The Aging Parent Penalty Across Countries*†

Noa De La Vega‡§ Stav Federman¶

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Abstract

This study examines the "aging parent penalty"- the impact of parental health deterioration on the labor market outcomes of adult daughters relative to adult sons. Using SHARE data and event studies around parental health shocks in six European countries, we find that the gender employment gap widens after the shock. In countries that rely on informal family care, daughters often reduce their employment after a parental health shock. Where care is provided formally through the market, sons may increase their employment to support care financially. This study contributes to understanding the gendered implications of caregiving responsibilities in aging European societies.

Keywords: gender roles, health care, economics of the elderly, caregiving

JEL Codes: J16, J14, I11

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†Corresponding author: Noa De La Vega, noadelavega@gmail.com.

‡European University Institute (EUI), Department of Economics, Florence (Italy).

§Data availability: The data used in this article come from SHARE and can be obtained from the SHARE Research Data Center at https://share-eric.eu/data/data-access upon registration.

¶Ben-Gurion University of the Negev, Department of Economics, Be'er Sheva (Israel).

Data Availability Statement

The data used in this article come from the Survey of Health, Ageing and Retirement in Europe (SHARE) and can be obtained from the SHARE Research Data Center at https://share-eric.eu/data/data-access upon registration.

Disclosure Statements

Noa de la Vega

The author conducted this research while supported by the European University Institute (EUI) as a Max Weber fellow. The author has not received any other significant financial support related to this work.

The author does not hold any paid or unpaid positions as officer, director, or board member of any entity relevant to the research. There are no relevant disclosures regarding close relatives or partners.

No external party had the right to review the paper prior to its circulation. This research does not involve the collection of data on human subjects and, therefore, did not require Institutional Review Board (IRB) approval.

Stav Federman

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1 Introduction

Recent studies have shown that childcare affects the careers of mothers and fathers in different ways (Bertrand et al., 2010; Angelov et al., 2016; Kleven, Landais and Søgaard, 2019; De La Vega, 2022). This raises the question: Are gender differences in caregiving limited to childcare, or do they extend to other types of informal care? In this study, we analyze the "aging parent penalty"- how deterioration in parental health affects the labor market outcomes of adult daughters relative to adult sons.

The impact of parents' health on adult children's labor market outcomes has received only limited scholarly attention. While Frimmel et al. (2025) found that parental health shocks negatively affect children's employment in Austria, no such effect was found in the Netherlands and Norway (Rellstab et al., 2020; Ramirez Lizardi et al., 2024). Previous research has examined the employment effects of caring for ill parents, but less is known about how this form of caregiving contributes to the gender gap in employment. We address this gap in the literature by studying how parental health shock affects the aging parent penalty and by assessing whether this penalty varies across countries. To better understand the cross-country differences in employment responses to parental illness, we also demonstrate substantial cross-country variation in the availability of formal and informal elderly support systems, public and private caregiving policies, and social norms surrounding gender and family responsibilities.

To analyze the impact of parental health on children's gender employment gap across different countries, we use data from the Survey of Health, Ageing and Retirement in Europe (SHARE), studying households in which parents experienced a health shock in different years. Using a quasi-experimental event study approach to analyze the impact of parental health shocks on children's employment across all countries in our study, we find that the employment gap between brothers and sisters widens after a parent experiences a health shock. Our results show that 6 years after the parental health shock, daughters' employment falls by 9.9% relative to that of sons due to the health shock. This finding aligns with existing literature, which attributes the persistent gender gap in employment to the unequal division of childcare responsibilities between mothers and fathers.[1] Our results extend this insight by showing that similar gendered patterns emerge in the context

[1] See, among others: Bertrand et al. (2010), Daniel et al. (2013), Goldin (2014), Angelov et al. (2016), Kuziemko et al. (2018), Kleven, Landais and Søgaard (2019).

of eldercare, further contributing to the gender employment gap.

However, we find substantial differences when examining the effects of parental health on children's employment separately by country. To better understand this cross-country variation, we document substantial differences in elderly care policies and norms surrounding caregiving responsibilities. We also examine how parental health shocks are associated with informal care provided by children, formal professional care, healthcare expenditure, and government disability benefits. These differences align with variation in employment responses of sons and daughters following a parental health shock.

We find that in Italy and Spain, where family members primarily provide informal caregiving, parents receive more support from their children after experiencing a health shock. In these countries, daughters' employment declines by 9.1% following a parental health shock. This suggests that daughters relocate their time between family duties and employment. In these countries, we find no effect of parental health shock on sons' employment.

In Germany and Switzerland, after experiencing a shock to their health, parents receive more professional help and their healthcare expenditure increases. As the responsibility of caring for the elderly is fulfilled through the market, more financial resources are required to pay for these services. In these countries, sons experience a 5.5% increase in employment. This may occur because sons provide financial assistance for their parents or because parents stop supporting their children in times of illness. In these countries, we find no effect of parental health shocks on daughters' employment.

In Sweden and Denmark, where caregiving duties are mostly provided by the government, there is an increase in the use of professional help after a parental health shock, with no significant change in healthcare expenditure. Additionally, compared to other countries, parents in these countries are more likely to receive disability benefits before experiencing a health shock, and this likelihood increases even further afterwards. In these countries, there is no change in employment for either daughters or sons, suggesting elderly parents depend more on the welfare system than on their children's assistance in times of illness.

Our findings indicate a divergence in caregiving dynamics and employment responses between genders. Daughters assume care responsibilities in informal care settings, negatively affecting their employment. Meanwhile, sons financially provide market-based care

solutions, positively affecting their employment after parental health shocks. Interestingly, we find that the effects of parental health on adult children's employment are more pronounced for families with mixed-sex siblings, suggesting that in these families, gender differences are more salient.

This work adds to the body of research exploring the impact of health shocks on family members' employment. One strand of literature examines how parents respond to health shocks experienced by their children. These studies find that mothers experience a sharper decline in labor supply following the event, while fathers are less affected (Adhvaryu et al., 2023; Breivik and Costa-Ramón, 2024). Another large body of work focuses on how health shocks affect spouses, with mixed results. Some report spouses reduce their labor supply in response to a partner's health shock (García-Gómez et al., 2013; Jeon and Pohl, 2017), while others find no significant effect (Dobkin et al., 2018; Macchioni Giaquinto et al., 2022).[2] In contrast to the large literature on health shocks' effects on spouses and parents, evidence on how adult children respond to parental health shocks remains limited. Adult children may step in as caregivers, particularly in families where spousal support is limited. In this context, we find that daughters of unmarried parents experience a greater impact on their employment compared to those whose parents are married, possibly because unmarried parents are more likely to rely on their daughters for support.

Our study builds on recent work examining how parental health shocks affect adult children's employment. Our findings qualitatively align with those of Frimmel et al. (2025), Rellstab et al. (2020) and Ramirez Lizardi et al. (2024).[3] Frimmel et al. (2025) found that in Austria, parental health shock negatively affects their children's employment, similar to our findings. They also show that a reform relaxing constraints and liberalizing formal care work mitigated the adverse effects of parental health shock on children's employment. These results demonstrate how the effect of parental health on adult children's labor market outcomes may differ depending on the elderly care policies in place. Our work expands on these findings by examining the parental health shock effect on children gender gap in employment. We also provide a cross-country analysis and highlight how differences in formal and informal support systems, public and pri-

[2] Fadlon and Nielsen (2021) show that fatal health shocks significantly increase the labor supply of surviving spouses, driven by families facing substantial income losses.

[3] Bergeot et al. (2024), using SHARE data, examined the effect of parental health shocks on adult children's labor supply and found no significant effect. However, since their study pooled data from all countries and did not differentiate between sons and daughters, its findings are difficult to compare with ours.

vate caregiving policies, and social norms shape children's employment responses to their parents' health shocks.

There is extensive literature on the relationship between informal caregiving and the labor market outcomes of family members. Studies in this area consistently find negative associations between informal caregiving and both the employment rates and working hours of caregivers (McGarry, 1998; Heitmueller, 2007; Bolin et al., 2008; Leigh, 2010; Ciani, 2012; Schmitz and Westphal, 2017; Løken et al., 2017; Heger and Korfhage, 2020). These negative associations are particularly pronounced among female caregivers (Van Houtven et al., 2013; Bauer and Sousa-Poza, 2015; Simard-Duplain, 2022). This body of research highlights the adverse labor market consequences experienced by adult children, conditional on them being the caregivers for their parents. By leveraging an exogenous parental health shock, we identify the causal effect of parents' health deterioration on their children's employment. Additionally, we offer a broader perspective on how aging parents affect their children's labor market outcomes beyond caregiving duties. Parental health deterioration may influence employment through alternative channels, such as increased financial burdens on families (García-Gómez et al., 2013; Trevisan and Zantomio, 2016).

In this sense, our paper connects to the literature estimating the effect of parenthood on parents' employment and income. Similarly to the parental health shock examined in this paper, the birth of a child is a shock affecting parents' employment through various channels, including caregiving responsibilities and financial demands. Research on this topic repeatedly demonstrates a differential effect of childbirth on mothers and fathers, with mothers often experiencing a decline in employment following motherhood (See, among others: Bertrand et al., 2010; Angelov et al., 2016; Kleven, Landais and Søgaard, 2019). This mirrors our results showing that daughters reduce their employment when a parental health shock increases informal caregiving needs. Additionally, it was found that fathers increase their employment after the first childbirth when taking on the breadwinner role in the family (De La Vega, 2022). This aligns with our result, showing an increase in sons' employment when a parental health shock increases the financial burden to the family. Our results also show that the effects of parental health on adult children's employment are driven by families with mixed-sex siblings. This corresponds to findings by Andresen and Nix (2022), who found that the impact of first childbirth on employment

is mitigated in same-sex couples, likely due to a more equal division of caregiving responsibilities. By analogy, in families with only same-sex siblings, caregiving and financial responsibilities may also be shared more equally.

This research makes three main contributions. First, it examines the causal effect of a parental health shock on the gender gap in employment among adult children, a question that has not been previously studied. Specifically, we show that sons and daughters assume different roles in supporting their aging parents, increasing the gender employment gap. This finding enriches the broader discussion on the gendered implications of caregiving and financial responsibilities in the context of the increasingly elderly population. Second, it addresses a critical gap in the literature by examining how the division of care responsibility for the elderly impacts adult children's allocation of time between paid employment and informal care provision. In our work, we establish a connection between the impact of parental health on their children's employment and the increase in paid formal care and informal care parents receive from their children. By making this connection, we offer novel insights into the relationship between the division of care responsibility for the elderly and the employment responses of sons and daughters to parental health shocks. Third, we highlight how individuals' responses to parental health shocks vary across countries. We further demonstrate substantial cross-country variation in the availability of formal and informal elderly support systems, public and private caregiving policies, and social norms surrounding gender roles and family responsibilities, all of which contribute to shaping these heterogeneous responses.

The rest of the paper proceeds as follows: Section 2 describes the data and the sample. Section 3 outlines the empirical strategy. Section 4 presents the impact of parental health on children's gender employment gap. Section 5 introduces a framework for classifying countries based on their reliance on formal and informal care, and provides evidence supporting the validity of this classification. Section 6 examines the impact of a parental health shock on sons' and daughters' employment by the country care classification. Section 7 provides a complementary analysis using the approach proposed by Callaway and Sant'Anna (2021). Section 8 explores heterogeneity by sibling gender composition and other demographic characteristics. Section 9 discusses the role of gender norms in shaping children's responses to parental health deterioration. Section 10 reports a series of robustness checks. Finally, Section 11 concludes.

2 Data and sampling

Our analysis is based on longitudinal data collected from individuals aged 50 or older participating in the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan et al., 2013). In our main sample, we use data from SHARE waves 1-2 and 4-6, collected between 2004 and 2015, with an average two-year interval between each wave. These waves provide comprehensive data on participants' social, economic, and health status, as well as information about their adult children, including employment details. Appendix C provides a description of the variables used in this paper. Waves 3 and 7, which focused on participants' childhood and life histories, did not include information on children and are therefore excluded. Similarly, waves 8 and 9 (2019–2021) are not used in the main analysis due to disruptions caused by the COVID-19 pandemic. Using the selected waves, we construct a panel dataset tracking children's employment and their parents' health over time, based on parental reports.[4]

A key strength of this dataset is its ability to capture household-level dynamics and intra-household changes that are typically unavailable in administrative data, offering a more holistic view of children's responses to parental health. For instance, the data allow us to observe changes in whether parents receive personal care or assistance from their children, an important shift that would be virtually impossible to detect using administrative sources. Additionally, the dataset includes multiple countries where all participants are asked the same questions, ensuring comparability across countries. In our sample, we focus on six European countries that participated in all waves of the SHARE: Denmark, Germany, Italy, Spain, Sweden, and Switzerland. The process of selecting countries is discussed in detail in Section 5. However, as with most survey data, limitations include a relatively small sample size and reliance on self-reported information.

Our main analysis focuses exclusively on children whose parents experienced a *health shock* during the observation period. A "health shock" is defined as an event in which the parent of an individual reports being diagnosed with a new health condition for the first time, having indicated in previous waves they had never been diagnosed with any of the health conditions. To identify the shock, we consider any of the following conditions:

[4]Earlier versions of SHARE lacked consistent child identifiers across waves, requiring researchers to manually construct child panels. With Release 9.0.0, SHARE introduced child ID variables, enabling precise and consistent longitudinal tracking of children across waves (SHARE Release Guide 9.0.0).

stroke, heart attack, cancer, Parkinson's disease, or chronic lung disease.[5] We exclude Alzheimer's disease from our definition because information about it is not consistently available across all SHARE waves used in this study.[6]

These conditions were selected based on both their prevalence in the SHARE data and their relevance in the literature on the economic consequences of health shocks (e.g., Jeon and Pohl, 2017; Fadlon and Nielsen, 2021; Schiele and Schmitz, 2023; Bergeot et al., 2024). Importantly, we limit the sample to health conditions that are unlikely to be anticipated 0–2 years in advance to preserve the validity of our identification strategy and address concerns about anticipation. For that reason, we consider the first diagnosis for the shock in the case of multiple diagnoses, as individuals might anticipate and prepare for later diagnoses.

While the conditions specified differ in severity, predictability, and implications for care, they represent severe health events that are most likely to represent the initial event that triggers adjustments in caregiving needs. Since specific types of health shocks are rare in the sample, we follow previous studies and classify respondents as having experienced a health shock if they report any of the five conditions. Moreover, as shown in Subsection 10.4, the estimated employment effects are consistent across different conditions.

We aim to analyze the impact of parental health on adult children's gender employment gap. Parental health shocks are unlikely to be randomly distributed, meaning individuals whose parents did not experience such a shock differ systematically from those whose parents did. For this reason, we focus exclusively on families in which a parental health shock occurred, and we leverage variation in the timing of these shocks to identify their effects.

We further restrict our analysis to nonfatal shocks for three reasons. First, since our interest lies in situations where children may provide care to their parents, fatal shocks are inherently incompatible with this framework. Second, our data relies on parents' self-reporting, meaning we cannot observe children in cases where the parent did not survive the shock. Third, research indicates that fatal and nonfatal shocks often lead to different labor market outcomes among family members (Fadlon and Nielsen, 2021). By focusing solely on nonfatal shocks, we provide clearer insights into this specific type of shock rather

[5] The proportions of all SHARE participants diagnosed with a health shock in each country are as follows: 7.6% in Germany, 9.7% in Sweden, 11% in Spain, 9% in Italy, 10.2% in Denmark, and 9.2% in Switzerland.

[6] A complete list of health conditions available in SHARE is provided in Appendix D

than combining two distinct cases.

To mitigate possible selection effects and to ensure the sample is as close as possible to a balanced panel, we restrict our sample to individuals who are observed: (1) at least twice, once before and once after the parental health shock; (2) in at least two consecutive waves, following the strategy used by Kleven, Landais, Posch, Steinhauer and Zweimüller (2019). This leaves a sample of 8,522 individuals (i.e., SHARE participants' children) and 28,572 person-year observations. In addition, in Subsection 10.1 we conduct a robustness check using a balanced panel, and find results consistent with our main findings, suggesting that our results are not driven by sample selection.

Column 1 of Appendix Table A.1 presents summary statistics for the parents and children in our sample.[7] Panel A reports statistics for parents, who are 71 years old and have 2.5 children on average at the time of the health shock. Approximately 20% of parents have attained education beyond high school. At the time of the health shock, 14% of mothers and 15% of fathers were employed, reflecting the high share of retired individuals in this age group.

Panel B presents summary statistics for the children. At the time of the parental health shock, they are on average 43 years old and have 1.16 children of their own. 40% have more than a high school education, and their pre-shock employment rates are 70% for daughters and 85% for sons.

3 Methodology

We use an event-study methodology to examine short- and medium-term changes associated with parents' health shock. Consider a panel of i =1...N individuals from j =1...J households, in which the variables are observed for a subset of p =1...P periods, measured in years, with increments of two years. In this setup, every unit receives treatment (i.e., parents' health shock) in some period E_i within the sample and stays treated forever.[8] Let $k_{ip} = p - E_i$ be the "relative time," the number of years relative to the parental health

[7] In the following sections, we divide the European countries into three country types. Summary statistics by country type are provided in Columns 2–3 of Appendix Table A.1 and discussed in detail in Subsection 5.4.

[8] Our main analysis focuses only on households that experienced a health shock, as using "never treated" individuals could be problematic. This is because individuals whose parents experience a health shock differ systematically from those whose parents do not. However, an analysis using alternative comparison groups is available in Section 7.

shock (the event), and let the letter t denote the event time.

Using an event studies approach, we examine the impact of a parental health shock on the labor market outcomes of daughters (d) and sons (s). Specifically, we estimate the following model separately by gender g=[d,s]:

$$y^g_{ijpt} = c_i + \gamma^g_{ip} + \sum_{\substack{k=-6 \\ k\neq -2}}^{6} \beta^g_k I[k = t] + \epsilon_{ijpt} \tag{1}$$

where y^g_{ijpt} is the outcome of interest for individual i, of gender g, from household j, in year p and at event time t. The third term on the right-hand side includes event-time dummies. We omit the event-time dummy at $t = -2$, implying the event-time coefficients β^g_k measure the impact of the parent's health shock relative to the two years before the parental health shock; c_i and γ^g_{ip} are individual and calendar year×country fixed effects (FE), respectively. The individual FE control for time-invariant characteristics specific to each individual, such as education and number of children and siblings (when these remain constant). The interaction of year and country allows us to absorb country-specific time trends without introducing multicollinearity with the individual FE. This structure allows us to rely on within-individual variation over time, net of country-specific temporal shocks. Robust standard errors are clustered at the parental household level because siblings are affected by the same parental health shock (Abadie et al., 2023).[9]

Following the methodology of Kleven, Landais and Søgaard (2019) to estimate the outcome variables for each period relative to the years before the parental health shock, we define the following equation:

$$\widetilde{y}^g_{ijpt} = \hat{y}^g_{ijpt} - \sum_{k\neq -2} \hat{\beta}^g_k I\left[k = t\right] = \hat{c}_i + \hat{\gamma}^g_{ip} \tag{2}$$

where $\widetilde{y}^g_{ijpt}$ is the predicted outcome when the contribution of the event time dummies is omitted.

We then calculate the effect of the parental health shock in relative year t as a per-

[9]In some of the analyses, to allow estimation when the sample size is relatively small, we also examine differences in the impacts of parental health shock on the outcome of interest within a general before\after framework instead of an event-study structure. For details, see Appendix E.

centage of the counterfactual outcome, the absence of parental health shock, by Eq. (3):

$$p_t^g = \frac{\hat{\beta}_t^g}{E\left[\widetilde{y}_{ijpt}^g | t\right]} \tag{3}$$

We use nonparametric bootstrapping to calculate confidence intervals and standard errors, accounting for the fact that the denominator is an estimated value.

Having estimated the impacts of parental health shock on daughters and sons separately, following Kleven, Landais and Søgaard (2019) we define an "aging parent penalty" on daughters (d) relative to sons (s) at event time t as:

$$aging\ parent\ penalty_{\,t} = \frac{\hat{\beta}_t^s - \hat{\beta}_t^d}{E\left[\widetilde{y}_{ijpt}^d | t\right]} \tag{4}$$

This *aging parent penalty* measures the percentage by which daughters' employment is falling behind sons due to the parents' health shock at event time t.

Our approach focuses only on households that experienced a similar unexpected health shock during our sample period. Hence, the treatment effect is identified solely based on the event's timing. Our identification relied on two assumptions. The first identification assumption is that given the year×country and individual FE, the timing of the parental health shock is not associated with the employment of their adult children in any of the periods. A violation of this identification assumption would occur if there is anticipation of a parent's health deterioration and, in response, their adult children adjust their employment status before the health shock is formally diagnosed. In such instances, the timing of the health shock is no longer considered exogenous to the child's employment situation. To address this concern, as explained in Section 2, we limit our analysis to health conditions that are unlikely to be anticipated 0-2 years in advance. Further support for this approach is provided in Subsection 10.3, where we validate that the selected conditions constitute a significant and unanticipated health shock. Additionally, in Subsection 10.4, we examine the effects across different conditions, recognizing that some may be more anticipated than others, and find a consistent employment impact across these categories.

A second identification assumption in the event study framework is the parallel trends assumption. This assumption requires that, in the absence of a parental health shock, the employment trajectories of treated and comparison individuals would have evolved

similarly over time. In our context, this means that—conditional on year×country and individual FE—the employment of adult children whose parents experienced a health shock in year p would have followed the same trend as those whose parents experienced the shock in a different year, had the shock not occurred. To support the plausibility of our identification assumptions, in Subsection 5.4 we present estimates of trends in employment before the parental health shock. Showing that sons' and daughters' employment rates remained stable and exhibited no differential patterns in the two to eight years prior to the shock.

Under these identification assumptions, our empirical strategy enables us to estimate the causal effect of parental health shocks on the employment of their adult children. As parents in our sample experience a health shock in different periods, and the treatment effect may diminish over time, which can bias our results, we also employ an additional estimation strategy proposed by Callaway and Sant'Anna (2021) using 2 alternative comparison groups in Section 7. In this setting, we find similar and consistent results, further reinforcing the robustness of our findings.

4 Employment

Figure 1 shows the impact of the parental health shock on children's employment by gender, based on the event-time coefficients estimated by Eq. (1) expressed as a percentage of the counterfactual outcome defined in Eq. (3). The figure shows that in the first period following the parental health shock, daughters' employment declines by 4.1%, while there is no statistically significant change in sons' employment relative to two years before the shock. This decline in daughters' employment persists over the following six years, ranging from 7% to 10%. The long-run aging parent penalty, which represents the percentage by which daughters' employment falls behind sons' employment due to parental health shock 6 years after the shock, is 9.9%. Overall, our results show a gendered response to parental health shocks: when their parents fall ill, daughters reduce their employment, increasing the gender employment gap.

These results parallel findings from the child penalty literature, which consistently show that employment responses to the birth of a first child differ by gender, with women typically reducing their employment (Bertrand et al., 2010; Daniel et al., 2013; Angelov

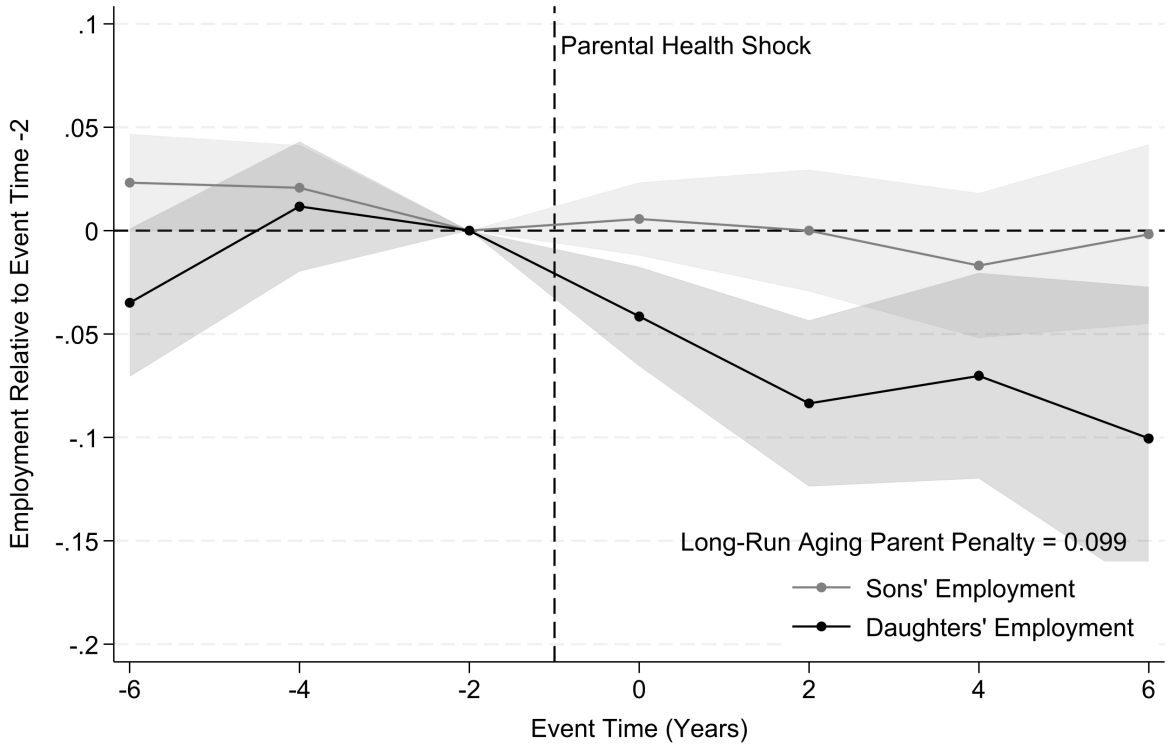


Figure 1: Parental health shock impacts on children's employment

Notes: This figure shows the impacts of parental health shock on children's employment by gender. The figure shows the event-time coefficients estimated by Eq. (1) expressed as a percentage of the counterfactual outcome defined in Eq. (3). Including bootstrapped 90% confidence intervals using 500 replications and clustering by parental household. The figure also reports the long-run "aging parent penalty," the percentage by which daughters' employment falls behind sons' employment following the parental health shock, defined by Eq. (4) and measured at event time 6.

et al., 2016; Kleven, Landais and Søgaard, 2019; De La Vega, 2022). However, the expectation that children will care for their aging parents is less straightforward than the expectation that parents will care for their children. Hence, in the following sections, we examine cross-country variation in the availability of formal and informal elderly support systems, public and private caregiving policies, and social norms surrounding gender and family responsibilities. We also analyse how sons and daughters differ in their employment responses to parental illness across countries in our study.

5 Country types classification

Elderly care responsibilities can be assumed by the government, the individual's immediate family and relatives, or the individual themselves. When families or individuals take on caregiving, this responsibility can be managed through home production or by out-

sourcing the caregiving to market-based solutions, such as hiring professional caregivers or opting for hospitalization in nursing homes.

The division of elderly care responsibilities typically involves a combination of all caregiving solutions, though the balance varies significantly across countries. In some countries, individuals rely more heavily on government support, while in others, families or the market play a more dominant role. In this section, we classify European countries into types according to prevailing patterns in how elderly care tends to be supported, whether primarily by the family, market, or government.

We focus on three key dimensions: (1) formal government policies that shape institutional care arrangements; (2) social norms that reflect cultural expectations about caregiving roles; and (3) reports by elderly individuals on who actually provides their care. In Appendix F we discuss how our classification corresponds to previous welfare regime typologies commonly used in the literature.

5.1 Long-Term Care policies

We focus on countries that participated in all waves of the SHARE: Austria, Belgium, Denmark, France, Germany, Italy, Spain, Sweden, and Switzerland, to examining differences in formal policies related to elderly care.[10] Since countries differ in how they organize care provision, comparing them to understand which actors play a more prominent role is not always straightforward. An alternative approach is to examine data on Long-Term Care (LTC) expenditure.[11] Although younger individuals may also require LTC services due to disability or illness, only 21% of LTC recipients across OECD countries are under 65, while adults over 80 account for more than 50% of recipients (OECD, 2019). Therefore, LTC expenditure offers valuable insights into how elderly care is structured and provided across different countries.

LTC services can be fulfilled formally by the government or the market or informally by relatives. Using OECD data, Figure 2 illustrates the variations in formal LTC expenditure among all countries that participated in all waves of SHARE.[12] The figure shows

[10] Although the Netherlands participated in all waves of SHARE, wave 6 used an experimental design that omitted key variables, including the child questionnaire, essential for our study.

[11] LTC is a range of services for individuals with physical or cognitive limitations, who require ongoing assistance with daily activities, such as bathing, getting out of bed, and dressing. It also includes basic medical support, health monitoring, and tasks like housework and transportation (Fujisawa and Colombo, 2009).

[12] OECD (2004-2019), Health expenditure and financing, https://data-explorer.oecd.org (accessed

government and out-of-pocket LTC expenditure by country as a percentage of GDP (left vertical axis) and the total annual LTC expenditure per capita in Purchasing Power Parities (PPP), Euro 2015 prices (right vertical axis).

Sweden and Denmark have the highest formal LTC expenditure as a share of GDP and in terms of total expenditure, with 93% of it publicly funded. In contrast, Italy and Spain exhibit low government and out-of-pocket LTC expenditure as a percentage of GDP, and the lowest formal expenditure per capita.[13] In Switzerland, Belgium, France, Germany, and Austria, formal LTC expenditure falls in the mid-range. Notably, there is a significant variance in the percentage of expenditure covered by the government, with coverage ranging from 66% in Switzerland to 90% in Belgium.

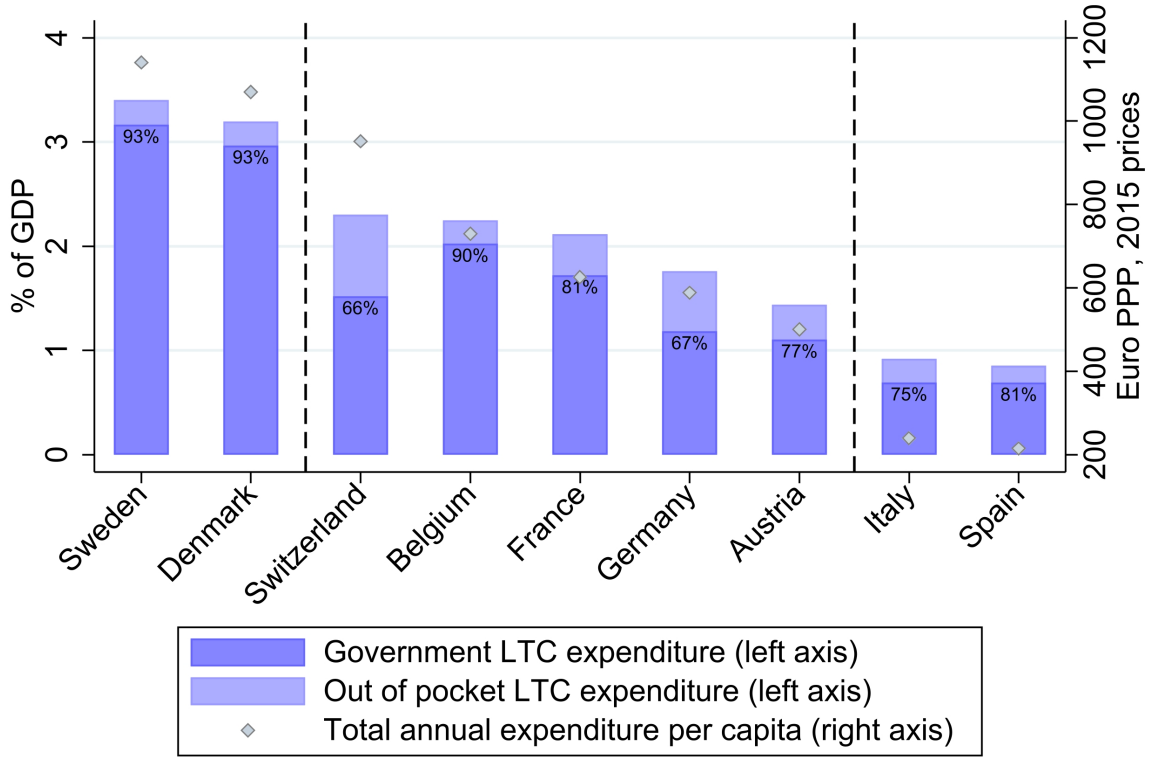


Figure 2: Long Term Care (LTC) expenditure by country, 2004-2019.

Notes: This figure displays the average LTC expenditure for each country during the years 2004-2019. The left vertical axis shows government and out-of-pocket LTC expenditure as a percentage of GDP, while the right vertical axis shows the total annual LTC expenditure per capita in Purchasing Power Parities (PPP) at Euro 2015 prices. *Source:* Authors' calculations, OECD Health expenditure and financing data, 2004-2019.

on 23/05/2024).

[13] This is not due to lower need for LTC services, as the percentage of the population over 80 years old is not correlated with the formal expenditure on LTC (OECD 2010, population age structure, https://data-explorer.oecd.org, accessed on 04/06/2024). In addition, the formal LTC expenditure does not correlate with the percentage of individuals diagnosed with a health shock in SHARE. For example, Spain has the highest diagnosis rate (11%) and the lowest formal LTC expenditure.

Based on these patterns, we classify Sweden and Denmark, where the LTC total expenditure is high and more than 90% is covered by the government, as *government-based care countries*. Germany and Switzerland, where the out-of-pocket expenditure exceeds 30% of the total formal expenditure on LTC, we classify as *market-based care countries*. Italy and Spain, where total formal LTC is below 1% of GDP, which reflects an absence of formal LTC services provided either by the government or the market, are classified as *family-based care countries*. In the latter, the need for LTC is partly fulfilled informally by relatives, as we show in Subsection 5.3. Due to the lack of a clear pattern distinguishing the remaining countries as one type or another, we focus solely on these six countries.

5.2 Caregiving norms

To validate our country classification, we examine attitudes on who holds the responsibility for caring for ill parents, the children or the government. We use the joint World Values Survey (WVS) and European Values Study (EVS) Wave 7, carried out from 2017 to 2022. In these surveys, subjects were asked how much they agree with the statements "Adult children have the duty to provide long-term care for their parents" and "The government should take more responsibility to ensure that everyone is provided for".

We construct dummy variables equal to 1 if the respondent agrees or strongly agrees with each of the statements, and 0 otherwise. Appendix Figure B.1 illustrates the percentage of respondents who agree with each statement in each type of country. There are significant differences between the types of countries in both statements. Agreement with the statement about the duty of children to care for parents is highest in family-based countries (67%), followed by market-based (39%) and government-based (22%). The reverse holds for support of government responsibility: 72% agree in government-based countries, compared to 63% and 46% in market- and family-based countries, respectively. These results show that caregiving values in these countries align with the division of caregiving responsibilities between the family and the government.

5.3 Formal and informal care

This subsection examines the relationship between parental health shocks and informal care by children, formal care, healthcare expenditure, and disability benefits using our

main SHARE data.[14] By analyzing these associations using the model described by Appendix Eq. (5), we strengthen our countries' classification and link the employment results, present in section 6, to the formal and informal care parents receive. Since the corresponding information is based on answers provided at the parental level, the analysis in this subsection cannot be conducted separately for daughters and sons.

In panel A of Appendix Table A.2, we examine the correlation between parents' health shocks and their children's help. Our analysis relies on parents' responses about receiving help or care from their children in the past year. Before the health shock, the average number of parents receiving help from their children was similar across all types of countries, at about 12%. After the shock, this share rises by 6.1 percentage points (53%) in family-based care countries. No such increase was observed in market- and government-based care countries. This finding supports the notion that in family-based care countries, caregiving duties are provided informally by the family.

In panel B of Appendix Table A.2, we show the association between parental health shock and the formal care received by parents. We use parents' reports on whether they had received professional or paid help with domestic tasks they were unable to perform themselves due to health problems in the past year. After a health shock, the use of professional or paid help increases by 4.6 percentage points (181.5%) in market-based care countries and 2.9 percentage points (93.5%) in government-based care countries. It is worth mentioning that the question wording does not distinguish whether the help was paid out-of-pocket or covered by the government or insurance. No significant increase is observed in family-based care countries. This further supports the notion that in family-based care countries, caregiving duties are often carried out informally.[15] It also suggests that, in government- and market-based countries, parents turn to formal care after a health shock. To explore differences in the type of formal care in these countries, we examine changes in healthcare expenditure and disability benefits.

Panel C of Appendix Table A.2 shows an annual increase in healthcare expenditure

[14]Note that the identification assumptions enables us to estimate the causal effect of parental health shocks on the employment of their adult children. However, as the timing of the parental health shock could be influenced by prior formal and informal care and health expenditures, this assumption may not hold for the outcome variables discussed in this subsection. Consequently, we interpret the results as indicating a correlation between parental health shocks and formal and informal care, while refraining from making definitive causal claims.

[15]Note that the mean of professional or paid help before the parental health shock in family-based care countries is slightly higher. This may be attributed to the fact that individuals in our sample are slightly older in these countries, which corresponds with the high life expectancy in Italy and Spain.

across all countries, although it is insignificant in family- and government-based countries. Market-based care countries exhibit the largest rise in healthcare expenditure, with an average increase of EUR 312 per year in health expenses, a 98.6% increase, reflecting the market's key role in providing care.[16] In contrast, family-based countries show a smaller, statistically insignificant increase of EUR 147 (49.8%), while government-based countries show the smallest rise of EUR 51 (19.6%), also statistically insignificant. These results correspond to the differences in formal LTC expenditure discussed in Section 5.

Panel D of Appendix Table A.2 presents the association between parental health shock and disability benefits received by the parents. This analysis uses parents' reports on benefits received, classifying a parent as receiving a disability benefit if they report any public disability or sickness benefit. The table shows an increased likelihood of receiving a disability benefit across all country types following a health shock, though the rise is statistically insignificant in family-based care countries. The largest increase is observed in government-based care countries, with a rise of 5.4 percentage points. In market-based care countries, the increase is more moderate, at 1.7 percentage points. The increase in market-based countries represents a 71% rise. This high percentage change is due to the low pre-shock, benefit-receiving rate in these countries, which equals 2.4%. Despite this significant increase, the share of people receiving disability benefits in market-based care countries remains the lowest among all country types. In contrast, the pre- and post-shock disability receiving rate is highest in the government-based care countries. This implies that parents in government-based care countries tend to rely more on public benefits both before and after the shock.

The analyses presented in Appendix Table A.2 provide evidence supporting the classification of countries based on how they tend to provide care for their elderly population.[17] Family-based care countries tend to rely on informal care carried out by family members, particularly the children of the elderly. In market-based care countries, while some public support is available, caregiving duties are largely met through paid professional services provided by the market. In government-based care countries, professional care is primarily provided by the government. This analysis also allows us to link the employment results

[16] According to German prices, 2015.

[17] In Appendix Table A.3 we conducted the same analysis on a sample of individuals who answered all four questions in at least one wave. This approach ensures that the same individuals are considered for the different outcomes. The results of this analysis remain consistent with our findings. Note that restricting the sample to individuals who answered all questions in all waves leaves us with a sample that is too small for the analysis.

presented in Section 6 to the formal and informal care parents receive.

5.4 Summary statistics

Appendix Table A.1 presents summary statistics for parents and children by the different types of countries. As shown in Table A.1, across all countries, parents are on average 71.6 years old at the time of their health shock. Parents from family-based countries tend to be older than those from other country types, which aligns with the higher life expectancy in Italy and Spain.[18] However, the children in our sample are of similar age at the time of the health shock, ranging from 41 to 43, suggesting they are at comparable life stages in terms of family and career. Hence, age differences are not likely to drive our results.[19]

Another key observation from the table shows the percentage of parents with more than a high school education in family-based countries is relatively low, at 7%. Although this may appear low, it is important to note that it reflects the proportion of individuals within the same cohort with more than a high school education in Italy and Spain.[20]The table further demonstrates that the pre-shock employment of daughters is lower than that of sons across all country types. In addition, the pre-shock employment of daughters in family-based countries is particularly low, at 62%. This corresponds to the low female employment rate of this age group in Spain and Italy, as recorded by the OECD.[21] Parents' employment is very low across all countries, as parents are 71.6 years old on average, an age at which most are already retired.[22]

The differences in pre-shock daughters' employment across different countries do not threaten our empirical strategy as long as it is not associated with the timing of the parental health shock in any of the periods. In order to assess differences in pre-trend employment patterns between types of countries, Appendix Figure B.2 illustrates the

[18]OECD (2010), Life expectancy by age and sex, https://data-explorer.oecd.org (accessed on 20/09/2024)

[19]To ensure that our results are not driven by age differences, we conduct the analysis described by Eq. (5) for individuals of working age: 25-34. Moreover, this age group aligns with the group typically examined in the child penalty literature and allows for a better comparison with the results of studies in this area. The results, presented in Appendix Table A.4, are consistent with those from the full sample.

[20]Eurostat data: https://ec.europa.eu/eurostat/databrowser/explore/all/all_themes (accessed on: 20/09/2024).

[21]OECD (2010), Employment and unemployment by five-year age group and sex, https://data-explorer.oecd.org (accessed on 20/09/2024).

[22]Given their low likelihood of being in the labor force, any potential effect of a health shock on parents' employment would be negligible. Thus, we do not conduct such an analysis.

employment rates of children 2-8 years before the parental health shock. Across all types of countries, the employment trends for sons and daughters in the two to eight years before a parental health shock are similar. Sons maintain an employment rate of about 84% throughout the entire period. Although daughters have different employment levels, with higher rates in government-based care countries and lower rates in family-based countries, no systematic pre-trends in employment are observed across countries.[23] This suggests the timing of the parental health shock is not associated with sons' and daughters' pre-shock employment in any of the countries.

6 Employment by country types

In Section 4, we observed a clear gendered pattern when pooling the six European countries: when parents fall ill, the gender employment gap widens. Now, we delve deeper into our analysis to examine whether this gendered effect varies across countries. Subsection 5.3 highlighted differences between countries. We found that a shock to the parents' health is associated with an increase in the share of parents who receive informal care from their children in family-based care countries. In market-based care countries, a shock to the parents' health is associated with increased use of paid professional care. In government-based care countries, a shock to parents' health is associated with increased use of professional care and the likelihood of receiving disability benefits. These differences in caregiving arrangements suggest that the impact of a parental health shock on children's employment may also vary across countries.

In Figure 3, we present the impacts of the parental health shock on children's employment based on event-time coefficients estimated by Eq. (1) expressed as a percentage of the counterfactual outcome defined in Eq. (3). The results for daughters are presented in panel A of Figure 3. We find that in family-based care countries, when a parent becomes ill, their daughters' employment decreases. In the year the parent reports being diagnosed with a health shock, there is a reduction of 9.6% in daughters' employment relative to the employment rate before the shock. In the two to six years following the health shock, the decrease in daughters' employment persists, showing a sustained 16%-22.4% reduction. In

[23]Note that while daughters' employment in market-based care countries increases slightly between year -8 and year -2, this change is not statistically significant and does not appear to be associated with the timing of the parental health shock. It may reflect broader labor market dynamics, such as recovery from the child penalty, rather than a threat to our identification strategy.

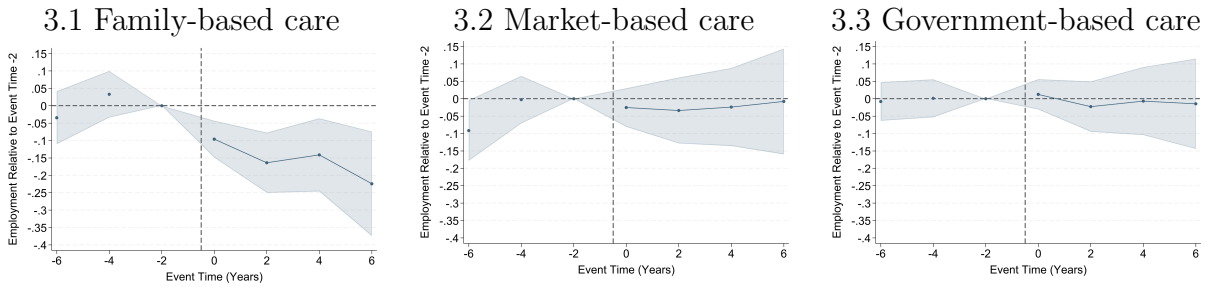
contrast, we do not find an impact of the parental health shock on daughters' employment in market- and government-based care countries.

The results for sons are presented in panel B of Figure 3. We find that in the year the parent reports being diagnosed with a health shock, sons in market-based care countries experienced a 4.7% increase in employment. This effect persisted in the short term, reaching a 7% increase two years after the shock. Nevertheless, this impact diminishes over the years. We do not find that the parental health shock affected sons' employment in family- and government-based care countries.

To complement these results, we present the average parental health shock impacts on children's employment in Table 1, where we present the employment β^{wg} coefficients estimated from Eq. (5), separately for each country type and gender. As in our event-time analysis, daughters' employment decreases in family-based care countries by 9.1% on average over the 0-6 years after their parents become ill. For sons in market-based care countries, we find a 5.5% average increase in employment.

Our results indicate a divergence in the caregiving dynamics and labor market outcomes between genders within countries of different types. An explanation for the differential effects on children's employment could be attributed to the division of care responsibility for the elderly among the market, government, and family. In family-based care countries, caregiving duties are mainly provided informally by the family, negatively impacting daughters' employment. In market-based care countries, caregiving duties are mainly externalized to the market and require additional financial resources, positively impacting sons' employment. In government-based care countries, caregiving duties are mainly provided formally by the government; therefore, no effect is observed on the employment of daughters and sons.

Panel A - Daughters' employment



Panel B - Sons' employment

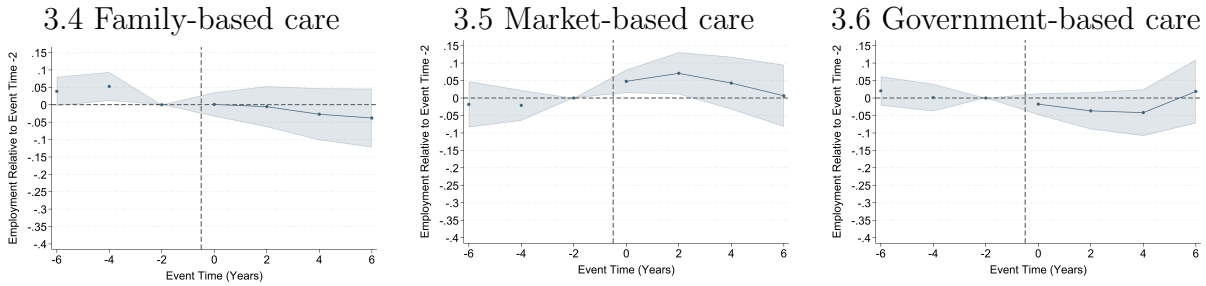


Figure 3: parental health shock impacts on children's employment.

Notes: This figure shows the impacts of parental health shock on children's employment by type of country. Panel A presents the impacts on daughters' employment, and panel B on sons' employment. Each subfigure shows the event-study coefficients estimated from Eq. (1) expressed as a percentage of the counterfactual outcome defined in Eq. (3). Including bootstrapped 90% confidence intervals using 500 replications and clustering by parental household.

Table 1: Average parental health shock impacts by type of country

	Daughters			Sons		
	(1) Family	(2) Market	(3) Gov.	(4) Family	(5) Market	(6) Gov.
Employment	-0.058***	-0.020	0.013	-0.008	0.046***	-0.014
	(0.019)	(0.024)	(0.019)	(0.015)	(0.017)	(0.014)
Mean	*0.633*	*0.726*	*0.802*	*0.847*	*0.837*	*0.850*
Effect as % of mean	-9.1%	-2.8%	1.6%	-0.9%	5.5%	-1.7%
Observations	5,657	3,247	4,095	6,171	3,214	4,587
# individuals	1,708	1,062	1,253	1,869	1,058	1,386

Notes: This table shows the average impacts of parental health shock on children's employment by type of country based on Eq. (5). Columns (1)-(3) present the impact on daughters' employment in family-based care, market-based care, and government-based care countries, respectively. Columns (4)-(6) present the impact on sons' employment in family-based care, market-based care, and government-based care countries, respectively. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

7 Alternative comparison groups

In Section 6, we demonstrate that employment responses to a parental health shock differ based on gender and the type of country. To do this, we use an event study analysis, where individuals act as their own comparison group over time. Recent literature on event studies highlights the potential bias in results when there is variation in treatment timing and heterogeneous treatment effects (De Chaisemartin and d'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2021). This concern is relevant to this study, as parents in our sample experience a health shock in different periods, and the treatment effect may diminish over time.

To overcome this concern, we use the inverse probability weighting estimator proposed by Callaway and Sant'Anna (2021) (hereafter CS). As in the event study, we use this method separately for daughters and sons and for each country type.[24] This method also allows us to use two additional comparison groups to estimate the effect of the shock, reinforcing our results. In all the analyses in this section, we control for age, country, parental gender, and parental education level.

The first comparison group is the *not-yet-treated*: individuals whose parents will experience a health shock within the time frame of analysis (2004-2015) but have not yet experienced it. The not-yet-treated serves as a useful comparison group assuming, conditional on covariates, the outcomes of the group treated in year t and the group treated in year $T > t$ would have followed parallel trends had the treatment not occurred. Given that we apply this model to samples of individuals of the same gender and country type whose parents experience the same health shock, and assuming that the timing of the shock is random, the parallel trends assumption is plausible. The not-yet-treated group does not allow us to estimate the event study coefficient for the earliest event time (-6) and the latest event time (6). This limitation arises because, during these periods, all of the sample's individuals are either not-yet-treated or already treated.

One potential solution is to use a group of *never-treated* individuals. However, using the *never-treated* could be problematic, as individuals whose parents experience a health shock may differ systematically from those whose parents do not. Instead, we construct a comparison group using individuals whose parents experienced a health shock after the

[24] In this section, we present the results for daughters in family-based care countries and sons in market-based care countries. All other analyses are available upon request.

analysis time frame, specifically in waves 8 and 9 of the SHARE study conducted in 2019 and 2021. Although these individuals are eventually treated, they effectively serve as a *never-treated* comparison group for our main sample since they were not treated within the analysis time frame. This comparison relies on the assumption that, in the absence of a health shock, the outcomes of individuals treated in year t would have followed a parallel trend to those treated only after the analysis period. Assuming that the timing of the shock is not associated with the outcome variable, and given that we compare individuals of the same gender and country type, it is likely that the conditional parallel trends assumption holds.

Appendix Figure B.3 presents the results for the CS event time coefficient and a weighted average of the ATTs (average effects of treatment on the treated) in the upper right corner of each subfigure. The results for daughters in family-based care countries are presented in Panel A. We find similar event-time coefficients to those found in Section 6. When a parent becomes ill, daughters in family-based care countries experience a decrease in employment. This is true for both comparison groups, although the effect is no longer significant two years after the shock when using the never-treated as a comparison group. Nonetheless, the magnitude of the effect in the first period after the shock is similar to the one found using the event study design.

The CS analysis results for sons in market-based care countries are presented in Panel B of Appendix Figure B.3. The results for this group are similar to those of the event study design. We find a short-run increase in sons' employment following the parental health shock. The effect found using the CS method is comparable in magnitude to that found in Section 6.

Combining the results for sons and daughters, our analyses consistently align with our previous findings. For daughters in family-based care countries, both the event study and the CS estimator reveal a significant decrease in employment following a parental health shock. Similarly, for sons in market-based care countries, both methods show a short-term increase in employment after a parental health shock. The consistency of results across different strategies and comparison groups confirms our conclusions, demonstrating they are robust to biases that might arise from variations in treatment timing and heterogeneous treatment effects.

8 Heterogeneity

8.1 Siblings' gender composition

Our previous analysis shows gender differences in caregiving and the employment of children after parental health shocks, across different types of countries. In family-based care countries, caregiving duties mainly fall on the family, and daughters often reduce their employment. In market-based care countries, reliance on market solutions boosts sons' employment. Andresen and Nix (2022) found child penalties are much smaller and decrease over time when parents are of the same gender. Hence, in this section, we examine whether the gender-based effect varies depending on the gender composition of the individual's siblings.[25]

In the context of siblings' gender composition, Brenøe (2018) shows that women with a brother are more likely to adopt traditional gender norms compared to those without, resulting in negative consequences for their labor market outcomes. Thus, we expect that when the child has siblings of the opposite gender, the care and financial duties will be divided according to traditional gender norms. Therefore, the adverse effect on daughters' employment in family-based care countries, and the increase in sons' employment in market-based care countries, are likely to be more pronounced in families with mixed-sex siblings.

The effect of a parental health shock on daughters' employment in family-based care countries by siblings' gender composition is presented in Appendix Table A.5. The first column shows the effect for daughters who have siblings. As the vast majority of the sample has at least one sibling, the result for this group is similar to the one found for the entire sample.[26] Columns 2 and 3 present the impact of a parental health shock on two groups: daughters from families with same-sex siblings (i.e., only sisters) and daughters from mixed-sex siblings (i.e., at least one brother). The effect for the first group is positive but not statistically significant. In contrast, daughters from a family with mixed-sex siblings experience a decrease in employment after a parental health shock. The effect is greater than that found for the entire sample, with an average 8.1 percentage points decrease, corresponding to 12.9%. This indicates that the decrease in daughters'

[25] Linking biological siblings is only possible using information from wave 3, therefore, in this section, we are limiting the sample to respondents who participated in that wave.

[26] For both sons and daughters, the complementary group of only children is too small for this analysis.

employment in family-based care countries is driven by daughters from families with mixed-sex siblings.

Appendix Table A.6 presents the results for sons in market-based care countries by siblings' gender composition. The results for sons with siblings are similar to those for the entire sample, as most of the children in the sample have siblings. As for daughters, the gender composition of siblings in the family matters for the effect of parental health shock on sons' employment. The employment effect of the parental health shock for sons from a family with same-sex siblings (i.e., only brothers) is positive, albeit relatively small and statistically insignificant. Meanwhile, the effect for sons with a sister is positive, larger in magnitude, and statistically significant.

We thus conclude that the effects of parental health on the employment of adult children are driven by families with mixed-sex siblings. It is also possible that children with same-sex siblings share caregiving (and financial) responsibilities more equally, thus reducing individual burdens and limiting the impact on their employment. However, an additional analysis comparing daughters (sons) with at least one sister (brother) to those without did not provide evidence supporting this explanation.[27]

Our finding aligns with previous research suggesting that the presence of individuals of the opposite gender—whether at home or in school—reinforces gender differences (Booth and Nolen, 2012; Brenøe, 2018; Andresen and Nix, 2022). In particular, our findings are consistent with Andresen and Nix (2022), who show that the parenthood penalty is mitigated in same-sex couples. Their study suggests that when both parents are of the same gender, caregiving responsibilities are more likely to be shared equally, reducing couple disparities in labor market outcomes. By analogy, in families with only same-sex siblings, caregiving and financial responsibilities may be allocated more evenly, whereas in families with mixed-sex siblings, traditional gender norms are more likely to shape the tendency for daughters to take on caregiving roles and sons to assume financial responsibilities. While drawing conclusions from same-sex couples to the general population might raise some concerns, our comparison between individuals with a brother versus those with a sister doesn't have the same problem. These results indicate that when both sons and daughters are present, gender roles become more salient, leading to a more traditional gender-based division of caregiving and financial responsibilities.

[27]This analysis is not reported here but is available upon request.

8.2 Heterogeneity by demographic characteristics

In this section, we assess the impact of parental health shocks on daughters' employment in family-based care countries, taking into account personal characteristics of both parents and daughters. We are particularly interested in identifying differences based on parental gender, marital status, income, and voluntary insurance coverage. Additionally, we want to examine whether a parental health shock has different effects on daughters' employment depending on whether they have children of their own and whether they live near their parents.

We expect the effects to be more pronounced for daughters of unmarried parents, as married parents have a partner to rely on in addition to their daughters' help. To rule out the possibility that children tend to take greater caregiving responsibility for the same-gender parents (i.e., sons to fathers and daughters to mothers), we examine whether the effect varies depending on whether the mother or the father experiences the health shock. We also expect the effect to be stronger for children of parents with low incomes and no voluntary medical insurance, as these parents may rely more heavily on family support in the absence of alternative resources. Therefore, we also examine whether the results differ based on the parents' education (which is highly correlated with income) and whether the parents have voluntary insurance coverage.

As for daughters' personal characteristics, the impact is expected to be more pronounced for daughters who live close to their parents. There is no clear prediction regarding how having children of her own will affect a daughter's response to a parental health shock. On the one hand, caregiving responsibilities for her own children may limit the time she can devote to her parents, potentially leading to a reduction in employment. In family-oriented contexts, this may also occur when a parent who previously provided childcare for their grandchildren experiences a health shock, prompting the daughter to reduce employment to care for her own children. On the other hand, daughters who are already working less due to motherhood may have more availability to care for their parents without further reducing their employment.

Appendix Table A.7 presents the impacts of a parental health shock on daughters' employment in family-based care countries, stratifying the sample based on the parent's gender and marital status two years before the health shock. The results indicate that the impact of parental health shocks on daughters' employment is the same, regardless of

the parent's gender. As expected, daughters of unmarried parents experience a greater impact of parental health shocks on their employment compared to those whose parents are married. Possibly because unmarried parents are more likely to rely on their daughters for care.

Appendix Table A.8 shows the effects of a parental health shock on daughters' employment, divided into two samples based on parents' education level (high school or less, or more than high school) and whether the parents had voluntary insurance coverage two years before the health shock. The results indicate the observed effect is linked to children of parents with lower levels of education. This may be because these parents cannot afford alternative formal care, unlike parents with higher levels of education. Furthermore, for those with private insurance, no negative effect on daughters' employment is observed, as the insurance may cover the cost of alternative formal care.

As shown in Appendix Table A.9, the effect of a parental health shock on daughters' employment is positive and significant regardless of whether the daughter has children of her own pre-shock. However, the effect is positive and significant only if the daughter lived within 100 kilometers of her parents, two years before the health shock; in contrast, if she lived farther away, the impact is smaller and not statistically significant. This suggests that daughters living closer to their parents are more likely to provide support and assistance during health crises, hence impacting their employment.

Our analysis shows that parental health shocks significantly affect daughters' employment, with the extent of the impact shaped by several factors. Daughters of unmarried parents, those whose parents have lower education levels or lack voluntary insurance, and those living within 100 kilometers of their parents face greater employment disruptions. These findings support the view that, in family-based care countries, daughters reduce their employment to provide care for their parents following a parental health shock.

9 Gendered roles and the division of responsibilities

Our findings indicate that when a parental health shock requires financial or caregiving support, these responsibilities tend to be divided along traditional gender lines. This division relates to a broader debate regarding the economic efficiency of caregiving and breadwinning roles versus the influence of social norms. When it comes to child caregiv-

ing, decisions within households about who should reduce their labor market participation typically factor in the household's overall income. This aligns with Becker's (1985) model, where the family seeks to minimize economic costs, often resulting in women—who traditionally earn less—assuming a larger share of caregiving responsibilities. However, when caregiving involves elderly parents, the decision-making process is not made within a single economic unit, as siblings usually belong to different households.

The Beckerian economic efficiency, thus, does not play a central role in the context of elderly caregiving. For example, even if a brother earns more than his sister, the economic benefit he gains by staying employed does not translate into a direct financial advantage for the sister if she reduces her employment to provide care for their parents. This situation raises the question of why daughters are more likely to assume caregiving roles, while sons are more likely to take on breadwinner roles. Akerlof and Kranton (2000)'s theory on deviations from social norms offers a relevant explanation; according to their model, deviating from expected social behavior leads to a decrease in an individual's utility, thereby making women more likely to conform to caregiving expectations and men to breadwinner expectations.

To explore this further, we examine perceptions regarding gender roles and provide suggestive evidence for the relationship between norms and the division of caregiving duties by gender. To understand whether there are differences in values regarding the gender division of caregiving and financial support across different countries, we used the Eurobarometer survey carried out in 2017 across all EU countries.[28] In this survey, subjects were asked to rate how much they agree with the statements "The most important role of a man is to earn money" and "The most important role of a woman is to take care of her home and family."

For each statement, we create a dummy variable that equals 1 if the individual agrees or strongly agrees and 0 if the individual is neutral or disagrees. Appendix Figure B.4 illustrates the percentage of respondents who agree with each statement in each type of country. In all countries, the rate of agreement with the statement that a man's primary role is to earn money is higher than the rate of agreement that a woman's primary role is to take care of her home and family. This is especially evident in market-based care countries, where the gap between the two statements is particularly large. Differences

[28]Eurobarometer does not include information on Switzerland because it is not part of the EU. Therefore, the market-based care findings from this survey only represent Germany.

also exist between the types of countries. The percentage of respondents who agree that a man's role is to earn money stands at 44% in family-based care countries, 40% in market-based care countries, and 16% in government-based care countries. In the case of the statement that a woman's role is to take care of her home and family, 42% agree in family-based care countries, 30% in market-based care countries, and 14% in government-based care countries.

These results show the gender norms in family- and market-based care countries align with the division of caregiving and breadwinner responsibilities between daughters and sons. When there is a gap in supporting the elderly, daughters typically take on the caregiving responsibility, while sons assume the financial support role. This pattern is consistent with Akerlof and Kranton (2000)'s model: women, who are traditionally expected to be caregivers, avoid deviating from this social expectation and are more likely to step in when there is a need for care. Similarly, men, who are expected to be financial providers, fulfill the social norm and assume the breadwinner role.

10 Robustness

10.1 Balanced Panel

All surveys face challenges related to attrition and non-response, and event study designs are particularly sensitive to changes in sample composition over event time. A key concern in our context is that individuals observed at later periods may differ systematically from those observed earlier, particularly if healthier individuals are more likely to remain in the sample. This could lead to biased estimates if changes in employment reflect shifts in who is observed rather than the true effects of the parental health shock.

To address this issue and enhance the credibility of our findings, we conduct an additional robustness check using a balanced panel. Specifically, we restrict the sample to individuals who are observed both at event time t=-2 and at t=0. By including only observations from these two periods, we ensure that the effect of the parental health shock is estimated over a sample with a fixed composition. This mitigates bias due to selective attrition. We estimate the coefficients from Eq. (5) on this balanced sample, replacing individual fixed effects with a set of controls: age, parental gender, parental education level, number of siblings, and calendar year. The results, shown in Appendix Table A.10,

remain consistent with our main findings, suggesting that our results are not driven by sample selection.

10.2 Immigration and the 2008 Financial Crisis

One factor that could bias our results is the possibility of parents relocating based on anticipated health status. For example, parents can move from family- or market-based care countries to government-based care countries for better social support. Such behavior would introduce selection, whereas individuals in poorer health are more likely to live in government-based care countries, and healthier individuals remain in family-based care countries. This, in turn, might alter the impact of the parental health shock. To address this, we estimate the coefficients from Eq. (5) using a sample excluding the children of immigrant parents. The results, shown in Appendix Table A.11, remained unchanged, indicating that migration does not drive the results.

Another concern is that part of the observed effect stems from the 2008 financial crisis, as different parents experienced the shock in different years, with some also facing a health shock during the financial crisis. Given that countries like Italy and Spain were hit particularly hard by the crisis, the observed decrease in daughters' employment in these countries might be attributed to the crisis rather than to the health shock. Since 2008 is not included in our sample, we address this concern by estimating the coefficients from Eq. (5) using a sample that excludes individuals who experienced a health shock in 2007, the year prior to the crisis. This sample thus excludes daughters who reduced their labor force participation due to the crisis. The results in Appendix Table A.12 remained unchanged, indicating that the crisis does not drive the results. Notably, the coefficient for sons in market-based countries decreases slightly and is not statistically significant, but it retains its sign.

10.3 Significant health shock

To validate the selected conditions constitute a significant health shock, we examine the impact of the health shock on two indicators of parents' health status. The first indicator is a binary variable equaling 1 if a parent reported their health as at least good (i.e., good, very good, or excellent) and 0 otherwise. The second indicator is a binary variable equaling 1 if a parent reported taking medication at least once a week and 0 otherwise. We

analyze the shock's impact on these indicators using the event-time coefficients estimated from Eq. (1), expressed as a percentage of the counterfactual outcome defined in Eq. (3).

Appendix Figure B.5 presents the results, showing parents across all country types are significantly less likely to report good health and more likely to take medication regularly following a health shock. The absence of a gradual trend before the shock, combined with the sharp deterioration in health reporting afterwards, confirms that the conditions considered in this study represent a significant and unanticipated deterioration in health.

10.4 Various health conditions

One potential concern is that one particular health condition is driving the results. A straightforward way to test for this would be to estimate the coefficients from Eq. (5) separately for each sample of individuals whose parents were diagnosed with the same condition. However, analyzing each condition separately is not feasible due to the limited sample size. Instead, we group conditions based on their similarities in disease progression, caregiving needs, and potential disruptions in the labor market. Specifically, we categorize them into three groups: (1) heart attack and stroke, (2) Parkinson's and lung disease, and (3) cancer.

Appendix Table A.13 presents the impact of parents' health shock on children's employment by health condition, focusing on daughters' employment in family-based care countries and sons' employment in market-based care countries. For daughters' employment in family-based care countries, the coefficients across all conditions are negative, suggesting that parental health shocks consistently reduce daughters' employment regardless of the specific condition. In market-based care countries, the coefficients for sons' employment are all positive and similar in magnitude, albeit not all statistically significant. This indicates a consistent employment effect across different conditions and suggests that no single health condition drives the results.

11 Conclusion

This study examines the "aging parent penalty" referring to the effect of parental health deterioration on the labor market outcomes of adult daughters compared to adult sons. We show that a parental health shock widens the gender employment gap, with a long-run

aging parent penalty of 9.9%, reflecting the percentage by which daughters' employment decreases relative to that of sons due to a health shock. We further show that this widened gender employment gap arises from two dynamics. In countries where parents rely on informal care from relatives, daughters typically assume the caregiving role and reduce their employment. In countries where care is provided primarily through the market, sons assume the financial support role and increase their employment.

This study makes several key contributions. We are the first to examine the causal effect of a parental health shock on the gender employment gap between brothers and sisters. Emphasizing that sons and daughters assume different caregiving roles, thereby widening the gender employment gap. Also, we address a gap in the literature by linking the effect of the parental health shock on adult children's employment to the care and financial support they provide to their parents. Finally, our research sheds light on how different elderly care policies and norms play a role in adult child employment decisions in the context of an aging population.

In family-based care countries, namely Italy and Spain, where families primarily provide informal caregiving, parents are more likely to receive help from their children after a health shock. Although healthcare expenditure increases after such shocks, parents do not receive additional professional care, as family members step in to meet the growing needs. In particular, daughters significantly reduce their employment by 9.1% to balance family duties and work after their parents experience a health shock. These findings align with the literature on the child penalties. In comparison, this reduction is equivalent to a quarter of the mother's *child penalty*, estimated at a 35% decrease in employment in Italy and Spain (Kleven et al., 2023). Sons' employment, however, remains unchanged after the parental health shock in these countries.

In market-based care countries, namely Germany and Switzerland, there is an increase in parents' healthcare expenses and the use of formal professional care after a health shock. In these countries, sons' employment increases by 5.5% in the year their parent is diagnosed with a health shock. Suggests that in market-based care countries, individuals partially finance their professional care. As a result, sons may increase their employment to adjust to the increasing parental expenses following the shock. This increase in employment in response to a parental health shock corresponds to half of the *breadwinner effect*, a phenomenon where men tend to increase their employment rates after childbirth

when becoming breadwinner-fathers. The *breadwinner effect* was previously estimated at a 10% increase in employment in Germany (De La Vega, 2022). In contrast, parental health shock does not affect daughters' employment in these countries.

In government-based care countries, namely Sweden and Denmark, where the government finances a large share of healthcare services, parents increase their use of professional care without a significant corresponding rise in healthcare expenditure. In addition, there is an increase in the probability of receiving disability benefits and no increase in the likelihood of parents receiving help from their children. In these countries, we find no effect of a parental health shock on children's employment. This implies children do not need to adjust their employment when their parents fall ill, when the government provides most of the caregiving needs.

These findings highlight the role of welfare policies in shaping the gender employment gap. While our findings suggest that the caregiving type of country plays a role in shaping the gendered employment responses to parental health shocks, we recognise that these cross-country differences may also reflect a broader set of institutional, cultural, and economic factors. These could include variations in labour market structures, social norms around gender and family responsibilities, and the availability of public support systems. Future research could further disentangle these influences to better understand the mechanisms at play.

Previous studies showed that the gendered division of childcare responsibilities is the main driver of the gender employment gap. We contribute to the literature by demonstrating that caregiving responsibilities beyond childbirth and childbearing, such as caregiving for the elderly, further widen it. Where caregiving and breadwinning responsibilities are divided along gender lines, the existing elderly care policies play a significant role in the development of the gender employment gap. Policies relying on family-based care often create economic disadvantages that primarily affect women, as they tend to take the caregiver role. In contrast, in countries depending on the market for caregiving, the obligation to pay for these services falls mainly on men, who are more likely to fulfill the breadwinner role.

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Appendix

A Tables

Table A.1: Summary statistics

		By caregiving systems		
	(1)	(2)	(3)	(4)
	Full sample	Family-based	Market-based	Government-based
Panel A: Parents				
Female	0.50	0.50	0.51	0.50
	(0.50)	(0.50)	(0.50)	(0.50)
Age at the time of shock	71.61	73.20	69.95	70.94
	(9.57)	(9.53)	(9.47)	(9.40)
More than high school	0.21	0.07	0.28	0.32
	(0.41)	(0.25)	(0.45)	(0.47)
Number of children	2.56	2.66	2.42	2.53
	(1.35)	(1.47)	(1.31)	(1.18)
Pre-shock employment (female)	0.14	0.06	0.21	0.19
	(0.35)	(0.24)	(0.41)	(0.39)
Pre-shock employment (male)	0.15	0.10	0.17	0.20
	(0.36)	(0.30)	(0.38)	(0.40)
Individuals	3,377	1,397	909	1,071
Panel B: Children				
Female	0.48	0.48	0.50	0.47
	(0.50)	(0.50)	(0.50)	(0.50)
Age at the time of shock	43.08	43.86	41.84	43.02
	(10.12)	(9.93)	(10.29)	(10.12)
More than high school	0.40	0.28	0.44	0.52
	(0.49)	(0.45)	(0.50)	(0.50)
Number of children	1.16	1.09	1.05	1.35
	(1.21)	(1.15)	(1.16)	(1.31)
Pre-shock employment (female)	0.70	0.62	0.72	0.78
	(0.46)	(0.48)	(0.45)	(0.41)
Pre-shock employment (male)	0.84	0.85	0.83	0.84
	(0.36)	(0.36)	(0.37)	(0.37)
Individuals	8,522	3,648	2,176	2,698

Notes: Averages during health shock (*t=0*). Standard deviations are in parentheses.

Table A.2: Parental health shock and formal and informal care by type of country

	(1) Family-based	(2) Market-based	(3) Government-based
Panel A: Help from children	0.065***	0.006	0.027
	(0.024)	(0.032)	(0.026)
Mean	*0.123*	*0.112*	*0.126*
Effect as % of mean	53.1%	5.5%	21.5%
Observations	10,890	5,875	7,717
# individuals	3,578	2,128	2,616
Panel B: Professional or paid help	0.009	0.046*	0.029*
	(0.019)	(0.027)	(0.017)
Mean	*0.039*	*0.025*	*0.031*
Effect as % of mean	23.5%	181.5%	93.5%
Observations	9,275	4,644	7,135
# individuals	3,609	2,081	2,671
Panel C: Health expenditure	147	312**	51
	(92)	(153)	(37)
Mean	*295*	*317*	*260*
Effect as % of mean	49.8%	98.6%	19.6%
Observations	9,315	5,157	7,211
# individuals	3,612	2,159	2,677
Panel D: Disability benefits	0.009	0.017*	0.054***
	(0.012)	(0.010)	(0.015)
Mean	*0.052*	*0.024*	*0.112*
Effect as % of mean	16.5%	71.0%	47.9%
Observations	12,108	6,697	8,938
# individuals	3,629	2,174	2,685

Notes: This table shows the association between the parental health shock and children's help, professional care, healthcare expenditure and disability benefits, based on Eq. (5), using parent FE instead of child FE. The dependent variable in Panel A equals one if the parent indicates one of their children helps or provides them with personal care, and 0 otherwise. The dependent variable in Panel B equals one if the parent indicated they have received professional or paid help with domestic tasks, and 0 otherwise. The dependent variable in Panel C is the annual amount paid on health in Euros in terms of Germany's prices in 2015. The dependent variable in Panel D equals one if a parent indicated they had received a disability or sickness benefit from a public source, and 0 otherwise. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: Parental health shock and care for individuals who answered all questions

	(1) Family-based	(2) Market-based	(3) Government-based
Panel A: Help from children	0.066***	0.007	0.026
	(0.024)	(0.034)	(0.026)
Mean	*0.124*	*0.108*	*0.125*
Effect as % of mean	53.2%	6.6%	21.1%
Observations	10,834	5,673	7,685
Panel B: Professional or paid help	0.010	0.046*	0.030*
	(0.019)	(0.027)	(0.018)
Mean	*0.039*	*0.026*	*0.031*
Effect as % of mean	27.2%	177.7%	96.0%
Observations	9,141	4,545	6,982
Panel C: Health expenditure	146	314*	50
	(93)	(169)	(38)
Mean	*298*	*321*	*261*
Effect as % of mean	49.1%	98.0%	19.1%
Observations	9,174	4,918	7,046
Panel D: Disability benefits	0.009	0.016	0.054***
	(0.012)	(0.010)	(0.016)
Mean	*0.053*	*0.024*	*0.114*
Effect as % of mean	17.5%	63.5%	47.6%
Observations	11,883	6,349	8,720
# individuals	3,539	2,025	2,598

Notes: This table shows the association between the parental health shock and children's help, professional care, healthcare expenditure and disability benefits, based on Eq. (5) for individuals who answered all three questions in at least one year, using parent FE instead of child FE. The dependent variable in Panel A equals one if the parent indicates one of their children helps or provides them with personal care, and 0 otherwise. The dependent variable in Panel B equals one if the parent indicated they have received professional or paid help with domestic tasks, and 0 otherwise. The dependent variable in Panel C is the annual amount paid on health in Euros in terms of Germany's prices in 2015. The dependent variable in Panel D equals one if a parent indicated they had received a disability or sickness benefit from a public source, and 0 otherwise. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Parental health shock impacts, individuals aged 25-34

	Daughters			Sons		
	(1) Family	(2) Market	(3) Gov.	(4) Family	(5) Market	(6) Gov.
Employment	-0.057**	0.007	0.008	0.004	0.051***	-0.002
	(0.027)	(0.035)	(0.026)	(0.019)	(0.018)	(0.019)
Mean	*0.659*	*0.742*	*0.769*	*0.841*	*0.827*	*0.820*
Effect as % of mean	-8.6%	0.9%	1.0%	0.5%	6.2%	-0.2%
Observations	3,144	1,749	2,336	3,440	1,894	2,585
# individuals	937	563	705	1,028	614	780

Notes: This table shows the impacts of parental health shock on children's employment by type of country based on Eq. (5), for individuals aged 25-34. Columns (1)-(3) present the impact on daughters' employment in family-based care, market-based care, and government-based care countries, respectively. Columns (4)-(6) present the impact on sons' employment in family-based care, market-based care, and government-based care countries, respectively. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Parental health shock impacts by daughters' siblings

	(1) Has siblings	(2) Same-sex siblings	(3) Mixed-sex siblings
Employment	-0.058***	0.048	-0.081***
	(0.022)	(0.041)	(0.026)
Mean	*0.641*	*0.678*	*0.631*
Effect as %	-9.1%	7.0%	-12.9%
Observations	3,504	783	2,721
# individuals	934	209	725

Notes: This table shows the impacts of parental health shock on daughters' employment in family-based care countries by daughter's siblings' gender composition based on Eq. (5). Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: Parental health shock impacts by sons' siblings

	(1) Has siblings	(2) Same-sex siblings	(3) Mixed-sex siblings
Employment	0.048**	0.014	0.062**
	(0.019)	(0.021)	(0.025)
Mean	*0.838*	*0.876*	*0.821*
Effect as %	5.7%	1.6%	7.5%
Observations	1,692	521	1,171
# individuals	467	144	323

Notes: This table shows the impacts of parental health shock on sons' employment in market-based care countries by sons' siblings' gender composition based on Eq. (5). Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.7: Parental health shock impacts by parents gender and marital status

	Parent's gender		Parent's marital status	
	(1) Father	(2) Mother	(3) Married	(4) Unmarried
Employment	-0.065**	-0.061**	-0.043**	-0.101**
	(0.032)	(0.025)	(0.021)	(0.040)
Mean	*0.669*	*0.601*	*0.643*	*0.587*
Effect as % of mean	-9.8%	-10.1%	-6.7%	-17.2%
Observations	2,650	3,005	4,416	1,135
# individuals	812	894	1,327	346

Notes: This table shows the impacts of parental health shock on daughters' employment in family-based care countries by parents' gender and marital status based on Eq. (5). Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.8: Parental health shock impacts by parents' education and insurance status

	Parent's education		Parent's insurance status	
	(1) HS and less	(2) More than HS	(3) No voluntary insur.	(4) Voluntary insur.
Employment	-0.067***	0.094	-0.066***	0.044
	(0.020)	(0.067)	(0.024)	(0.063)
Mean	*0.631*	*0.638*	*0.626*	*0.641*
Effect as % of mean	-10.7%	14.7%	-10.5%	6.8%
Observations	5,216	324	3,014	556
# individuals	1,563	106	804	177

Notes: This table shows the impacts of parental health shock on daughters' employment in family-based care countries by parents' education and insurance status based on Eq. (5). Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.9: Parental health shock impacts by daughter's fertility and residential distance

	Daugther's fertility		Daugther's distance from parents	
	(1) Has children	(2) No children	(3) Distance $<$ 100 km	(4) Distance $\geq$ 100 km
Employment	-0.064***	-0.045*	-0.079***	0.019
	(0.024)	(0.027)	(0.026)	(0.069)
Mean	*0.664*	*0.624*	*0.625*	*0.639*
Effect as % of mean	-9.6%	-7.3%	-12.7%	3.0%
Observations	3,791	1,903	3,285	387
# individuals	1,131	558	1,039	119

Notes: This table shows the impacts of parental health shock on daughters' employment in family-based care countries by daughter's fertility and residential distance based on Eq. (5). Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.10: Parental health shock impacts, balanced panel

	Daughters			Sons		
	(1) Family	(2) Market	(3) Gov.	(4) Family	(5) Market	(6) Gov.
Employment	-0.077*	-0.009	-0.025	0.008	0.083**	-0.027
	(0.043)	(0.044)	(0.071)	(0.031)	(0.033)	(0.060)
Mean	*0.643*	*0.763*	*0.812*	*0.826*	*0.849*	*0.846*
Effect as % of mean	-11.9%	-1.2%	-3.1%	1.0%	9.8%	-3.2%
Observations	1,546	1,194	998	1,754	1,196	1,074
# individuals	773	597	499	877	598	537

Notes: This table shows the impacts of parental health shock on children's employment by type of country based on Eq. (5), using a balanced panel. The sample is restricted to individuals who are observed both at time 2 and at time 0, and includes only observations from these two periods. Columns (1)-(3) present the impact on daughters' employment in family-based care, market-based care, and government-based care countries, respectively. Columns (4)-(6) present the impact on sons' employment in family-based care, market-based care, and government-based care countries, respectively. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.11: Parental health shock impacts, excluding immigrants

	Daughters			Sons		
	(1) Family	(2) Market	(3) Gov.	(4) Family	(5) Market	(6) Gov.
Employment	-0.060***	-0.010	0.019	-0.005	0.045**	-0.016
	(0.020)	(0.025)	(0.019)	(0.015)	(0.019)	(0.014)
Mean	*0.634*	*0.727*	*0.806*	*0.847*	*0.843*	*0.854*
Effect as % of mean	-9.4%	-1.4%	2.3%	-0.6%	5.3%	-1.9%
Observations	5,506	2,729	3,793	6,035	2,637	4,214
# individuals	1,658	888	1,157	1,822	867	1,272

Notes: This table shows the impacts of parental health shock on children's employment by type of country based on Eq. (5), excluding children whose parents immigrated to their country of residence. Columns (1)-(3) present the impact on daughters' employment in family-based care, market-based care, and government-based care countries, respectively. Columns (4)-(6) present the impact on sons' employment in family-based care, market-based care, and government-based care countries, respectively. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.12: Parental health shock impacts, excluding the year 2007

	Daughters			Sons		
	(1) Family	(2) Market	(3) Gov.	(4) Family	(5) Market	(6) Gov.
Employment	-0.062***	-0.020	-0.003	-0.010	0.035*	0.001
	(0.023)	(0.027)	(0.022)	(0.018)	(0.019)	(0.016)
Mean	*0.637*	*0.721*	*0.804*	*0.844*	*0.834*	*0.853*
Effect as % of mean	-9.7%	-2.7%	-0.3%	-1.2%	4.2%	0.1%
Observations	4,740	2,740	3,404	5,083	2,767	3,719
# individuals	1,429	891	1,028	1,539	893	1,110

Notes: This table shows the impacts of parental health shock on children's employment by type of country based on Eq. (5), excluding children whose parents experienced a health shock in the year 2007. Columns (1)-(3) present the impact on daughters' employment in family-based care, market-based care, and government-based care countries, respectively. Columns (4)-(6) present the impact on sons' employment in family-based care, market-based care, and government-based care countries, respectively. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.13: Parental health shock impacts by health condition

	Daughters, family-based			Sons, market-based		
	(1) Heart attack & Stroke	(2) Parkinson's & Lung disease	(3) Cancer	(4) Heart attack & Stroke	(5) Parkinson's & Lung disease	(6) Cancer
Employment	-0.070***	-0.062*	-0.098**	0.047**	0.063**	0.029
	(0.023)	(0.037)	(0.044)	(0.023)	(0.029)	(0.030)
Mean	*0.756*	*0.722*	*0.734*	*0.792*	*0.758*	*0.780*
Effect as %	-9.3%	-8.6%	-13.3%	5.9%	8.4%	3.7%
Observations	3,184	1,967	887	1,615	974	799
# individuals	954	602	277	525	329	258

Notes: This table shows the impacts of parental health shock on children's employment by health condition based on Eq. (5). Columns (1)-(3) present the impact on daughters' employment in family-based care countries. Columns (4)-(6) present the impact on sons' employment in market-based care countries. Standard errors are clustered at the parental household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B Figures

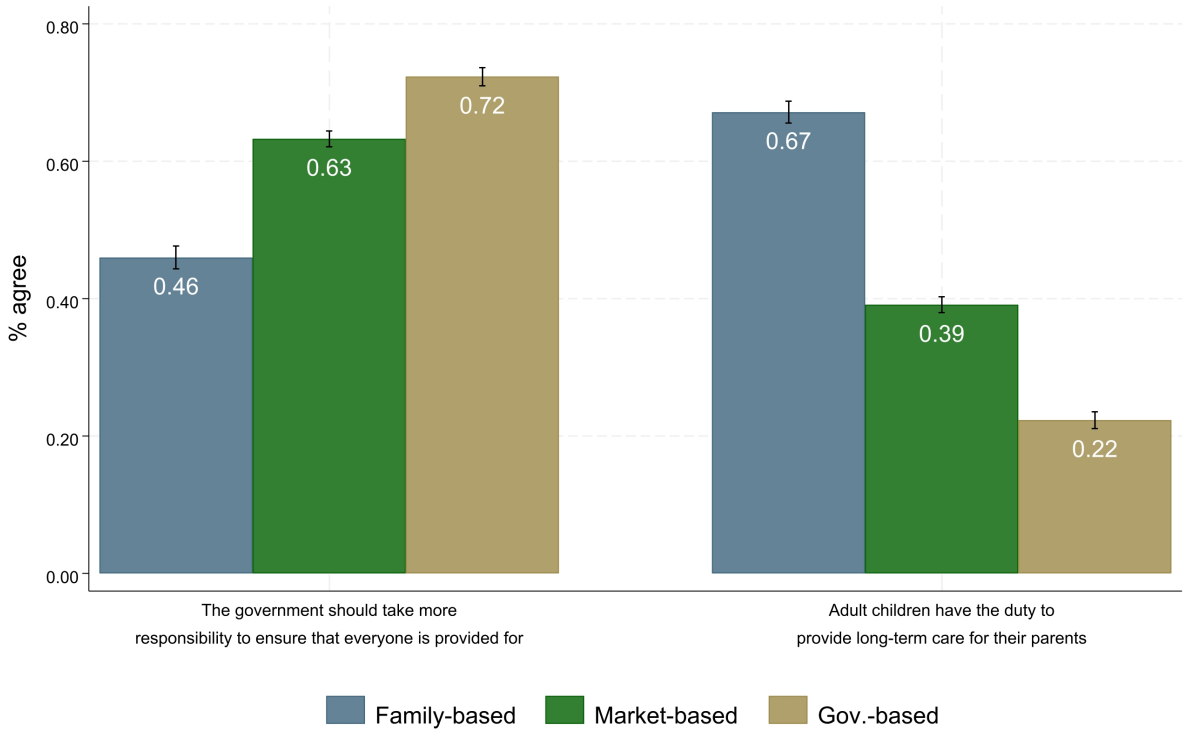
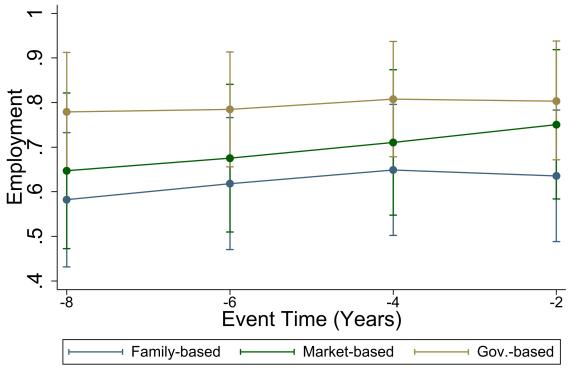


Figure B.1: Views on caregiving roles by type of country.

Notes: The figure is based on data from the joint World Values Survey and European Values Study Wave 7 (2017-2022) available at https://search.gesis.org/research_data. Each set of bars shows the percentage of respondents in each type of country who answered either "agree" or "agree strongly" to the question indicated at the bottom.

B.2.1 Daughters' employment



B.2.2 Sons' employment

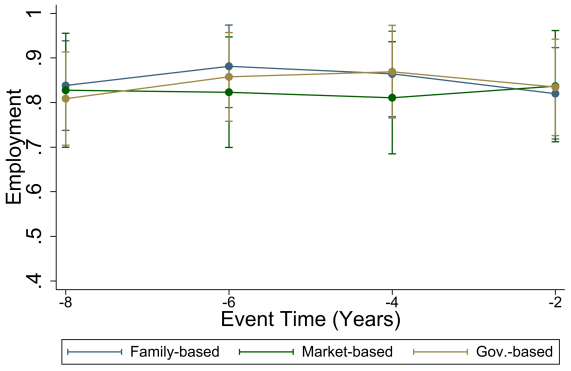
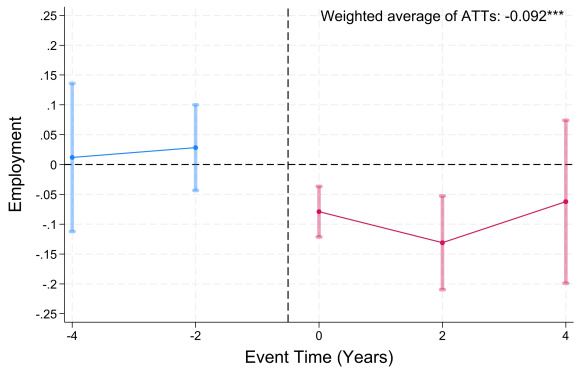


Figure B.2: Employment prior to parental health shock.

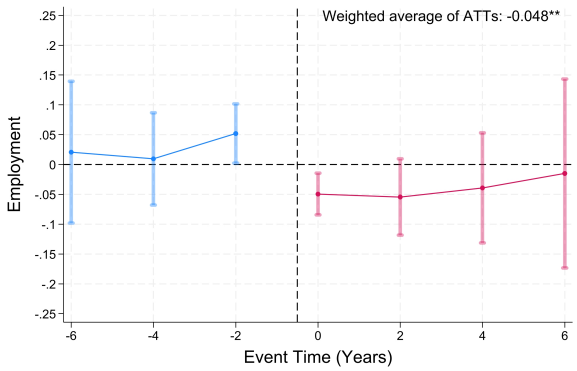
Notes: These figures examine the trend in child employment before their parents' health shock by type of country. Subfigure B.2.1 pertains to daughters' employment, while subfigure B.2.2 pertains to sons' employment. All estimates control for country, calendar year, and year of birth fixed effects. Including 95 percent confidence intervals, with standard errors clustered at the parental household level.

Panel A - Daughters' employment in family-based care countries

B.3.1 Comparison group: not-yet-treated

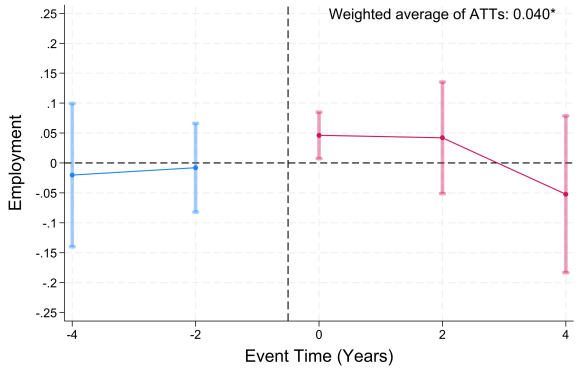


B.3.2 Comparison group: never-treated



Panel B - Sons' employment in market-based care countries

B.3.3 Comparison group: not-yet-treated



B.3.4 Comparison group: never-treated

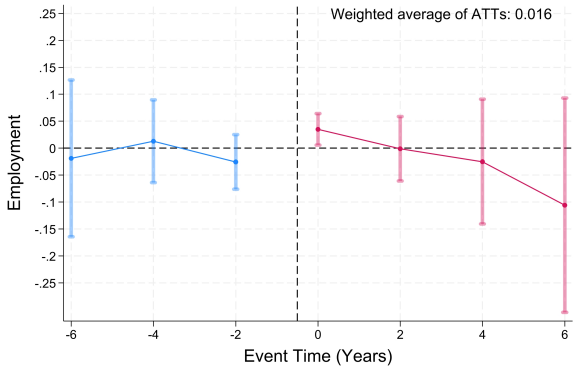


Figure B.3: Parental health shock impacts on children's employment.

Notes: This figure shows the impacts of parental health shock on children's employment by type of country. Panel A presents the impacts on daughters' employment in family-based care countries, and panel B on sons' employment in market-based care countries. Each subfigure shows the event-study coefficients estimated of the parent health shock on children's employment using the method proposed by Callaway and Sant'Anna (2021) (including 95 percent confidence intervals). The weighted average of the ATTs is presented in the upper right corner of each subfigure. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

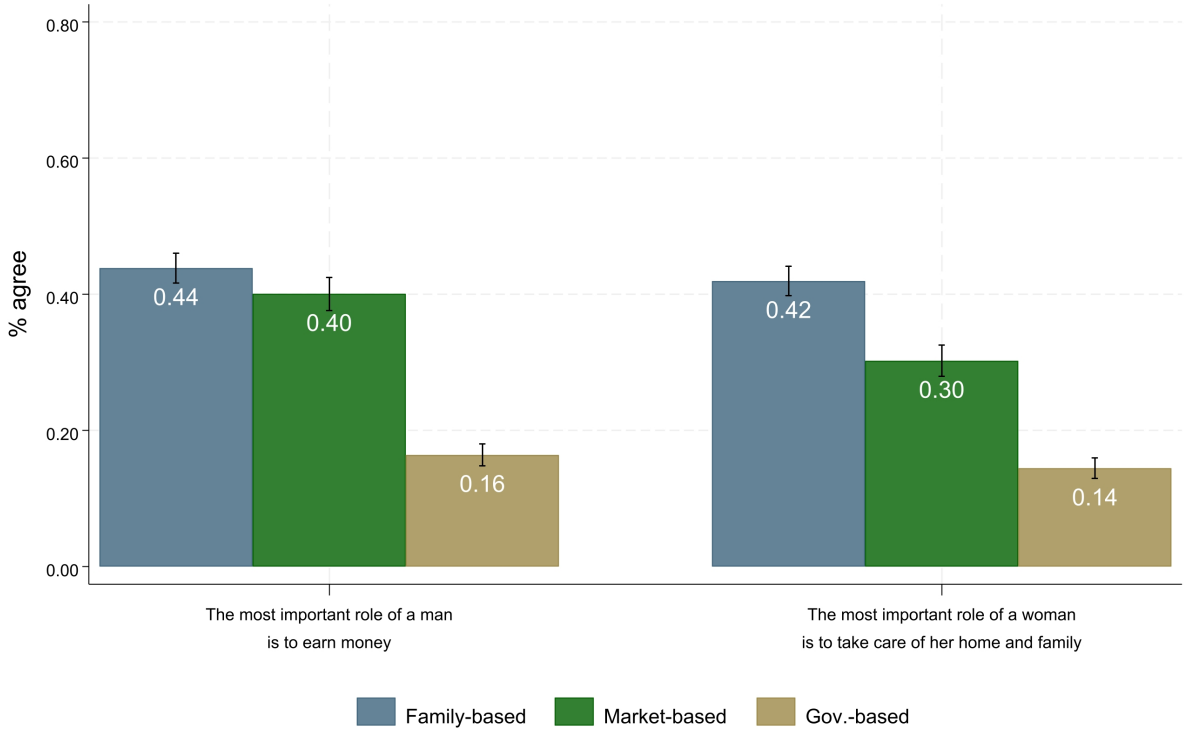
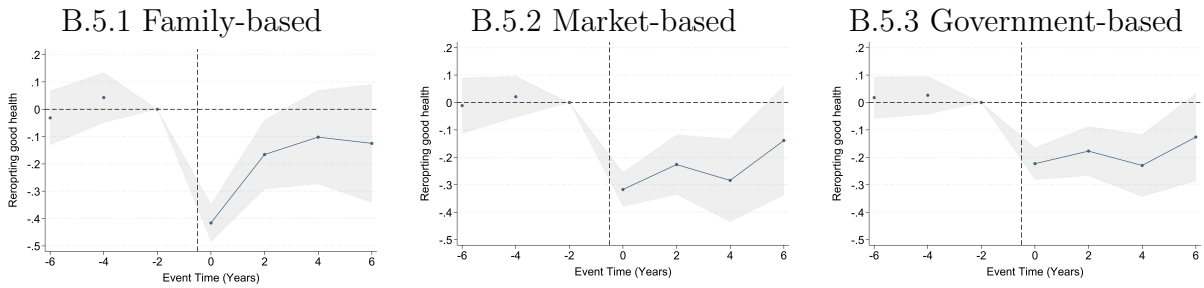


Figure B.4: Views on gender roles by type of country.

Notes: The figure is based on data from Eurobarometer "Perception of Security, and Gender Equality" questionnaire (2017) available at https://search.gesis.org/research_data. Each set of bars shows the percentage of respondents in each type of country who answered either "agree" or "agree strongly" to the question indicated at the bottom.

Panel A - Reporting good health



Panel B - Taking medications

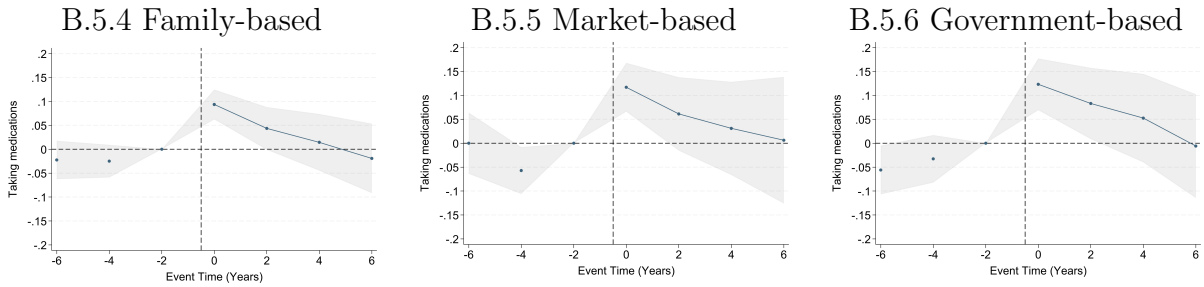


Figure B.5: Parental health shock impacts on parents' health indicators.

Notes: This figure shows the impacts of parental health shock on parents' health indicators by type of country. Panel A presents the impacts on the probability of reporting good health, and panel B on the probability of taking medications at least once a week. Each subfigure shows the event-study coefficients estimated from Eq. (1) expressed as a percentage of the counterfactual outcome defined in Eq. (3). Including bootstrapped 90% confidence intervals using 500 replications and clustering at the parental individual level.

C Variable definition

Variable	Description
Help from children	Equals 1 if the parent indicated a child had provided them with help or personal care in the past 12 months, 0 otherwise.
Professional or paid help	Equals 1 if the parent indicated he had received professional or paid help with domestic tasks in the last 12 months, 0 otherwise.
Health expenditure	Parents' out-of-pocket expenditure in the last twelve months for inpatient care, nursing home, outpatient care and medications. In euro, in terms of Germany's prices in 2015.
Disability benefits	Equals 1 is a parent reported they received any public disability or sickness benefit in the past 12 months, 0 otherwise.
Age at the time of shock	The age of the parent/child in years at the year the parent indicated they were diagnosed with a health condition.
More than high school	Equals 1 if the parent/child has at least a high school diploma, 0 otherwise.
Number of children	The number of children the parent/child has.
Employment	Equals 1 if the parent/child is full-time, part-time, self-employed, or working for their family business and 0 otherwise.
Event time	The number of years relative to the parental health shock.
Reporting good health	Equals 1 if the parent reports good or excellent health, 0 otherwise.
Taking medications	Equals 1 if the parent indicated they currently take any medication at least once a week for a health condition, 0 otherwise.
Child's distance from parents	Equals 1 if the parent indicated their child resides less than 100 KM away, 0 otherwise.
Married	Equals 1 if the parent/child is married, living together with a spouse or in a registered partnership, 0 otherwise.
Voluntary insurance	Equals 1 if the parent has any voluntary, supplementary or private health insurance, 0 otherwise.

D List of health conditions available in SHARE

- A heart attack, including myocardial infarction or coronary thrombosis, or any other heart problem including congestive heart failure
- High blood pressure or hypertension
- High blood cholesterol
- A stroke or cerebral vascular disease
- Diabetes or high blood sugar
- Chronic lung disease such as chronic bronchitis or emphysema
- Asthma
- Arthritis, including osteoarthritis, or rheumatism
- Osteoporosis
- Cancer or malignant tumour, including leukaemia or lymphoma, but excluding minor skin cancers
- Stomach or duodenal ulcer, peptic ulcer
- Parkinson disease
- Cataracts

E Before-after analysis

In some analyses, to address limited sample sizes, we also estimate the effects of a parental health shock using a general before-and-after framework instead of the full event-study design. Specifically, we take the event-study equation (Eq. (1)) and collapse the event-time year dummies into a simple variable before and after the parental health shock ($Shock_{ip}$). Formally, we estimate the following model:

$$y^g_{ijp} = c_i + \gamma^g_{ip} + \beta^g Shock_{ip} + \epsilon_{ijp} \tag{5}$$

Where $Shock_{ip} = 1$ if in year p individual i is observed after the parental health shock ($k \geq 0$). All other variables are previously defined. Standard errors are clustered at the parental household level.

F Esping-Andersen welfare regime classification

Our country type classification aligns with existing welfare state typologies commonly discussed in the literature. Esping-Andersen (1999) classified welfare states into three main types: Liberal, Conservative (Corporatist), and Social Democratic. This typology is based on the level of government intervention, the structure of social benefits, and the role of the market and family in welfare provision. Social Democratic welfare regimes, exemplified by countries like Denmark and Sweden, are characterized by universal benefits, strong government involvement, and high levels of social protection. Conservative (Corporatist) welfare regimes, such as Germany and Switzerland, emphasize earnings-related benefits and social insurance, focusing on maintaining the individual's standard of living based on their past employment and contributions. A variation of the Conservative model, often referred to as the Southern European or Mediterranean welfare regime, includes countries like Italy and Spain, where social protection is more fragmented, and families play a more significant role in caregiving.

While Esping-Andersen's (1999) classification primarily focuses on income redistribution and welfare policies, we adapt this framework to elderly care by specifically examining how caregiving responsibilities are allocated among different entities. Countries with a Democratic welfare regime are characterized by high universal public welfare expendi-

ture, with the *government* primarily providing for the needs of the aging population. In countries that follow the Conservative (Corporatist) model, welfare expenditure is shared between the government and the *market*. While there is public welfare expenditure for elderly care, it is less universal compared to Social Democratic models and there is a higher level of private welfare expenditure. In Southern European welfare countries, the formal public and private welfare expenditure is lower, and a lion's share of the caregiving burden falls on *family* members rather than the government or market.