28	21
Criterion function	0.2267	0.7993	0.7628	0.2312	0.7792	0.8197	0.2191	0.7342	0.4731
Hansen's J statistic	417.074	287.736	152.552	529.471	280.497	163.947	466.582	293.697	99.353

Note: Dependent variables in logarithms. Helmert transformation applied before estimation. Heteroscedasticity and serial correlation robust standard errors between parenthesis. ***, ** and ** denote significance at the 1%, 5% and 10% significance level, respectively. Estimations for all countries: 2002-2015. Estimation of GMM panel-VAR with one lag and one to four lags in the endogenous instruments. Estimations for Northern countries and Southern countries: 2009-2015. Northern countries include Denmark, Finland, Norway and Sweden. Southern countries include Greece, Italy, Portugal and Spain. LTC_Social not available for Greece. Estimation of Bayesian panel-VAR. Standard errors are obtained after 100 Monte Carlo repetitions.

Table 3. Panel-VAR for Inpatient expenditure

	LTC Expenditure (in logs)			Health LTC Expenditure (in logs)			Social LTC Expenditure (in logs)		
	All countries	Northern European Countries	Southern European countries	All countries	Northern Euruopean Countries	Southern European countries	All countries	Northern Euruopean Countries	Southern European countries
Eq: LogLTC									
LogLTC(-1)	0.9181***	1.7957***	0.7167***	0.9538***	1.0612***	0.6269***	0.9277***	10.5031***	-
	(0.0835)	(0.1107)	(0.1571)	(0.0661)	(0.0885)	(0.0400)	(0.2166)	(3.9341)	-
	-	-				-	-		
LogInpatient(-1)	0.3091***	0.2042***	-1.1032**	-0.3043**	-0.1860	1.1450***	0.3187***	-1.5989***	-
	(0.0183)	(0.0300)	(0.0456)	(0.1256)	(0.1509)	(0.0980)	(0.0525)	(0.2403)	-
LogGDP pc(-1)	0.0089	0.2693***	0.0647	0.1664	0.1362	0.1801	0.1161	7.4449***	-
	(0.0289)	(0.0713)	(0.1505)	(0.3092)	(0.2302)	(0.8546)	(0.0712)	(1.1103)	-
Eq: LogInpatient									
		-	-			-	-		
LogLTC(-1)	-0.5054**	1.3693***	1.0668***	-0.0261*	-0.4231***	0.8717***	0.5076***	-0.9670***	-
	(0.2303)	(0.3382)	(0.1404)	(0.0143)	(0.0050)	(0.0129)	(0.1766)	(0.1416)	-
LogInpatient(-1)	0.6831***	1.5811***	0.6020***	0.6456***	1.0938***	0.6990***	0.5043***	1.3235***	-
	(0.0591)	(0.0701)	(0.0399)	(0.0602)	(0.0350)	(0.0117)	(0.0774)	(0.1224)	-
LogGDP pc(-1)	0.5016***	1.0282***	0.3514	0.5144***	1.1583***	0.4422*	0.5125***	0.7726***	-
	(0.1245)	(0.2477)	(0.2806)	(0.1229)	(0.0802)	(0.2383)	(0.1101)	(0.1150)	-
Eq: LogGDP pc									
LogLTC(-1)	0.1977***	1.0557***	0.4733***	0.1788***	0.7359***	0.0681***	0.0602***	0.1627***	-
	(0.0545)	(0.3466)	(0.0591)	(0.0488)	(0.0365)	(0.0188)	(0.0128)	(0.0434)	-
LogInpatient(-1)	0.0277	0.6972***	0.3352**	0.0117	0.3255***	0.1101***	0.1321*	0.3171***	-
	(0.0471)	(0.0954)	(0.1155)	(0.0541)	(0.0697)	(0.0207)	(0.0790)	(0.1060)	-
LogGDP pc(-1)	0.5611***	0.0972***	0.4506	0.5791***	0.1306	1.2289	0.5942***	0.4138***	-
	(0.0844)	(0.0156)	(0.3107)	(0.0868)	(0.1010)	(1.1029)	(0.1121)	(0.0754)	-
N	322	28	21	322	28	21	308	28	-
Criterion function	0.2028	0.8045	0.6078	0.1888	0.5502	0.5043	0.2138	0.7117	-
Hansen's J statistic	425.874	289.603	121.559	396.500	198.074	100.866	416.874	284.697	-

Note: Dependent variables in logarithms. Helmert transformation applied before estimation. Heteroscedasticity and serial correlation robust standard errors between parenthesis. ***, ** and ** denote significance at the 1%, 5% and 10% significance level, respectively. Estimations for all countries: 2002-2015. Estimation of GMM panel-VAR with one lag and one to four lags in the endogenous instruments.Estimations for Northern countries and Southern countries: 2009-2015. Northern countries include Denmark, Finland, Norway and Sweden. Southern countries include Greece, Italy, Portugal and Spain. LTC_Social not available for Greece and inpatient expenditure not available for Italy. Estimation of Bayesian panel-VAR. Standard errors are obtained after 100 Monte Carlo repetitions.

Table 4. Panel-VAR for Outpatient expenditure

	LTC Expenditure (in logs)			Health LTC Expenditure (in logs)			Social LTC Expenditure (in logs)		
	All countries	Northern European Countries	Southern European countries	All countries	Northern European Countries	Southern European countries	All countries	Northern European Countries	Southern European countries
Eq: LogLTC									
LogLTC(-1)	0.9287***	1.5835***	0.9763***	0.9908***	0.9873***	1.1446***	0.6475***	1.4169***	0.8272***
	(0.0697)	(0.1643)	(0.2110)	(0.0646)	(0.0950)	(0.0479)	(0.1088)	(19.154)	(0.0680)
LogOutpatient(-1)	-0.0006	-0.0341***	-0.5278***	-0.1851	-0.0477	-2.7341***	0.3882***	-1.9360***	-0.2091
	(0.0106)	(0.0122)	(0.0469)	(0.1207)	(0.0513)	(0.4085)	(0.0938)	(0.6351)	(0.1365)
LogGDP pc(-1)	0.0287	0.1236**	0.0878	0.0509	1.5792***	0.9805	0.7016*	3.6841***	1.6601
	(0.0260)	(0.0599)	(0.2100)	(0.2847)	(0.1838)	(0.6496)	(0.3587)	(1.527)	(0.9803)
Eq: LogOutpatient									
LogLTC(-1)	-0.0136	-0.2646***	-0.1269	-0.0250	-0.1262***	-0.1190***	-0.1190*	-0.1730***	-0.0900*
	(0.4525)	(0.0158)	(0.4910)	(0.0285)	(0.0050)	(0.0398)	(0.0654)	(0.0529)	(0.0535)
LogOutpatient(-1)	0.8672***	0.2583***	0.3742**	0.9557***	1.1138***	0.1112	1.1761***	1.4395***	-0.0177
	(0.1245)	(0.0459)	(0.1522)	(0.1025)	(0.0331)	(0.1377)	(0.0641)	(0.1621)	(0.0966)
LogGDP pc(-1)	0.0326	0.2443	0.0547	0.1045	0.5145***	-0.1949	0.2323	-0.0679	2.6602***
	(0.2717)	(0.1694)	(0.2404)	(0.2864)	(0.1948)	(0.3569)	(0.1792)	(0.0899)	(0.4308)
Eq: LogGDP pc									
LogLTC(-1)	0.2101***	0.9827***	0.6286***	0.2215***	0.8257***	0.0866***	0.0635***	0.1428***	0.5190***
	(0.0540)	(0.2559)	(0.1506)	(0.0483)	(0.0589)	(0.0294)	(0.0146)	(0.0349)	(0.0538)
LogOutpatient(-1)	0.0790**	0.1074***	0.0149	0.0527	0.0740**	0.5726**	0.0858***	0.1709***	0.0390
	(0.0359)	(0.0275)	(0.0434)	(0.0324)	(0.0306)	(0.2493)	(0.0272)	(0.0333)	(0.0255)
LogGDP pc(-1)	0.5234***	0.0838**	0.3481	0.5154***	0.0826	1.3655	0.5829***	0.3494***	0.2016
	(0.0926)	(0.0311)	(0.2512)	(0.1272)	(0.0599)	(1.2128)	(0.1032)	(0.1024)	(0.1399)
N	336	28	28	336	28	28	322	28	21
Criterion function	0.2080	0.7958	0.9161	0.2277	0.8311	0.6776	0.5344	0.6453	0.6825
Hansen's J statistic	440.928	286.474	201.538	475.804	299.181	149.073	325.954	258.123	191.088

Note: Dependent variables in logarithms. Helmert transformation applied before estimation. Heteroscedasticity and serial correlation robust standard errors between parenthesis. ***, ** and ** denote significance at the 1%, 5% and 10% significance level, respectively. Estimations for all countries: 2002-2015. Estimation of GMM panel-VAR with one lag and one to four lags in the endogenous instruments.Estimations for Northern countries correspond to the period 2009-2015. Northern countries include Denmark, Finland, Norway and Sweden. Estimation of Bayesian panel-VAR. Standard errors are obtained after 100 Monte Carlo repetitions.
Insufficient observations for social LTC expenditure for Southern countries.

Table 5. Panel-VAR for Medication expenditure

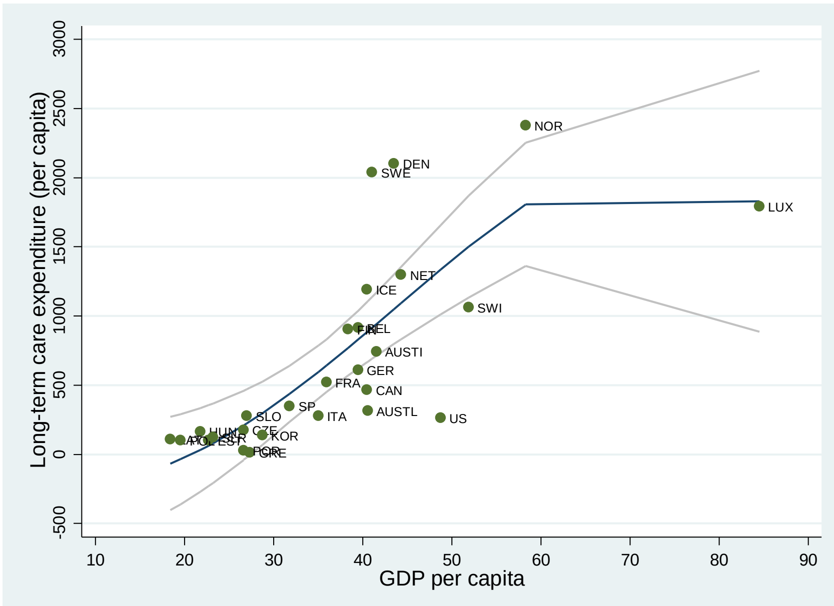
	LTC Expenditure (in logs)		Health LTC Expenditure (in logs)		Social LTC Expenditure (in logs)	
	All countries	Northern European Countries	All countries	Northern European Countries	All countries	Northern European Countries
Eq: LogLTC						
LogLTC(-1)	0.8817***	1.7128***	0.8702***	0.9249***	2.5137***	5.1612***
	(0.0709)	(0.1086)	(0.0518)	(0.0398)	(0.4233)	(1.501)
LogMedicine(-1)	-0.0181*	-0.0400***	-0.2017	-0.0582*	-0.0505	-0.0471***
	(0.0105)	(0.0099)	(0.1306)	(0.0330)	(0.2116)	(0.0108)
LogGDP pc(-1)	0.0042	0.4970***	0.4329	0.5193***	7.9770***	1.8110
	(0.0318)	(0.0972)	(0.3535)	(0.1496)	20.013	(1.5221)
Eq: LogMedicine						
LogLTC(-1)	-0.8691**	-1.1199***	-0.0898***	-0.0648***	-0.8956***	-1.0675***
	(0.4021)	(0.2053)	(0.0228)	(0.0092)	(0.0744)	(0.3872)
LogOutpatient(-1)	-0.8691**	-1.1199***	-0.0898***	-0.0648***	-0.8956***	-1.0675***
	(0.4021)	(0.2053)	(0.0228)	(0.0092)	(0.0744)	(0.3872)
LogGDP pc(-1)	0.2911*	5.6216***	0.1728	1.4261***	1.0177***	1.0217***
	(0.1756)	10.105	(0.1838)	(0.3744)	(0.3205)	(0.3850)
Eq: LogGDP pc						
LogLTC(-1)	0.2778**	1.0973**	0.1892***	0.7529**	0.0702**	0.1744***
	(0.0940)	(0.4622)	(0.0132)	(0.1125)	(0.0358)	(0.0515)
LogMedicine(-1)	0.0580*	0.1364***	0.0643*	0.1274***	0.0272	0.1404
	(0.0338)	(0.0365)	(0.0390)	(0.0289)	(0.0263)	(0.1479)
LogGDP pc(-1)	0.5513***	0.1283**	0.6170***	0.1488***	0.6154***	0.4630***
	(0.1169)	(0.0474)	(0.0969)	(0.0302)	(0.1331)	(0.1643)
N	280	28	280	28	266	28
Criterion function	220.000	40.000	200.000	40.000	50.000	30.000
Hansen's J statistic	0.1994	0.8610	0.2324	0.7966	0.7058	0.6841

Note: Dependent variables in logarithms. Helmert transformation applied before estimation. Heteroscedasticity and serial correlation robust standard errors between parenthesis. ***, ** and ** denote significance at the 1%, 5% and 10% significance level, respectively. Estimations for all countries: 2002-2015. Estimation of GMM panel-VAR with one lag and one to four lags in the endogenous instruments. Estimations for Northern countries correspond to the period 2009-2015. Northern countries include Denmark, Finland, Norway and Sweden.

Appendix for Online Publication

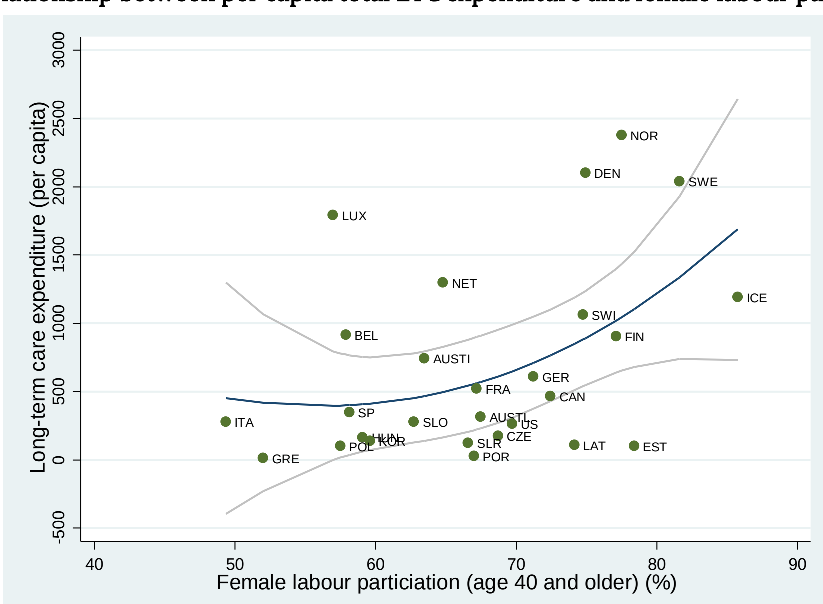
Appendix A

Figure A1. Relationship between per capita total LTC expenditure and per capita GDP (constant prices, constant PPPs, OECD base year).



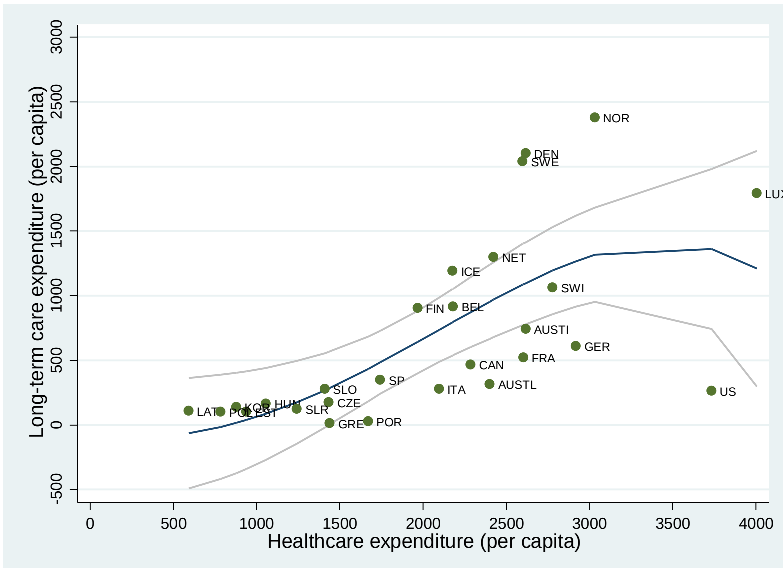
Notes LTC expenditure per capita is the sum of social and health LTC expenditure per capita.
Per capita total LTC expenditure in constant prices, constant PPPs, 2010 US Dollars. AUSTL: Australia; AUSTI: Austria; BEL: Belgium; CAN: Canada; CZE: Czech Republic; DEN: Denmark; EST: Estonia; FIN: Finland; FRA: France; GER: Germany; GRE: Greece; HUN: Hungary; ICE: Iceland; IRE: Ireland; ITA: Italy; KOR: Korea; LAT: Latvia; LUX: Luxembourg; NET: Netherlands; NOR: Norway; POL: Poland; POR: Portugal; SLR: Slovak Republic; SLO: Slovenia; SP: Spain; SWE: Sweden; SWI: Switzerland; US: United States. Blue line corresponds to the prediction for per capita total LTC expenditure from estimation of a fractional polynomial of percentage of per capita GDP and grey lines correspond to confidence intervals at 95% level of significance. Own work using data from OECD Stats.

Figure A2. Relationship between per capita total LTC expenditure and female labour participation



Notes: LTC expenditure per capita is the sum of social and health LTC expenditure per capita.
Per capita total LTC expenditure in constant prices, constant PPPs, 2010 US Dollars. Blue line corresponds to the prediction for per capita total LTC expenditure from estimation of a fractional polynomial of percentage of female labour participation (40 years and older) and grey lines correspond to confidence intervals at 95% level of significance. Own work using data from OECD Stats.

Figure A3. Relationship between per capita total LTC expenditure (and per capita total HC expenditure (constant prices, constant PPPs, OECD base year).



Notes: LTC expenditure per capita is the sum of social and health LTC expenditure per capita.
Healthcare expenditure per capita does not include LTC expenditure related to health services.
Variables in constant prices, constant PPPs, 2010 US Dollars. Blue line corresponds to the prediction for LTC expenditure from estimation of a fractional polynomial of percentage of HC expenditure and grey lines correspond to confidence intervals at 95% level of significance. Own work using data from OECD Stats.

Table A1. Definition of the variables

Name	Definition
LTC Total	Per capita total LTC expenditure (constant prices, constant PPPs, 2010 US Dollars)
LTC Health	Per capita health LTC expenditure (constant prices, constant PPPs, 2010 US Dollars)
LTC Social	Per capita social LTC expenditure (constant prices, constant PPPs, 2010 US Dollars)
HC total	Per capita total healthcare expenditure (constant prices, constant PPPs, 2010 US Dollars). It does not include health LTC expenditure
Inpatient	Per capita expenditure in inpatient care (constant prices, constant PPPs, 2010 US Dollars)
Outpatient	Per capita expenditure in outpatient care (constant prices, constant PPPs, 2010 US Dollars).
Medicines	Per capita expenditure in prescribed medicines (constant prices, constant PPPs, 2010 US Dollars)
FemPart	Female labour participation (age 40 and older)
GDP pc	Per capita gross domestic product (constant prices, constant PPPs, 2010 US 1,000 Dollars)

Table A2. Country availability of information

	HC Total	Inpatient	Outpatient	Medicines	LTC Total	LTC Health	LTC Social	FemPart
Australia	X	X	X	X	X	X	X	X
Austria	X	X	X	X	X	X	X	X
Belgium	X	X	X	X	X	X	X	X
Canada	X	X	X	X	X	X	NO	X
Czech Rep.	X	X	X	X	X	X	X	X
Denmark	X	X	X	X	X	X	X	X
Estonia	X	X	X	X	X	X	X	X
Finland	X	X	X	X	X	X	X	X
France	X	X	X	X	X	X	X	X
Germany	X	X	X	X	X	X	X	X
Greece	2009-2015	2009-2015	2009-2015	NO	2009-2015	2009-2015	NO	X
Hungary	X	X	X	X	X	X	X	X
Iceland	X	X	X	X	X	X	X	X
Italy	2009-2015	NO	X	NO	2009-2015	2009-2015	X	X
Korea	X	X	X	X	X	X	X	X
Latvia	X	X	X	X	X	X	X	X
Luxembourg	X	X	X	X	X	X	X	X
Netherlands	X	X	X	NO	X	X	X	X
Norway	X	X	X	X	X	X	X	X
Poland	X	X	X	X	X	X	X	X
Portugal	X	X	X	NO	X	X	X	X
Slovak Rep.	X	X	X	X	X	X	X	X
Slovenia	X	X	X	X	X	X	X	X
Spain	X	X	X	X	X	X	X	X
Sweden	X	X	X	X	X	X	X	X
Switzerland	X	X	X	X	X	X	X	X
United States	X	NO	NO	X	X	X	X	X
N (2002-2015)	350	336	350	322	350	350	350	378
Southern countries	28	21	28	7	28	28	21	28
Northern countries	28	28	28	28	28	28	28	28

X: means information available for the whole period 2002-2015.
NO: means not available for the period 2002-2015.
Southern countries (Greece, Italy, Portugal, Spain): observations for the period 2009-2015.
Northern countries (Denmark, Finland, Norway, Sweden): observations for the period 2009-2015.
Italy and Greece will not be included in the analysis for the period 2002-2015, but will be used in a posterior analysis for the subperiod 2009-2015.

Table A3. Descriptive statistics

	GDP pc	LTC Total	LTC Health	LTC Social	HC Total	Inpatient	Outpatient	Medicines	FemPart (%)
Australia	40.58	313.36	38.37	275.00	2,401.57	901.20	794.60	289.59	67.48
	2.13	142.67	32.77	114.97	213.62	61.68	86.51	12.32	2.73
Austria	41.56	743.06	452.29	290.78	2,617.29	1,201.76	716.76	365.66	63.49
	1.75	118.06	47.24	71.73	174.89	89.81	49.16	14.62	4.59
Belgium	39.50	917.37	716.56	200.81	2,181.07	828.19	523.23	374.81	57.89
	1.30	177.08	132.46	50.17	194.59	82.00	41.36	32.61	4.70
Canada	40.50	466.79	466.79	-	2,286.93	612.13	753.78	261.42	72.45
	1.42	21.37	21.37	-	232.11	48.69	129.55	20.11	1.49
Czech Rep.	26.63	175.37	106.11	69.26	1,434.57	513.35	402.86	248.94	68.72
	2.44	82.70	84.77	17.52	135.27	48.91	81.65	30.07	2.59
Denmark	43.52	2,101.19	927.07	1,174.14	2,617.36	1,088.04	927.34	165.71	74.94
	1.19	106.85	84.22	38.82	187.50	77.97	109.00	23.42	1.08
Estonia	22.72	101.71	39.11	62.59	940.57	340.31	247.24	123.44	78.41
	2.93	34.92	16.92	18.82	181.92	52.87	65.72	15.71	2.39
Finland	38.38	905.22	484.39	420.84	1,968.21	755.99	694.86	245.04	77.10
	1.74	187.15	77.48	127.90	193.68	52.12	111.41	16.55	1.37
France	35.95	523.21	401.93	121.29	2,604.14	1,072.36	439.21	415.58	67.20
	0.84	94.58	72.92	23.02	106.68	25.07	37.99	13.31	2.01
Germany	39.50	610.79	424.20	186.59	2,919.36	1,063.86	722.42	481.20	71.23
	2.26	92.79	59.44	33.42	394.28	131.23	112.47	63.67	4.69
Greece	27.33	14.87	14.87	-	1,440.71	654.99	178.13	473.33	52.02
	2.97	5.47	5.47	-	343.01	168.15	25.23	167.01	3.68
Hungary	21.76	164.66	51.87	112.79	1,057.43	376.74	195.32	251.67	59.10
	1.38	22.68	9.31	16.16	67.88	23.04	12.27	32.60	3.52
Iceland	40.50	1,192.54	675.91	516.65	2,179.14	965.78	569.71	219.05	85.78
	2.68	221.65	64.95	213.11	123.70	144.99	41.14	31.75	1.29
Italy	35.04	277.36	235.49	40.62	2,097.43	835.18	672.47	-	49.36
	1.50	10.33	3.43	5.16	93.94	37.40	184.02	-	4.81
Korea	28.74	137.03	116.44	20.63	877.79	253.54	277.70	218.45	59.61
	3.68	90.20	100.90	16.36	178.93	41.81	61.47	44.45	1.63
Latvia	18.41	107.74	46.37	61.07	592.55	233.73	99.79	88.68	74.15
	2.96	21.16	8.37	16.77	73.36	34.46	13.55	23.32	3.45
Luxembourg	84.52	1,793.53	950.78	842.74	4,005.21	1,414.35	1,372.01	439.44	56.99
	3.32	213.95	101.61	118.64	340.27	66.51	299.46	71.87	5.68
Netherlands	44.31	1,299.14	927.60	371.54	2,424.64	806.26	738.50	-	64.80
	1.69	335.80	281.66	57.54	411.37	58.59	203.47	-	5.23
Norway	58.29	2,377.96	1,251.01	1,126.97	3,032.43	1,390.81	672.42	221.54	77.51
	1.50	248.67	179.14	84.91	235.98	117.19	120.85	29.09	1.13
Poland	19.57	100.90	70.29	30.63	786.00	378.04	156.43	110.92	57.49
	3.09	25.92	14.18	15.61	158.94	90.68	30.24	9.73	2.01
Portugal	26.67	29.42	28.70	0.71	1,671.43	441.47	590.59	-	67.01
	0.61	11.82	11.77	0.33	110.10	59.99	49.74	-	2.33
Slovak Rep.	23.20	123.84	6.52	116.69	1,243.07	369.54	280.06	359.96	66.59
	3.70	12.34	0.51	16.11	235.32	66.46	101.33	25.98	2.17
Slovenia	26.99	279.17	207.98	71.19	1,410.36	567.31	369.09	230.66	62.73
	1.83	46.02	29.31	19.56	102.57	49.40	49.14	15.60	2.82
Spain	31.79	350.14	178.07	172.06	1,744.36	571.92	518.41	344.51	58.14
	1.10	110.02	52.25	61.49	149.02	65.58	41.96	31.62	8.00
Sweden	41.06	2,041.32	568.84	1,472.48	2,599.14	931.05	957.96	255.53	81.62
	2.14	550.29	442.42	124.59	172.35	34.71	90.22	17.39	1.67
Switzerland	51.88	1,064.80	701.33	363.46	2,780.07	1,256.32	847.98	401.28	74.75
	2.41	118.11	87.46	33.98	250.13	76.12	65.43	14.07	2.03
United States	48.74	264.68	260.01	4.68	3,733.36	-	-	262.88	69.71
	1.88	17.70	17.70	0.28	1,311.85	-	-	59.41	0.96
All countries	36.95	705.04	393.22	300.97	2,072.20	750.89	567.56	271.92	67.27
	13.85	710.22	368.89	397.07	928.13	356.48	310.66	109.88	9.58

Own work using OECE Stats. Standard deviations in italics.
LTC and HC expenditures are expressed in per capita terms (constant prices, constant PPPs, 2010 US Dollars)
GDP pc is expressed in per capita terms (constant prices, 1,000 constant PPPs, 2010 US Dollars)

Appendix B

Table B1. Panel unit root tests. All countries

	Harris-Tzavalis test		Im-Pesaran-Shin test	
	Statistic	p-value	Statistic	p-value
Log LTC_Total	0.2488	0.0387	-23.739	0.0088
Log LTC_Health	0.1883	0.0452	-26.802	0.0037
Log LTC_Social	0.6873	0.0439	-16.857	0.0459
Log HC_Total	-0.4640	0.0474	-20.708	0.0192
Log Inpatient	0.2501	0.0467	-24.657	0.0068
Log Outpatient	0.1714	0.0332	-36.992	0.0001
Log Medicines	0.1345	0.0013	-24.660	0.0068
Log GDP pc	-0.7289	0.0001	-19.936	0.0231

Harris-Tzavalis unit-root test (1999): Ho: Panels contain unit roots vs. Ha: Panels are stationary.
Im-Pesaran-Shin unit-root test (2003): Ho: All panels contain unit roots vs. Ha: Some panels are stationary.

Table B2. Panel-VAR model selection. All countries

	CD	J statistic	J pvalue	MMSCBIC	MMSCAIC	MMSCHQIC
Panel-VAR Model 1: Log(Femp_Part), , log(LTC_total), Log(GDP pc)						
Lag 1	0.9999569	12.92761	0.3743241	**-52.27705**	**-11.07239**	**-27.69537**
Lag 2	0.9999584	6.038905	0.6428738	-37.43087	-9.961095	-21.04308
Lag 3	0.9999367	4.513766	0.3409184	-17.22112	-3.486234	-9.027229
Panel-VAR Model 1: Log(Femp_Part), , log(LTC_health), Log(GDP pc)						
Lag 1	0.999929	13.94894	0.3039807	**-51.25572**	**-10.05106**	**-26.67404**
Lag 2	0.9999281	6.441629	0.5978891	-37.02815	-9.558371	-20.64036
Lag 3	0.9998983	2.420629	0.6589026	-19.31426	-5.579371	-11.12037
Panel-VAR Model 1: Log(Femp_Part), , log(LTC_social), Log(GDP pc)						
Lag 1	0.9998795	7.527316	0.8208933	**-57.30481**	**-16.47268**	**-32.95816**
Lag 2	0.9998954	4.105701	0.8474629	-39.11572	-11.89439	-22.88461
Lag 3	0.9998777	0.6963365	0.9517799	-20.91437	-7.303663	-12.79882
Panel-VAR Model 2: log(LTC_total), Log(HC_total), Log(GDP pc)						
Lag 1	0.9998333	13.32586	0.3458075	**-51.87881**	**-10.67414**	**-27.29713**
Lag 2	0.9998853	10.27741	0.2460933	-33.19237	-5.722599	-16.80459
Lag 3	0.9998262	8.675323	0.0697475	-13.05957	0.675322	-4.865672
Panel-VAR Model 2: log(LTC_total), Log(Outpatient), Log(GDP pc)						
Lag 1	0.9998612	9.443865	0.6646233	**-54.83517**	**-14.55613**	**-30.83598**
Lag 2	0.9998633	6.780511	0.5604898	-36.07219	-9.21959	-20.07273
Lag 3	0.9998247	3.482858	0.4804895	-17.94349	-4.51714	-9.943757
Panel-VAR Model 2: log(LTC_total), Log(Inpatient), Log(GDP pc)						
Lag 1	0.9998811	10.10867	0.6064276	**-54.05662**	**-13.89133**	**-30.12867**
Lag 2	0.9998823	10.66469	0.2214318	-32.11217	-5.335315	-16.16021
Lag 3	0.9998237	4.807544	0.3076206	-16.58089	-3.192456	-8.604902
Panel-VAR Model 2: log(LTC_total), Log(Medicines), Log(GDP pc)						
Lag 1	0.9998857	9.686755	0.8091055	**-54.76133**	**-16.31325**	**-31.89954**
Lag 2	0.9998817	8.565531	0.3802608	-33.06652	-7.434469	-17.82533
Lag 3	0.9998465	2.846512	0.5838309	-17.96951	-5.153480	-10.34892
Panel-VAR Model 2: log(LTC_health), Log(HC_total), Log(GDP pc)						
Lag 1	0.999793	24.03128	0.6201427	**-41.17339**	**-2.131275**	**-16.59171**
Lag 2	0.9997873	15.86605	0.0443379	-27.60372	-1.0339467	-11.21594
Lag 3	0.9997478	8.367966	0.078992	-13.36692	-0.367966	-5.173029
Panel-VAR Model 2: log(LTC_health), Log(Outpatient), Log(GDP pc)						
Lag 1	0.9997352	9.976144	0.6180536	**-54.30289**	**-14.02386**	**-30.30378**
Lag 2	0.9997514	6.412948	0.6010789	-36.43974	-9.587052	-20.44028
Lag 3	0.9997364	1.413159	0.8419047	-20.01319	-6.586841	-12.01346
Panel-VAR Model 2: log(LTC_health), Log(Inpatient), Log(GDP pc)						
Lag 1	0.9997637	11.03594	0.5258408	**-53.12935**	**-12.96406**	**-29.20139**
Lag 2	0.999766	7.882184	0.4450627	-34.89468	-8.117816	-18.94271
Lag 3	0.9997762	3.110056	0.5395797	-18.27837	-4.889944	-10.30239
Panel-VAR Model 2: log(LTC_health), Log(Medicines), Log(GDP pc)						
Lag 1	0.999809	13.31256	0.3467381	**-49.13552**	**-10.68744**	**-26.27374**
Lag 2	0.9997997	8.979212	0.3440526	-32.65284	-7.020788	-17.41165
Lag 3	0.9997517	1.268108	0.8667628	-19.54792	-6.731892	-11.92732
Panel-VAR Model 2: log(LTC_social), Log(HC_total), Log(GDP pc)						
Lag 1	0.9998694	17.49857	0.1317853	**-46.94908**	**-8.501426**	**-22.84415**
Lag 2	0.9998593	7.418323	0.4922428	-35.54678	-6.581677	-19.47682
Lag 3	0.9998529	6.517208	0.1637093	-14.96534	-1.482792	-6.930365
Panel-VAR Model 2: log(LTC_social), Log(Outpatient), Log(GDP pc)						
Lag 1	0.9996643	4.766925	0.9653141	**-59.10919**	**-19.23307**	**-35.36201**
Lag 2	0.9997017	1.749843	0.9877441	-40.83424	-14.25016	-25.00278
Lag 3	0.9996984	0.439831	0.9790878	-20.85221	-7.560168	-12.93648
Panel-VAR Model 2: log(LTC_social), Log(Inpatient), Log(GDP pc)						
Lag 1	0.9998296	6.563949	0.885035	**-56.77343**	**-17.43605**	**-33.36171**
Lag 2	0.9996549	3.904682	0.865619	-38.32024	-12.09532	-22.71242
Lag 3	0.9991048	1.795036	0.773390	-19.31742	-6.204964	-11.51352
Panel-VAR Model 2: log(Medicines), Log(HC_total), Log(GDP pc)						
Lag 1	0.9997845	2.590712	0.997808	**-59.17922**	**-21.40929**	**-36.73353**
Lag 2	0.999743	5.224027	0.733385	-35.95593	-10.77597	-20.99213
Lag 3	0.9995951	1.013102	0.907802	-19.57688	-6.986898	-12.09498

CD: coefficient of determination; J statistic: Hansen's (1982) J statistic; J pvalue: p-value for the Hansen's (1982) J statistic;
MMSCAIC: moment and model selection criteria (MMSC) proposed by Andrews and Lu (1002) based on AIC (Akaike information criteria).
MMSCBIC: moment and model selection criteria (MMSC) proposed by Andrews and Lu (1002) based on BIC (Bayesian information criteria).
MMSCHQIC: moment and model selection criteria (MMSC) proposed by Andrews and Lu (1002) based on HQIC (Hannan-Quinn information criteria). GMM panel-VAR for both models with one to four lags in the endogenous instruments has been estimated

Table B3. Granger causality tests. All countries

	Chi2	df	pvalue		Chi2	df	pvalue		Chi2	df	pvalue
Panel-VAR Log(Fem_part), Log(LTC_total), Log(GDP pc)				**Panel-VAR Log(Fem_part), Log(LTC_health), Log(GDP pc)**				**Panel-VAR Log(Fem_part), Log(LTC_social), Log(GDP pc)**			
Eq: Log(Femp_part)				Eq: Log(Femp_part)				Eq: Log(Femp_part)			
Log(LTC_total)	1.744	1	0.1870	Log(LTC_health)	1.827	1	0.1760	Log(LTC_social)	7.783	1	0.0050
Log(GDP pc)	27.945	1	0.0000	Log(GDP pc)	26.253	1	0.0000	Log(GDP pc)	31.348	1	0.0000
All	34.081	2	0.0000	All	26.336	2	0.0000	All	37.826	2	0.0000
Eq: Log(LTC_total)				Eq: Log(LTC_health)				Eq: Log(LTC_social)			
Log(Fem_part)	6.084	1	0.0140	Log(Fem_part)	7.259	1	0.0070	Log(Fem_part)	12.178	1	0.0000
Log(GDP pc)	12.796	1	0.0000	Log(GDP pc)	14.904	1	0.0000	Log(GDP pc)	2.895	1	0.0890
All	18.021	2	0.0000	All	21.496	2	0.0000	All	15.189	2	0.0010
Eq: Log(GDP pc)				Eq: Log(GDP pc)				Eq: Log(GDP pc)			
Log(Fem_part)	2.89	1	0.0890	Log(Fem_part)	7.921	1	0.0050	Log(Fem_part)	2.256	1	0.1330
Log(LTC_total)	8.252	1	0.0040	Log(LTC_health)	0.388	1	0.5340	Log(LTC_social)	8.432	1	0.0040
All	16.665	2	0.0000	All	9.111	2	0.0110	All	13.23	2	0.0010
Panel-VAR Log(HC_total), Log(LTC_total), Log(GDP pc)				**Panel-VAR Log(HC_total), Log(LTC_health), Log(GDP pc)**				**Panel-VAR Log(HC_total), Log(LTC_social), Log(GDP pc)**			
Eq: Log(HC_total)				Eq: Log(HC_health)				Eq: Log(HC_social)			
Log(LTC_total)	4.043	1	0.0440	Log(LTC_health)	4.725	1	0.0300	Log(LTC_social)	1.225	1	0.2680
Log(GDP pc)	30.129	1	0.0000	Log(GDP pc)	26.885	1	0.0000	Log(GDP pc)	7.868	1	0.0050
All	33.239	2	0.0000	All	33.241	2	0.0000	All	10.251	2	0.0060
Eq: Log(LTC_total)				Eq: Log(LTC_health)				Eq: Log(LTC_social)			
Log(HC_total)	0.005	1	0.9430	Log(HC_health)	1.93	1	0.1650	Log(HC_social)	0.536	1	0.4640
Log(GDP pc)	2.656	1	0.1030	Log(GDP pc)	0.125	1	0.7240	Log(GDP pc)	1.014	1	0.3140
All	2.774	2	0.2500	All	1.953	2	0.3770	All	2.589	2	0.2740
Eq: Log(GDP pc)				Eq: Log(GDP pc)				Eq: Log(GDP pc)			
Log(HC_total)	1.033	1	0.3100	Log(HC_health)	0.003	1	0.9550	Log(HC_social)	5.077	1	0.0240
Log(LTC_total)	5.333	1	0.0210	Log(LTC_health)	5.001	1	0.0250	Log(LTC_social)	0.967	1	0.3250
All	5.474	2	0.0650	All	5.235	2	0.0730	All	5.243	2	0.0730
Panel-VAR Log(Inpatient), Log(LTC_total), Log(GDP pc)				**Panel-VAR Log(Inpatient), Log(LTC_health), Log(GDP pc)**				**Panel-VAR Log(Inpatient), Log(LTC_social), Log(GDP pc)**			
Eq: Log(Inpatient)				Eq: Log(Inpatient)				Eq: Log(Inpatient)			
Log(LTC_total)	4.817	1	0.0280	Log(LTC_health)	32.047	1	0.0000	Log(LTC_social)	6.507	1	0.0110
Log(GDP pc)	16.248	1	0.0000	Log(GDP pc)	33.584	1	0.0000	Log(GDP pc)	20.46	1	0.0000
All	16.285	2	0.0000	All	33.903	2	0.0000	All	27.075	2	0.0000
Eq: Log(LTC_total)				Eq: Log(LTC_health)				Eq: Log(LTC_social)			
Log(Inpatient)	0.241	1	0.6240	Log(Inpatient)	1.765	1	0.1840	Log(Inpatient)	34.552	1	0.0000
Log(GDP pc)	0.094	1	0.7590	Log(GDP pc)	25.139	1	0.0000	Log(GDP pc)	1.74	1	0.1870
All	0.338	2	0.8440	All	25.74	2	0.0000	All	34.692	2	0.0000
Eq: Log(GDP pc)				Eq: Log(GDP pc)				Eq: Log(GDP pc)			
Log(Inpatient)	0.347	1	0.5560	Log(Inpatient)	0.191	1	0.6620	Log(Inpatient)	6.786	1	0.0090
Log(LTC_total)	1.639	1	0.2010	Log(LTC_health)	5.418	1	0.0200	Log(LTC_social)	6.849	1	0.0090
All	1.996	2	0.3690	All	5.986	2	0.0500	All	14.766	2	0.0010
Panel-VAR Log(Outpatient), Log(LTC_total), Log(GDP pc)				**Panel-VAR Log(Outpatient). Log(LTC_health). Log(GDP pc)**				**Panel-VAR Log(Outpatient). Log(LTC_social). Log(GDP pc)**			
Eq: Log(Outpatient)				Eq: Log(Outpatient)				Eq: Log(Outpatient)			
Log(LTC_total)	0.001	1	0.9760	Log(LTC_health)	6.668	1	0.0100	Log(LTC_social)	36.237	1	0.0000
Log(GDP pc)	0.014	1	0.9050	Log(GDP pc)	8.744	1	0.0030	Log(GDP pc)	15.839	1	0.0000
All	0.016	2	0.9920	All	13.669	2	0.0010	All	44.124	2	0.0000
Eq: Log(LTC_total)				Eq: Log(LTC_health)				Eq: Log(LTC_social)			
Log(Outpatient)	20.003	1	0.0000	Log(Outpatient)	20.268	1	0.0000	Log(Outpatient)	34.506	1	0.0000
Log(GDP pc)	1.213	1	0.2710	Log(GDP pc)	38.491	1	0.0000	Log(GDP pc)	18.347	1	0.0000
All	2.051	2	0.3590	All	76.533	2	0.0000	All	50.335	2	0.0000
Eq: Log(GDP pc)				Eq: Log(GDP pc)				Eq: Log(GDP pc)			
Log(Outpatient)	4.845	1	0.0280	Log(Outpatient)	0.569	1	0.4510	Log(Outpatient)	43.924	1	0.0000
Log(LTC_total)	0.713	1	0.3980	Log(LTC_health)	2.19	1	0.1390	Log(LTC_social)	9.419	1	0.0020
All	7.616	2	0.0220	All	2.951	2	0.2290	All	43.934	2	0.0000
Panel-VAR Log(Medicines), Log(LTC_total), Log(GDP pc)				**Panel-VAR Log(Medicines), Log(LTC_health), Log(GDP pc)**				**Panel-VAR Log(Medicines), Log(LTC_social), Log(GDP pc)**			
Eq: Log(Medicines)				Eq: Log(Medicines)				Eq: Log(Medicines)			
Log(LTC_total)	4.672	1	0.0310	Log(LTC_health)	38.492	1	0.0000	Log(LTC_social)	9.755	1	0.0020
Log(GDP pc)	2.746	1	0.0970	Log(GDP pc)	54.737	1	0.0000	Log(GDP pc)	23.467	1	0.0000
All	4.778	2	0.0920	All	89.474	2	0.0000	All	27.872	2	0.0000
Eq: Log(LTC_total)				Eq: Log(LTC_health)				Eq: Log(LTC_social)			
Log(Medicines)	2.946	1	0.0860	Log(Medicines)	1.246	1	0.2640	Log(Medicines)	0.054	1	0.8170
Log(GDP pc)	0.018	1	0.8950	Log(GDP pc)	2.696	1	0.1010	Log(GDP pc)	2.377	1	0.1230
All	4.67	2	0.0970	All	5.33	2	0.0700	All	2.766	2	0.2510
Eq: Log(GDP pc)				Eq: Log(GDP pc)				Eq: Log(GDP pc)			

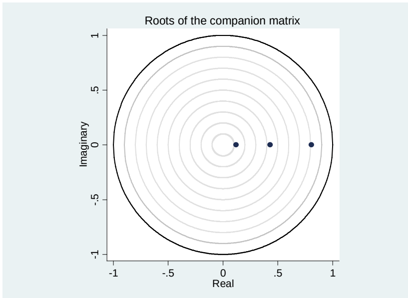
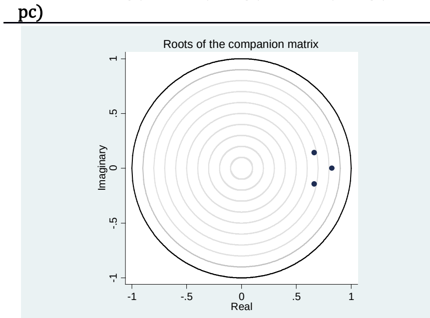
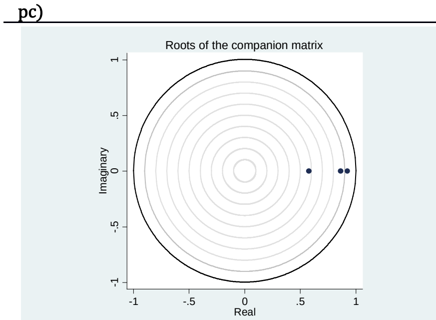
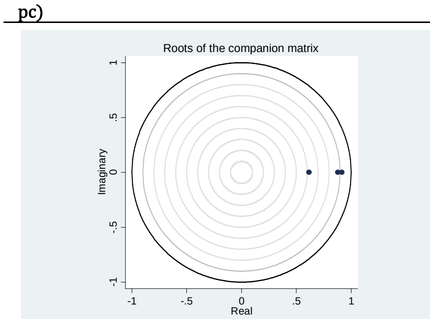
Log(Medicines)	2.949	1	0.0860	Log(Medicines)	4.143	1	0.0420	Log(Medicines)	0.882	1	0.3480
Log(LTC_total)	0.893	1	0.3450	Log(LTC_total)	24.464	1	0.0000	Log(LTC_total)	10.208	1	0.0010
All	4.879	2	0.0870	All	27.072	2	0.0000	All	12.525	2	0.0020

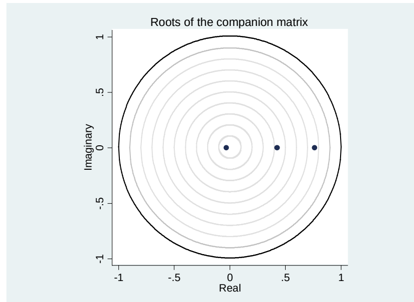
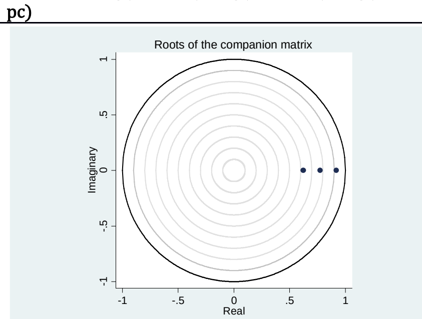
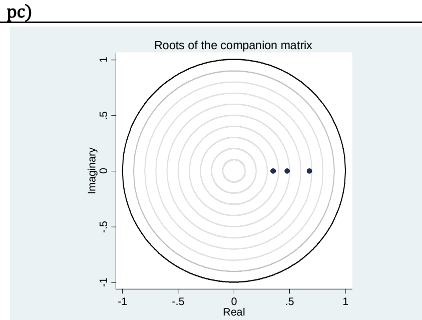
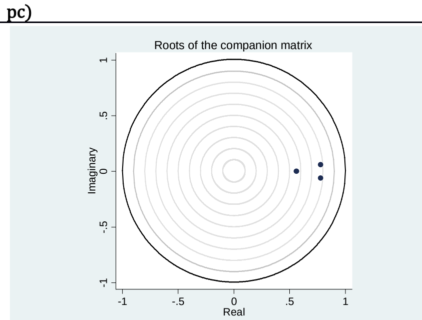
The table shows the results of the Granger causality test based on the baseline GMM panel-VAR specification with one lag and one to four lags in the endogenous instruments.
Ho: the excluded variable does not Granger-cause the equation variable.
H1: the excluded variable Granger-causes the equation variable.

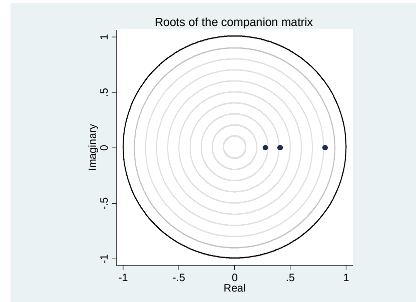
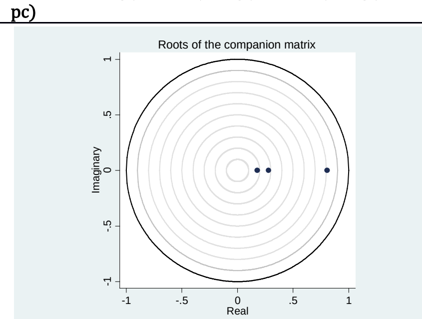
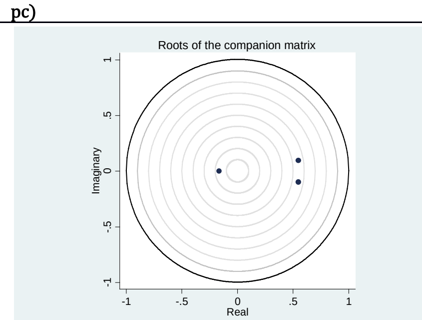
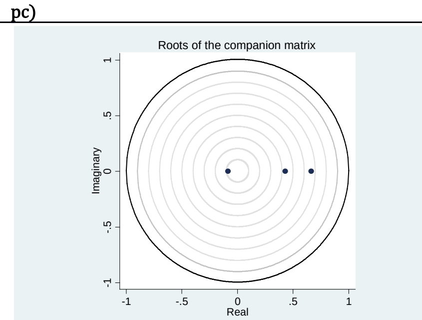
The first model suggests that: (i) female labour participation Granger-causes LTC expenditures (total, health, and social), (ii) total LTC expenditures and social LTC expenditures Granger-cause GDP pc, and (iii) social LTC expenditures Granger-causes female labour participation. Moving on to the second model, we find that total LTC expenditures and health LTC expenditures Granger-cause total HCE, as well as inpatient and medication expenditures. In contrast, only the social dimension of LTC expenditures Granger-cause outpatient expenditures. However, outpatient expenditures Granger-cause total LTC expenditures and, finally, inpatient expenditures Granger-cause social LTC expenditures.

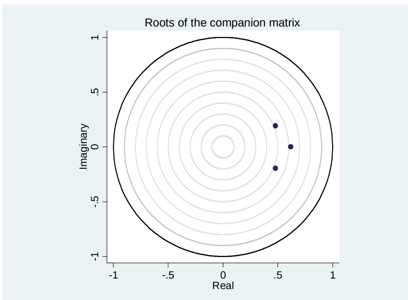
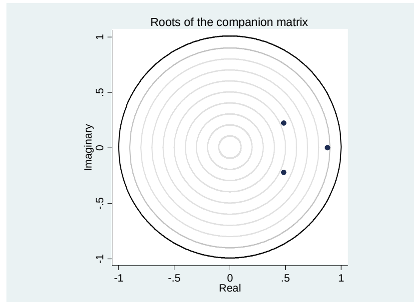
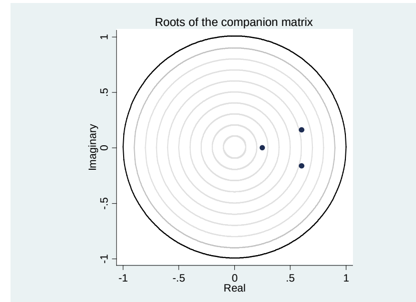
As for the Granger-causality of GDP pc, results suggest that: (i) total LTC and health LTC expenditure Granger-cause GDP pc in the model for total HCE, (ii) LTC social expenditure Granger-causes GDP pc in the models for inpatient and outpatient expenditure and (iii) health and social LTC expenditure Granger-cause GDP pc in the model for medicine expenditure. Finally, the condition of stability (i.e., that the module of all of the eigenvalues is within the unit circle) is also verified. For both models, Table B4 shows that this condition is met.

Table B4. Stability of panel-VAR models. All countries

	Real	Imaginary	Modulus
Panel-VAR Log(Fem_part), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.8053	0.0000	0.8053
Eigenvalue 2	0.4294	0.0000	0.4294
Eigenvalue 3	0.1187	0.0000	0.1187
Panel-VAR Log(HC_total), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.8231	0.0000	0.8231
Eigenvalue 2	0.6622	-0.1431	0.6775
Eigenvalue 3	0.6622	0.1431	0.6775
Panel-VAR Log(Inpatient), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.9239	0.0000	0.9239
Eigenvalue 2	0.8626	0.0000	0.8626
Eigenvalue 3	0.5757	0.0000	0.5757
Panel-VAR Log(Outpatient), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.9164	0.0000	0.9164
Eigenvalue 2	0.8775	0.0000	0.8775

	Real	Imaginary	Modulus
Panel-VAR Log(Fem_part), Log(LTC_health), Log(GDP pc)			
			
Eigenvalue 1	0.7626	0.0000	0.7626
Eigenvalue 2	0.4243	0.0000	0.4243
Eigenvalue 3	-0.0307	0.0000	0.0307
Panel-VAR Log(HC_total), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.9192	0.0000	0.9192
Eigenvalue 2	0.7729	0.0000	0.7729
Eigenvalue 3	0.6229	0.0000	0.6229
Panel-VAR Log(Inpatient), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.6799	0.0000	0.6799
Eigenvalue 2	0.4789	0.0000	0.4789
Eigenvalue 3	0.3525	0.0000	0.3525
Panel-VAR Log(Outpatient), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.7795	-0.0606	0.7818
Eigenvalue 2	0.7795	0.0606	0.7818

	Real	Imaginary	Modulus
Panel-VAR Log(Fem_part), Log(LTC_social), Log(GDP pc)			
			
Eigenvalue 1	0.8134	0.0000	0.8134
Eigenvalue 2	0.4079	0.0000	0.4079
Eigenvalue 3	0.2772	0.0000	0.2772
Panel-VAR Log(HC_total), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.8048	0.0000	0.8048
Eigenvalue 2	0.2799	0.0000	0.2799
Eigenvalue 3	0.1769	0.0000	0.1769
Panel-VAR Log(Inpatient), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.5475	-0.0962	0.5559
Eigenvalue 2	0.5475	0.0962	0.5559
Eigenvalue 3	-0.1648	0.0000	0.1648
Panel-VAR Log(Outpatient), Log(LTC_total), Log(GDP pc)			
			
Eigenvalue 1	0.6622	0.0000	0.6622
Eigenvalue 2	0.4281	0.0000	0.4281

Eigenvalue 3	0.6154	0.0000	0.6154	Eigenvalue 3	0.5610	0.0000	0.5610	Eigenvalue 3	-0.0850	0.0000	0.0850
Panel-VAR Log(Medicines), Log(LTC_total), Log(GDP pc)				**Panel-VAR Log(Medicines), Log(LTC_total), Log(GDP pc)**				**Panel-VAR Log(Medicines), Log(LTC_total), Log(GDP pc)**			
											
Eigenvalue 1	0.6180	0.0000	0.6180	Eigenvalue 1	0.8783	0.0000	0.8783	Eigenvalue 1	0.6019	0.1622	0.6234
Eigenvalue 2	0.4802	0.1938	0.5178	Eigenvalue 2	0.4869	0.2225	0.5353	Eigenvalue 2	0.6019	-0.1622	0.6234
Eigenvalue 3	0.4802	-0.1938	0.5178	Eigenvalue 3	0.4869	-0.2225	0.5353	Eigenvalue 3	0.2506	0.0000	0.2506

Eigenvalues lie inside the unit circle. Panel-VAR for for Model 1 (FemPart, LTC, GDP pc) and Model 2 (LTC, HC, GDP pc) satisfy the stability condition. For both models a GMM panel-VAR with one lag and with one to four lags in the endogenous instruments has been estimated.

Table B5. Forecast error variance decomposition for Model 1

Forecast horizon	All countries		Northern European countries		Southern European countries	
	%	Std.dev	%	Std.dev	%	Std.dev
Impulse: Logfempart						
Response: LogLTC_total					No signif.	
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	5.7030	2.9480	13.4440	12.8500	0.0100	7.6040
2	6.4960	3.0970	22.0340	8.1900	1.9840	6.1950
3	6.9810	3.1910	36.3160	9.0010	3.0450	6.5830
4	7.3150	3.2570	50.8320	10.1900	3.4130	6.7280
5	7.5420	3.3110	62.8380	10.9500	3.4920	6.8390
6	7.6920	3.3570	70.9070	11.0730	3.5620	7.0090
7	7.7910	3.3960	75.9080	10.8970	3.6550	7.2150
8	7.8550	3.4300	78.8270	10.6820	3.7420	7.4170
9	7.8960	3.4580	80.4530	10.4970	3.8060	7.6100
10	7.9230	3.4820	81.3370	10.3560	3.8510	7.7880
Impulse: LogLTC_total						
Response: LogGDP pc						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.1310	0.7540	1.6540	6.3550	33.6730	15.7340
2	1.8170	1.5260	8.6330	7.1460	37.3020	14.8370
3	2.5470	2.0460	8.1390	6.5930	34.4410	13.8460
4	2.8360	2.2590	8.0280	6.0830	34.3950	13.9660
5	2.9660	2.3600	8.4300	5.5540	34.4260	13.7590
6	3.0320	2.4130	8.7720	5.1250	34.3480	13.7760
7	3.0690	2.4450	9.1180	4.9890	34.3440	13.7260
8	3.0910	2.4640	9.4910	5.1370	34.3460	13.7000
9	3.1050	2.4770	9.7970	5.4540	34.3430	13.6830
10	3.1130	2.4860	10.0080	5.8140	34.3410	13.6770
Impulse: Logfempart						
Response: LogLTC_health					No signif.	
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	3.6220	0.2120	24.6640	11.8960	14.6260	13.5950
2	4.4270	0.2930	21.0590	9.8080	10.0970	9.6850
3	5.0610	0.3560	23.7160	9.0220	9.1980	10.0430
4	5.5370	0.4040	27.7420	8.5910	9.6080	10.4960
5	5.8800	0.4380	32.1890	9.0430	10.4920	10.8970
6	6.1180	0.4620	36.8740	10.3600	11.5500	11.2740
7	6.2800	0.4780	41.7170	12.1200	12.6500	11.6370
8	6.3880	0.4890	46.6110	13.8820	13.7290	11.9970
9	6.4600	0.4960	51.4390	15.4090	14.7590	12.3540
10	6.5080	0.5010	56.0890	16.6380	15.7230	12.7070
Impulse: LogLTC_social						
Response: Logfempart						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.3840	0.0570	9.6630	11.2810	0.3710	4.3600
3	0.5250	0.0800	9.8360	16.8900	0.4110	4.9590
4	0.5940	0.0930	9.9630	20.7470	0.4400	5.3670
5	0.6300	0.1000	10.0120	23.0690	0.4550	5.6060
6	0.6490	0.1040	10.7430	24.1420	0.4650	5.7940
7	0.6600	0.1060	11.2630	24.3120	0.4730	5.9420
8	0.6660	0.1070	11.0770	24.0680	0.4780	6.0660
9	0.6690	0.1080	11.8680	23.7230	0.4820	6.1700
10	0.6710	0.1080	12.0940	23.9000	0.4850	6.2590
Impulse: Logfempart						
Response: LogLTC_social						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.9680	0.7430	1.3860	6.5430	5.0980	7.8140
2	11.5150	0.9940	15.2710	8.6100	6.5790	8.7030
3	14.4700	1.1240	30.8310	14.1310	6.4240	8.3780
4	15.6080	1.2050	43.8290	18.3320	7.0100	8.4700
5	16.1070	1.2560	54.4010	20.8370	7.9540	8.6710
6	16.3500	1.2900	63.0010	22.4050	9.1300	8.9990
7	16.4760	1.3140	70.0030	24.1800	10.4520	9.4340
8	16.5460	1.3310	75.7110	25.4360	11.8720	9.9760
9	16.5850	1.3450	80.3670	26.7840	13.3570	10.6030
10	16.6070	1.3550	84.1690	27.5190	14.8870	11.2960
Impulse: LogLTC_social						
Response: LogGDP pc						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	4.3380	2.5610	11.5920	2.0530	3.0180	1.5100
2	4.3400	1.9260	11.7910	1.9840	3.0780	2.4820
3	4.3430	1.8420	11.9990	2.0100	3.0560	2.4810
4	4.3490	1.8130	12.2120	2.2950	3.0510	2.4790
5	4.3590	1.7990	12.4270	2.8250	3.0470	2.4780
6	4.3770	1.7910	12.6380	3.3440	3.0450	2.4780

7	4.4140	1.7870	12.8400	3.8170	3.0430	2.4790
8	4.4980	1.7850	13.0350	4.1180	3.0420	2.4790
9	4.7420	1.7840	13.1020	4.3160	3.0410	2.4800
10	5.7300	1.7830	13.4390	4.4500	3.0400	2.4810

The table shows the variation in the response variable explained by the impulse variable. Model 1 (FemPart, LTC, GDP pc). Estimation of GMM panel-VAR for both models with one lag and one to four lags in the endogenous instruments has been made. The variance decomposition is at a horizon of 10 years after the shock. The ordering of the variables in the Cholesky decomposition for Model 1 is as follows: Female labour participation → LTC expenditures→ GDP pc.

Table B6. Forecast error variance decomposition for Model 2

Forecast horizon	All countries		Northern European countries		Southern European countries	
	%	Std.dev	%	Std.dev	%	Std.dev
Impulse: LogHC_total Response: LogLTC_total	No signif.					
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.2548	1.1827	0.0000	0.0000	0.8042	0.4012
2	2.0144	1.6014	0.2744	0.1938	0.5923	0.3348
3	3.3066	1.6910	0.7907	0.3974	1.0246	0.4555
4	3.9097	1.7167	1.4499	0.5326	1.6017	0.5541
5	4.1037	1.7237	2.1833	0.6173	2.1376	0.6132
6	4.1123	1.7240	2.9438	0.6718	2.5768	0.6484
7	4.0566	1.7220	3.6996	0.7085	2.9149	0.6701
8	3.9927	1.7197	4.4297	0.7342	3.1653	0.6839
9	3.9421	1.7179	5.1210	0.7530	3.3460	0.6929
10	3.9092	1.7167	5.7657	0.7670	3.4738	0.6988
Impulse: LogLTC_total Response: LogHC_total						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.4073	0.2605	0.0000	0.0000
2	1.1736	0.4859	1.5599	0.5484	0.7298	0.3797
3	1.3873	0.6949	3.2640	0.6889	1.6327	0.5581
4	1.9834	0.7711	5.3813	1.7590	2.4327	0.6378
5	2.4540	0.8048	7.7672	1.7973	3.0706	0.6789
6	2.5512	0.8221	10.2854	2.8203	3.5544	1.0024
7	2.2171	0.8319	12.8183	2.8349	3.9108	1.1167
8	3.4875	1.5379	15.2733	2.8447	4.1685	1.7259
9	4.4310	1.7417	17.5841	2.8516	4.3524	1.7319
10	5.1188	1.8442	19.7086	2.8565	4.4828	1.7358
Impulse: LogLTC_total Response: LogGDP pc						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	2.9785	0.6738	0.2552	0.1830	0.1461	0.1147
2	4.9339	0.7483	1.8535	0.5846	1.1005	0.0822
3	7.1417	0.7895	4.5245	0.7371	2.0855	0.0709
4	9.4091	0.8135	7.9434	0.7994	3.0871	0.0721
5	11.5818	0.8285	11.7255	0.8293	5.1049	1.0855
6	13.5566	0.8382	15.5319	2.8456	7.1383	1.1093
7	15.2793	0.8447	19.1234	3.8553	8.1842	2.1400
8	16.7331	0.8492	22.3647	3.8615	10.2379	3.1730
9	17.9275	0.8525	25.2018	4.8657	13.2946	3.2048
10	18.8867	0.8547	27.6335	4.8686	15.3501	3.2334
Impulse: LogHC_total Response: LogGDP pc	No signif.					
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.6001	1.3375	3.0292	0.6766	0.0018	0.0016
2	0.9135	1.4296	2.8156	0.6641	0.2237	0.1645
3	1.2191	1.4944	2.5515	0.6466	0.6421	0.3519
4	1.4940	1.5391	2.3045	0.6276	1.1435	0.4801
5	1.7279	1.5701	2.1272	0.6122	1.6490	0.5603
6	1.9194	1.5917	2.0475	0.6047	2.1128	0.6109
7	2.0717	1.6070	2.0705	0.6069	2.5134	0.6438
8	2.1904	1.6179	2.1856	0.6175	2.8456	0.6660
9	2.2814	1.6257	2.3746	0.6333	3.1129	0.6812
10	2.3505	1.6314	2.6172	0.6512	3.3235	0.6918
Impulse: LogLTC_total Response: LogInpatient						
0	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000
1	0.1053	0.0858	1.4094	0.5265	1.6688	0,5628
2	1.0663	0.4644	5.5122	0.7618	2.4842	0,6417
3	2.0328	0.6032	11.7487	1.8294	2.8342	0,6653
4	2.7534	0.6602	18.1813	2.8531	2.8606	0,6669
5	3.2344	0.6875	23.7065	2.8636	2.7356	0,6591
6	3.5388	0.7017	28.1864	3.8692	2.5770	0,6484
7	3.7237	0.7095	31.8058	3.8726	2.4540	0,6394
8	3.8307	0.7137	34.7657	4.8748	2.4021	0,6355
9	3.8882	0.7159	37.2191	5.8765	2.4354	0,6380
10	3.9150	0.7169	39.2749	5.8777	2.5536	0,6467
Impulse: LogLTC_total Response: LogOutpatient	No signif.					
0	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000
1	1.2583	1.5015	0.0539	0.0461	8.7592	0,8078
2	1.2326	1.4969	0.3027	0.2091	6.4988	0,7800
3	1.2139	1.4935	0.7565	0.3876	4.8160	0,7453
4	1.2003	1.4910	1.4286	0.5294	3.5640	0,7028
5	1.1903	1.4891	2.3204	0.6289	2.6360	0,6525
6	1.1830	1.4877	3.4240	0.6966	1.9524	0,5952

7	1.1776	1.4867	4.7243	1.7428	1.4531	0,5331
8	1.1736	1.4859	6.2009	1.7750	1.0930	0,4700
9	1.1706	1.4854	7.8302	2.7981	2.8380	0,4103
10	1.1684	1.4849	9.5865	3.8150	2.6624	0,5586
Impulse: LogLTC_total						
Response: LogMedicines						
0	0.0000	0.0000	0.0000	0.0000	-	-
1	0.5801	0.3304	0.4923	0.2969	-	-
2	2.8228	0.6646	3.0371	0.6771	-	-
3	3.0686	0.6788	6.2127	0.7752	-	-
4	2.6613	0.6542	9.2299	0.8120	-	-
5	2.2530	0.6233	11.7520	2.8294	-	-
6	1.9668	0.5966	13.7233	3.8389	-	-
7	1.7899	0.5774	15.2083	4.8445	-	-
8	1.6873	0.5651	16.3035	5.8480	-	-
9	1.6303	0.5578	17.1016	5.8503	-	-
10	1.5994	0.5538	17.6790	5.8518	-	-

The table shows the variation in the response variable explained by the impulse variable. Model 2 (LTC, HC, GDP pc). Estimation of GMM panel-VAR for both models with one lag and one to four lags in the endogenous instruments has been made. The variance decomposition is at a horizon of 10 years after the shock. The ordering of the variables in the Cholesky decomposition for Model 2 is: LTC expenditures → HC expenditures → GDP pc.