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Austerity, Health Care Provision, and Health Outcomes in Spain*

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Abstract

The recession that started in the United States in December 2007 has had a significant impact on the Spanish economy through a large increase in the unemployment rate and a long recession which led to tough austerity measures imposed on public finances. Taking advantage of this quasi-natural experiment, we use data from the Spanish Ministry of Health from 1997 to 2014 to provide novel causal evidence on the short-term impact of health care provision on health outcomes. The fact that regional governments have discretionary powers in deciding health care budgets and that austerity measures have not been implemented uniformly across Spain helps isolate the impact of these policy changes on health indicators of the Spanish population. Using Ruhm's (2000) fixed effects model, we find that staff or hospital bed reductions account for a significant increase in mortality rates from cardiovascular disease and external causes, for 25-34 and 65-74 year-old groups, and in the late foetal mortality rate. Mortality rates, however, do not seem to be robustly affected by the 2012 changes in retirees' pharmaceutical co-payments. Contrary to expectations, we find some evidence of reduced mortality rates for cancer and female cancer as a result of the 2012 changes in migrants' access restrictions to the Spanish NHS. Overall, our analyses suggest that short-term impacts of decreases in health care provision on mortality are significant but small. However, impacts prove to be economically and quantitatively significant in the case of fatalities due to external causes, especially accidental deaths.

Keywords: Health care provision; Mortality; Health cuts.

JEL: I10, I18

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1. Introduction

Usually, recessions cause unemployment, poverty, and changes in the distribution of resources. In many cases recessions also call for changes in government expenditures, regulations, and the provision of public goods. All these factors have important consequences for individuals' health status. Economists, however, have mainly focused on studying the impact of macroeconomic conditions on health outcomes (see for instance Ruhm 2000), disregarding the analysis of how health care policy influences outcomes. Given that health care is a potential determinant of individuals' health status, knowing the extent to which health resources affect health is crucial for assessing the importance of additional investments in health provision.

We can think of at least three channels through which cuts in health care services may impact health outcomes. First, reduced provision may give rise to hospital congestion, lower hospital nurse/patient ratios, and increased hospital staff workloads, with the result of lower service quality, including discharging patients before they are fully recovered and higher hospital readmission and in-hospital mortality rates (Evans and Kim 2006, Jaeger and Tucker 2017). Cutbacks in health care provision may also increase waiting lists and average waiting times for elective or semi-elective surgery, with the potential result of adverse health outcomes, such as quality-adjusted life years (Moscelli et al. 2016, Nikolova et al. 2016). Finally, when reduced health care spending involves hospital closures, increased travel times or distance to hospitals may lead to worse health outcomes, including longer average hospital stays, non-attendance at follow-up appointments, and higher mortality rates (Buchmueller et al., 2006, Kelly et al. 2016).

The austerity measures imposed by the financial needs of the state and regional treasuries during the recent crisis constitute a quasi-experimental variation in health care resources. In this paper we study the short-term impact of changes in the provision of health care services exogenously imposed by budget cuts on health outcomes in Spain from 1997 to 2014.

We use data from the Spanish Ministry of Health on different health outcomes (mortality, cause-specific mortality, age-specific mortality, and various indicators of infant mortality) together with data on the quality of health care provision (staffing and hospital beds) and health reform indicators for both the pharmaceutical co-payment and access restrictions for illegal immigrants for the different Spanish regions during the years 1997-2014. Changes in health care provision and regulations are assumed to be exogenously determined by austerity measures and not driven by population needs. In particular, given that regional governments have discretionary powers in deciding health care budgets, our identification strategy is based on the time and cross-region variation in the data, including the different levels of implementation of national health care policies in different regions. We isolate the effect of health cuts on health outcomes using Ruhm's (2000, 2015) fixed effects model which identifies the effect of changes in health care quality through within-region variation in mortality rates, relative to changes in other regions and after controlling for the socio-demographic composition of the population and the effect of the business cycle.

We find that health cuts have had a significant, though small, impact on Spanish health outcomes. In particular, staff reductions of one doctor per 1,000 inhabitants, such as those experienced by the Balearic Islands, which went from 13.56 employees in 2008 to 12.34 employees in 2013, are associated with increases in the male mortality rate of about 0.7 per cent, in the cerebrovascular mortality rate of about 3 per cent, in the mortality rate for the 65 to 74 year-old group of 1.4 per cent, and increases in late foetal mortality of between 4 and 8 per cent. Decreases of about one hospital bed per 10,000 inhabitants are associated with increases in mortality due to external causes of about 2 per cent and increases in the 25-34 year-old mortality rate of between 1.5 and 2 per cent. We find only marginally significant evidence of the introduction of the retirees' pharmaceutical co-payment increasing the 55-64 year-old group mortality rate about 3 per cent. As an unexpected side effect, apparently the introduction of access restrictions has benefited cancer, especially female cancer, patients.

Our work contributes to the literature that relates health determinants to health indicators, estimating basically aggregate versions of Grossman's (1972) health investment model. Studies such as Barros (1998) and Or (2000) mainly use data from the OECD and focus on the impact of health expenditure on health, controlling for characteristics of different health systems. In comparison, our study uses staff employed in hospitals and operational hospital beds as measures of health care provision. The use of non-monetary measures of health care provision avoids the problems of comparing the purchasing power of monetary magnitudes across different regions.

Our work also contributes to the scarce literature that analyses the effects of different health care reforms on health outcomes. Most studies consider hospital mortality rates as indicators of quality of care and study the health impact of either hospital closures and hospital density (Buchmueller et al., 2006), or introducing competition in health care markets (Cooper et al., 2011, Gaynor et al. 2013), or changes in minimum staff ratios (Cook et al. 2012). Most of these studies use hospital-level information and face adverse patient selection problems, as worse patients may choose to go to better equipped hospitals. When considering aggregate regional-level data this problem is considerably reduced because this sort of 'health' migration between regions, although possible, is plausibly much less common than between hospitals in the same location.

Finally, our work contributes to the most recent literature that has analysed the health impact of business cycles (Ruhm 2000, 2006, 2015). For Spain we find the fundamental works of Tapia Granados (2005), Aparicio and Gonzalez (2014), Belles-Obrero et al. (2016), and Regidor et al. (2016). In most cases, both in Spain and elsewhere, mortality fluctuates pro-cyclically, so overall health tends to improve during recessions. With respect to this literature we include additional explanatory variables that control for health care inputs and quality that can decrease during recessions; their inclusion may contribute to uncovering an even greater positive effect of recessions on health outcomes.

To our knowledge, our work is also the first analysis of the impact of health cuts motivated by the Great Recession on health outcomes in an OECD country which, along with indicators of the quality of hospital supply, includes indicators related to changes in health policies such as the pharmaceutical co-payment and the access restrictions to the Spanish National Health Service (NHS) introduced in 2012. The Spanish case is especially relevant in this respect given the severity of the Spanish crisis and the quantitative importance of the Spanish health cuts.

The second section describes the institutional framework. Section three presents the data and estimating method. Section four describes the results. Section five briefly investigates the pro-cyclical nature of mortality and section six presents conclusions.

2. Institutional Background

2.1. The Spanish Health Care System

When the mixed economy of welfare was created in Spain in 1880, the state was slow to take on an active role and the private insurance market was still very limited (Pons & Vilar, 2011). After decades of lagging behind other European countries, Spanish governments started to implement the first social insurances in the early twentieth century. Some proposals on schemes for industrial accidents, old age and unemployment were approved before the Civil War, while in the area of health care the few initiatives underway were limited to maternity coverage.

The Franco dictatorship used sickness insurance as a key element of its policies (Pons & Vilar, 2012). Consequently, it created the legal framework by passing compulsory sickness insurance in 1942, but unlike other European countries it did not provide public funding. Apart from the question of political resolve, the maintenance of an outdated tax system, based on indirect taxes, with low income and a high level of fraud, restricted the state's spending power. This led to serious deficiencies in terms of benefits, facilities and treatment. The state resorted to financing through social contributions, particularly onerous for workers in a context of very low wages, and the provision of services managed by private institutions.

The passage of the Basic Law on Social Security in 1963 was intended to replace the existing social insurance system with a universal social security model (Pons & Vilar, 2014). However, the successes achieved by this reform were severely limited by meagre public funding, hampered by the continuance of an obsolete tax system. The 1970s was a decade of two long-awaited events in the health care sector: the arrival of democracy and the creation of a Ministry of Health (Francia, 1997 and Guillén, 2000). It was hoped that these two events would enable the establishment of a public health care system in Spain along European lines.

From the start of the transition to democracy until the passage of the General Health Law in 1986, there was an important ongoing debate on the model and functioning of the Spanish health care system. The General Health Law was an enormous step forward in the creation of a health care model suitable for a modern democratic state, similar to that in other European countries, even though it only set out basic guidelines and general objectives for health care which still required the implementation of subsequent and more specific reforms (Pons & Vilar, 2014). The General Health Law established that public health care provision would be extended to the entire Spanish population in conditions of equality. The so-called “decree of universalisation” (Royal Decree 1088/89, BOE [official state gazette] 09/09/1989, No. 216) put an end to charitable health care in Spain and provided for people without sufficient economic resources within a national health system. However, the universalisation of Spanish health care required an increase in public health care expenditure and a transformation of the financing model.

The General Health Law created a mixed funding model for the Spanish NHS based on social contributions, state transfers, charges for the provision of certain services and contributions from the autonomous regions and local authorities. In practice, the public health model that was actually implemented opted for a progressive increase in funding based on general taxes instead of Social Security contributions, as had been the case up until then. After the modification of the system of financing health care provision, introduced in the General State Budget for 1989, Law 37/1988, most health care funding came from state revenue (Temes & Gil, 1996: 12).

A third key aspect of the General Health Law was the management model it introduced. The law established direct administration by government authorities, with its own facilities and staff, as the general rule. In this way, not only did the state establish the rules for public health coverage and finance it, but it also took charge of the actual provision of health care (Muñoz et al., 1997: 272-273). All in all, the General Health Law promoted by Ernest Lluch towards the end of the first Socialist legislature was one more step in the progress of the Spanish health care model.

From its inception, the national health system was a decentralised entity. In 1986, however, only the historical regions of Catalonia, the Basque Country and Andalusia had health care responsibilities and a centrally managed agency, the INSALUD, organised health care services in the remaining regions (Lopez-Casasnovas et al. 2005). During the following two decades health care responsibilities were gradually transferred – devolved – to other regional governments (Costa-Font 2010).[1] The new challenge for Spanish health care was now achieving a balance between decentralisation and coordination, with the common goal of ensuring both equality and quality services. This was the aim of the Law of Cohesion and Quality of the National Health System of 2003 (Pons & Vilar, 2014: 378). Notwithstanding, the end product of this transfer process was 'a system of regional health services' (Lopez-Casasnovas et al. 2005).

The devolution process ran parallel to health care reforms. The relatively low health care expenditure in Spain compared with other European countries led the political debate towards two positions (Navarro, 2010: 10-11). On the one hand, confirming the severe underfunding of Spanish public health care and, on the other hand, justifying the health care deficit through the poor administration of public resources. The results of what was known as the "April Report" (1991) rekindled the debate on the greater efficiency of private management compared with public. The changes recommended by experts in the management of health care provision, and finally implemented by the government in the INSALUD Strategic Plan, opened the way to new forms of management such as foundations, consortiums, public companies, medical societies and cooperatives (Pons & Vilar, 2014).

By the mid-2000s, the health care debate continued in the centre of the political arena, above all in relation to three questions: waiting lists, the need to contain expenditure and increase efficiency, and the management model, all interrelated issues. Within this context, adequate financing of the health care system became one of the main objectives. It seemed clear that the future of public health care basically depended on the rationalisation of expenditure, establishing priorities in the provision of services, and transparent management. Different governments tried to curb spending through the rationalisation of pharmaceutical spending (control of prescriptions, agreements with the industry, promoting generic medicines), and through better administration of hospital resources. These measures were in conflict with the need to increase staff and services to reduce waiting lists – a problem constantly embroiled in a war of figures.

2.2. The Great Recession and Budget Cuts

Spain officially entered into a recession in the last quarter of 2008, after gross domestic product shrank for two consecutive quarters. Unemployment rates soared to 25 per cent. In the banking sector, BANKIA required a 22 billion euro bailout. Risk premiums on national debt hit over 5 percentage points.

[1] The transfer of health care competencies to the autonomous regions followed the following schedule: 1981 (Catalonia); 1984 (Basque Country and Andalusia); 1987 (Valencia); 1990 (Galicia and Navarre); 1994 (Canary Islands); 2001 (Aragón, Asturias, Balearic Islands, Cantabria, Castile La Mancha, Castile León, Extremadura, La Rioja, Madrid and Murcia).

The austerity measures implemented from 2010 onwards aggravated the situation of the Spanish public health care sector, which bore a disproportional share of the financial adjustment to the crisis (Lopez-Valcarcel and Barber 2017): whereas current total government spending fell by 6 per cent between 2009 and 2014, public spending in health care dropped by 13 per cent (OECD 2017). The first measures were horizontally applied across the Spanish regions and mainly affected staffing, through increased working hours, reduced wages, and reductions in the rate of replacement of retired workers, and investments, through reductions in the purchase of new equipment and the closure of hospital wards. The second set of measures came in the form of a royal decree (Royal Decree Law 16/2012, of 20 April) and was considered by the defenders of public health as "the cornerstone of the health care counter-reform in Spain", underpinning the trend towards the privatisation model in a context of budgetary consolidation (Fernández Ruiz & Sánchez Bayle, 2013: 17). Three aspects of the law highlight the break with the model advocated in the General Health Law of 1986. First, the objective of a universal right to health care provision is abandoned, as non-residents are denied access to health care services. Second, the law establishes a change in the portfolio of services, resulting in cuts in health care provisions and the funding of treatment. Third, changes are introduced in the co-payment of medicines, increasing it and including pensioners, while simultaneously establishing wage bands for active workers.

Given that regional governments have discretionary powers in deciding health care budgets, depending on their financial situation, different regions were affected differently by the first set of government measures (López-Valcarcel and Barber 2017). The measures decided by the royal decree were even more unequally executed. Some regions provided aids for pensioners to face co-payments and some others went even as far as not to impose any access restrictions to health care services (Bagacigulpe et al. 2016). As a result, regional disparities in public health care provision increased during the crisis.

The belated setting up of the health care model in Spain and the application of adjustment policies in a context of crisis have taken their toll. Four figures enable us to offer a brief panorama of current Spanish health care within a European framework. First, public health care expenditure as a percentage of GDP in Spain is similar to other countries. In 2014 this indicator was 6.3 for Spain, while in countries such as France, Germany, Denmark, and the Netherlands it was over 8%, and in others such as Portugal, Italy, and Austria it was about 7% (OECD 2017). Second, public health care expenditure per inhabitant in Spain is, however, much lower than in the rest of Europe. In 2014 expenditure per capita (in 2010 PPP US dollars) was 1,975 in Spain compared with 3,964 in Germany; 3,174 in France; and 2,969 in the United Kingdom. Third, the number of beds available per thousand inhabitants in Spain fell from 3.16 in 2009 to 2.97 in 2014; compared with 4.38 (6.15) and 4.14 (6.18) respectively in France (Germany) (OECD 2017). And finally with regard to personnel data, the number of doctors, nurses and assistant nurses in public health care between 2010 and 2013 fell in Spain (from 11.56 to 11.3 hospital workers per 1,000 inhabitants), Portugal (from 11.67 to 11.48) and France (from 20.79 to 19.63) but increased in Germany (from 14.86 to 15.93 hospital workers per 1,000 inhabitants) and the UK (from 21.06 to 21.27) (OECD 2017).

3. Data and Method

This study uses data on mortality rates and health care indicators from the Statistical Site of the Spanish NHS merged to socio-demographic data from the Spanish National Statistics Institute

(Instituto Nacional de Estadística-INE) at the regional (autonomous community) level from 1997 to 2014. We have information on the 18 autonomous communities over 18 years (324 observations).

All the data is publicly available and therefore no ethical approval was needed. We investigated the possibility of using hospital data from the National Catalogue of Hospitals, available also from the NHS Statistical Site and amenable to provincial, instead of regional, disaggregation. However, in Spain, health policy was transferred to the autonomous communities from 1981 to 2002 (Costa-Font 2010) and is therefore decided at the regional level. And besides, as defended by Lindo (2013), given that our identification method is based on the within-location variation of health care quality indicators and mortality rates, potential spillovers could mean that more disaggregated analysis would severely understate the impact of health care provision on health outcomes. In addition, the potential problem of adverse patient selection emphasized by Gaynor et al. (2015), which arises under medically-driven migration, is also mitigated by the use of larger geographical units.

All the data are merged at the region-year level. Using the region of residence meant leaving a very small number of deaths (less than 0.5 per cent) out of the analysis, involving non-residents and for which no information on population and economic controls could be attached.

The health outcome variables used in this paper are the overall mortality rate, sex-specific, cause-specific and sex and cause-specific mortality rates, mortality rates for ten age groups, and four measures of infant mortality. The overall mortality rate quantifies deaths in the corresponding year and region times 100,000 divided by the corresponding population, using the population figures also provided on the NHS Statistical Site. For comparison with previous studies, such as Tapia Granados (2005) and Buchmueller (2006), cause- and sex-specific mortality rates for major diseases (tumours, cerebrovascular diseases, ischemic heart diseases, diseases of the respiratory tract and diseases of the digestive tract) and external causes and age-specific mortality rates (for 0-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, and 85 or over year olds) are also calculated following the same methodology.

The analysis of cause-specific mortality rates requires comparing the 9th International Classification of Diseases (ICD-9), used between 1981 and 1998, and ICD-10, used since 1999. We use the correspondence between both classifications officially provided by INE at the five digit level. However, even if the comparability between both classifications for leading causes of death has previously been defended for the Spanish case (Cano-Serral et al. 2006), we will use broad causes of death for which equivalence concerns are arguably smaller (Ruhm 2015).

Infant mortality rates are taken directly from the NHS Statistical Site. The overall infant mortality rate includes deaths during the first year of life in the corresponding year and region times 100,000 divided by the corresponding births. Deaths during the first year of life are classified as neonatal deaths if occurring within the first 28 days and post-neonatal deaths if afterwards. Late foetal deaths refer to deaths of foetuses of over six months of gestation before complete extraction from the mother. Table 1 presents descriptive statistics for all outcome variables.

Our main measure of quality of health care provision is health care workers per 1,000 inhabitants. We also include information on the number of operational hospital beds per 1,000 inhabitants. From 2012 onwards the cuts also involved access restrictions to health care of undocumented immigrants and increases in co-payments for drugs (see Section 2). As the policies were implemented differently by the different regional governments we also include dummies for these variables (Bacigalupe et al. 2016). Table 2 presents descriptive statistics for our main independent variables.

We include additional control variables to isolate the impact of health care supply changes. As emphasized by Ruhm (2000, 2003, 2015) and demonstrated by Tapia-Granados (2005) for Spain, we control for the impact of the business cycle by including regional unemployment rates. We also include demographic composition controls including the share of the regional population who are female, aged 55-64, 65-74, 75-84, and 85 years old or over. Following Lindo (2013), we also include the young dependency index and the aged dependency index. To control for different paths in the devolution of health budgets to regional governments, we include a dummy for since when the devolution took place (Jimenez-Rubio 2011). To control for different trends towards privatisation of health care in the region, we also include the ratio of public to private beds in the region (Legido-Quigley et al. 2013). See definitions and summary statistics of controls in Table A.1 in the Appendix.

Following Ruhm (2000, 2015) and Lindo (2013) we use the following regression equation:

$$H_{jt} = HC_{jt}\beta + X_{jt}\delta + \alpha_j + \mu_t + \theta_j t + \varepsilon_{jt}$$

where H_{jt} is the measure of health (the mortality rate or the log mortality rate) for region j in year t, HC is a vector of health care provision including the number of hospital beds and personnel per 1,000 inhabitants and the indicators for changes in the pharmaceutical co-payment and the access to the National Health Service. X is a vector of time-varying controls. α_j are region fixed-effects that account for those determinants of deaths that differ across regions but are time-invariant (such as persistent lifestyle disparities between residents of Madrid and Andalusia). μ_t are time fixed effects and hold constant determinants of death that vary uniformly across locations over time, especially widely spread advances in medical technologies. Since the supplementary time-varying state characteristics (Xjt) do not necessarily control for all time-varying determinants of death, our preferred specification also includes θjt region-specific time trends. The impact of changes in health care provision is identified from within-region variations in mortality rates, relative to changes in other states and after controlling for demographic and socio-economic characteristics, the business cycle and state-trends.

4. Results

Table 3 presents the results of the changes in health care provision and policy on the logarithm of total mortality and diverse cause-specific mortality rates (the corresponding results for the rates in levels are shown in Table A.2). Specification 1 (columns 1, 4, and 7) only includes time and region fixed effects; Specification 2 (columns 2, 4, and 8) includes the business cycle, population composition and socio-economic controls presented in Section 4; Specification 3 (columns 3, 6, and 9) additionally controls for region-specific time trends. Given the decisive role of demographics as determinants of health care demand, we will focus on results for specifications 2 and 3. In addition, all these specifications cluster standard errors at the regional level, as do most analyses in the literature (Ruhm 2000, 2015; Lindo 2013). [2]

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[2] As noted by Cameron and Miller (2015), using few clusters may understate the standard errors. We additionally estimated results for specification 3 with simple White robust standard errors. Estimated standard errors were systematically lower than those reported in the tables and thus are not reported.

The results in Panel A in Table 3 show no significantly robust impact of health care measures and indicators on total and sex-specific mortality rates. We only find significant impacts of personnel on male mortality and of the introduction of access restrictions on female mortality in the specification controlling for the business cycle and population without region-specific time trends (Specification 2). In particular we find a 0.7 per cent increase in mortality for one less hospital worker per 1,000 inhabitants and a 1.6 per cent decrease in female mortality for the introduction of restrictions. For the average reduction of 0.5 staffing in our sample from 2009 to 2013, the first figure implies an increase in male mortality of about 0.3 per cent during the recession.

Panels B to E present results for cause- and sex and cause-specific mortality rates. Reductions in hospital personnel are responsible for significant increases in mortality due to cerebrovascular disease and digestive problems. For the average drop of 0.5 staffing per 1,000 inhabitants, we find a robust impact of 3 per cent more deaths due to cerebrovascular disease for both males and females and a 1.5 per cent increase in total deaths due to digestive problems. Drops in the number of available beds are only associated to increases in mortality from external causes. The average reduction of 0.2 beds per 1,000 inhabitants in our sample from 2009 to 2013 is associated with a non-negligible increase in the external-cause mortality rate of about 4 per cent (0.2*20 per cent), which is driven mostly by male deaths. We find no significant impact of the introduction of the pharmaceutical co-payment on mortality rates but excluding undocumented migrants from non-emergency care seems to have had a positive impact on residents' health. In particular the introduction of access restrictions is responsible for a significant reduction in cancer mortality of about 3 per cent, especially driven by female cancer mortality which increases by almost 5 per cent, and a less robust decrease in cerebrovascular mortality.

Table 4 presents the results of the changes in health care provision and policy on the logarithm of mortality for different age brackets (the corresponding results for the rates in levels are shown in Table A.3). Limiting our comments to impacts significant at least at the 5 per cent level, Panel A in Table 4 shows that increases in the number of operational hospital beds have a very robust and significant impact on the 25-34 mortality rate of about 20 per cent per additional hospital bed per 1,000 inhabitants. In particular, for the average decrease in the number of hospital beds during the recession, 0.2 hospital beds per 1,000 inhabitants, the estimated coefficient implies a 2 per cent increase in the 25-34 year-old mortality rate. This result is quite consistent with the previously commented increase in mortality due to external causes as a result of drops in hospital deaths, given that younger persons die disproportionately from external causes (Ruhm 2015).

Panels B, E and F in Table 4 show significant impacts of changes in hospital personnel on the 35-44, 65-74, and 75-84 year-old mortality rates. The most robust finding is shown for the 65-74 year-old group where one less hospital worker increases the 65-74 year-old mortality rate by 1.2 per cent. For the average drop in hospital staffing of 0.5 workers per 1,000 inhabitants this figure implies a 0.7 increase in the mortality rate of 75 to 84 year-olds.

Panel D in Table 4 shows that the introduction of pharmaceutical co-payment changes in 2012 increased the 55-64 year-old mortality rate by about 3 per cent, but this finding is not robust across specifications.

Table 5 presents the estimated impact of changes in health care provision and policy on the logarithm of different indicators of infant mortality (the corresponding results for the rates in levels are shown in Table A.4). Limiting our comments to impacts significant at least at the 5 per cent level, Panel B in Table 5 shows that decreases in staffing levels of about one less worker per 1,000 inhabitants increase late foetal mortality by about 8 per cent. For the average drop in 0.5 workers per 1,000 inhabitants from 2009 to 2013 in our sample, this figure means an increase in late foetal mortality of about 4 per cent as a result of health spending cuts. In addition, we also find increases in late foetal mortality due to the introduction of access restrictions to the Spanish NHS services. However the impact is not robust across the different specifications and is only marginally significant.

4.1. Robustness Check: Deaths by External Causes

External causes of death cover a heterogeneous group of events including transport accidents, poisoning and adverse effects of drugs, accidental falls, accidents caused by fire and flames, accidents due to natural and environmental factors, late effects of accidents, assaults and suicide or self-inflicted injury. In Spain, almost one third of all fatalities from external causes belong to the category of suicide and self-inflicted harm, by far the largest category in the ICD chapter.

Health care provision has a leading role in suicide prevention by adequately treating mental illnesses (Adams et al. 2005). However, we expected that the short-term impact of reductions in health care provision on mortality would be smaller for suicides than for other accidental deaths. Intentional self-harm that ends in death is in principle devised so that no health care intervention is feasible, while victims of unintended accidents are treated as soon as possible.

Table 6 shows that the estimated impact of changes in the availability of hospital beds on mortality from external causes is driven by accidental deaths rather than suicides. It is the mortality from external causes excluding suicide that increases about 4 per cent for the average decrease of 0.2 hospital beds per 1,000 inhabitants.

5. A Note on the Pro-cyclical Nature of Mortality

Several studies have reported that mortality declines during recessions in developed countries. This pro-cyclical pattern of mortality has been found for instance for the United States (Ruhm 2000, 2015; Dehejia and Lleras-Muney 2004; Stevens et al. 2015), Germany (Neumayer 2004), Spain (Tapia Granados 2005, Aparicio-Gonzalez, 2014, Belles-Obrero et al. 2016) and OECD countries (Johansson 2004, Gerdtham and Ruhm 2006).

None of the above studies has controlled for changes in health care provision, though. A priori, we would expect health care quality to drop during recessions due to cuts in health care funding, with mortality rates increasing as a result. In this case, including health care measures in the regression of mortality on unemployment rates would strengthen the pro-cyclical nature of mortality. Stevens et al. (2015), however, consider a different scenario in which staffing shortages lower health care quality during economic expansions and consequently health care quality fluctuates counter-cyclically. Controlling for health care provision would in this case reduce the pro-cyclical nature of mortality.

In this section we first document that, contrary to the findings of Stevens et al. (2015) for the United States, on average health care resources move pro-cyclically in Spain. That is, regional unemployment is negatively correlated with both hospital personnel and available beds and positively correlated with co-payment and access restrictions indicators (Table A.5). We would then expect that including health care provision measures in the regression of mortality on unemployment would increase its estimated impact.

Table 7 presents results for the impact of regional unemployment on total, sex-, cause-, and sex and cause-specific mortality for models with no additional controls apart from year and region fixed effects (Specification 1), controlling for health care provision measures (Specification 2), and controlling for all available controls and region-specific time trends (Specification 3). In general, consistent with previous evidence for Spain (Tapia Granados 2005), the negative association between unemployment and mortality holds. By comparing results from specification 1 (columns 1, 4, and 7) and specification 2 (columns 2, 5, and 8) we see that, contrary to expectations, with the exception of fatalities from external causes, including health care provision and policy controls does not increase but actually decreases the absolute size of the impact of unemployment on mortality rates. For instance, an increase in regional unemployment of about 10 percentage points, as was the case in the average region in Spain from 2009 (16%) to 2013 (26%), is associated with a 6 per cent reduction in the total mortality rate in Specification 1 (column 1 in Panel A of Table 7) which drops to 5 per cent in Specification 2 when health care controls are included (column 2 in Panel A of Table 7). The magnitude of this drop is, however, small in all cases and may be related to the unexpected positive impact of access restrictions on residents' health. Including demographic controls and region-specific time trends (Specification 3) usually reduces the impact of regional unemployment on mortality furthermore and to a larger extent, even rendering it no longer significant.

Results from Panel E in Table 7 show that including health care provision measures in the regression of mortality from external causes on unemployment strengthens the pro-cyclical nature of mortality as expected. In particular, male mortality from external causes decreases 0.6 per cent for each additional percentage point increase in regional unemployment in Specification 1 (Column 4 in Panel E in Table 7) but decreases 0.9 per cent in Specification 2 when health care controls are included (Column 5 in Panel E in Table 7). The difference between both impacts is now larger than in the other panels and implies that failing to control for health care policy restrictions underestimates the pro-cyclical nature of mortality from external causes in Spain.

6. Conclusion

Health care provision and policies are considered important for health outcomes, though not many studies quantify this relationship. We provide causal evidence on the short-term impact of changes in the provision of health care on health outcomes by applying a fixed effects model to Spanish data spanning from 1997 to 2014. We find that staff or hospital bed reductions account for a significant increase in the mortality rates from cardiovascular disease and external causes, for 25-34 and 65-74 year-old groups, and in the late foetal mortality rate. The size of the impact is, however, small, of between 0.5 and 4 per cent increases in these mortality measures for the average reductions in staffing and hospital beds during the recession.

One of the largest, most robust results is found for the impact of changes in hospital beds on the 25-34 year-old group mortality and, especially, on mortality from external causes, given that both fatality rates are usually related (Ruhm 2015). The fact that our results for mortality from external causes are driven by accidental deaths rather than suicides provides additional support for the conclusion that our estimated effects are causal and not the product of spurious correlation.

Mortality rates do not seem robustly affected by the 2012 changes in retirees' pharmaceutical co-payments. However, contrary to expectations, we find some evidence of reduced mortality rates for cancer and female cancer as a result of the 2012 changes in migrants' access restrictions to the Spanish NHS. Even if this result is robust across specifications, the fact that we do not find it for other illnesses also subject to waiting lists for hospital intervention, such as cerebrovascular disease, suggests that it should be interpreted with caution.

We also find that failing to control for health care provision and policy indicators does not significantly alter the positive impact of economic recessions on health outcomes. The only exception seems to come from estimates for mortality from external deaths: failing to include health care measures underestimates the impact of the pro-cyclicality of mortality from external deaths.

Taken together, our analyses suggest that short-term impacts of decreases in health care provision on mortality are significant but small. However, impacts prove to be economically and quantitatively significant in the case of fatalities due to external causes, especially accidental deaths. We acknowledge that the short-term perspective adopted in the study leaves the dynamics of long-term impacts out of the analysis (Coile et al. 2014). We hope to undertake this task in further research. We also recognise that mortality is an extreme negative measure of health. Using incidence rates of different illnesses to estimate our model, especially at the individual microdata level, it might be possible to unveil additional insights on the relationship between health care provision and health outcomes.

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Tables

Table 1 Summary stats of dependent variables

Variable	Description	mean	sd	min	max
total rate	per 100,000 inhabitants	890.53	148.93	578.42	1224.14
male total rate	per 100,000 inhabitants	464.23	74.99	291.02	617.99
female total rate	per 100,000 inhabitants	426.30	75.27	273.52	608.23
neoplasms rate	per 100,000 inhabitants	240.56	44.50	137.74	348.13
male neoplasms rate	per 100,000 inhabitants	149.95	28.36	81.85	214.99
female neoplasms rate	per 100,000 inhabitants	90.62	16.69	52.14	134.85
nervous illness rate	per 100,000 inhabitants	36.36	12.81	9.85	76.67
male nervous illness rate	per 100,000 inhabitants	14.53	4.69	4.38	32.73
female nervous illness rate	per 100,000 inhabitants	21.83	8.37	5.11	48.54
ischemic disease rate	per 100,000 inhabitants	86.03	20.03	43.31	148.83
male ischemic disease rate	per 100,000 inhabitants	49.28	10.96	25.74	83.87
female ischemic disease rate	per 100,000 inhabitants	36.75	9.46	15.43	67.09
cerebrovascular disease rate	per 100,000 inhabitants	79.41	22.94	29.69	142.11
male cerebrovascular dis rate	per 100,000 inhabitants	33.20	9.10	13.16	53.18
female cerebrovascular dis rate	per 100,000 inhabitants	46.21	14.21	16.42	88.92
respiratory disease rate	per 100,000 inhabitants	98.99	21.59	48.77	152.03
male respiratory disease rate	per 100,000 inhabitants	57.71	12.33	28.25	91.31
female respiratory disease rate	per 100,000 inhabitants	41.28	10.10	17.25	69.05
digestive disease rate	per 100,000 inhabitants	44.41	7.40	22.16	60.58
male digestive disease rate	per 100,000 inhabitants	23.91	4.14	10.94	35.87
female digestive disease rate	per 100,000 inhabitants	20.50	3.79	5.72	29.40
external cause rate	per 100,000 inhabitants	36.56	8.28	14.18	56.11
male external cause rate	per 100,000 inhabitants	25.52	6.09	7.95	42.32
female external cause rate	per 100,000 inhabitants	11.05	3.35	1.29	25.08
suicide rate	per 100,000 inhabitants	7.94	2.33	0.71	15.20
male suicide rate	per 100,000 inhabitants	6.08	1.74	0.71	11.23
female suicide rate	per 100,000 inhabitants	1.86	0.79	0.00	4.47
0-4 year-old mortality rate	per 100,000 inhabitants	95.65	32.56	38.79	236.45
5-14 year-old mortality rate	per 100,000 inhabitants	12.47	4.83	0.00	37.58
15-24 year-old mortality rate	per 100,000 inhabitants	40.26	14.47	6.78	91.33
25-34 year-old mortality rate	per 100,000 inhabitants	59.16	21.90	21.97	164.38
35-44 year-old mortality rate	per 100,000 inhabitants	119.92	31.28	54.80	251.16
45-54 year-old mortality rate	per 100,000 inhabitants	289.63	42.70	179.85	415.67
55-64 year-old mortality rate	per 100,000 inhabitants	657.77	92.64	483.03	1087.39
65-74 year-old mortality rate	per 100,000 inhabitants	1606.74	296.69	1038.94	2545.61
75-84 year-old mortality rate	per 100,000 inhabitants	4715.15	686.18	3309.39	6559.52
85+ year-old mortality rate	per 100,000 inhabitants	14982.08	1531.00	11607.19	20444.18
infant mortality rate	per 100,000 inhabitants	3.84	1.35	1.63	10.14
late foetal mortality rate	per 100,000 inhabitants	3.66	1.50	0.25	13.54
neonatal mortality rate	per 100,000 inhabitants	2.52	0.99	0.59	9.18
postneonatal mortality rate	per 100,000 inhabitants	1.30	0.59	0.00	4.55

Source. Spanish NHS Statistical Site.

Table 2 Summary stats of independent variables

Variable	Description	mean	sd	min	max
Hospital personnel	Personnel per 1000 inhabitants	10.88	1.58	7.65	16.34
Hospital beds	Operational hospital beds per 1000 inhabitants	3.44	0.60	2.05	4.91
Copayment dummy	=1 if change in copayment implemented	0.12	0.33	0.00	1.00
Access restrictions dummy	=1 if access restriction implemented	0.06	0.23	0.00	1.00

Source. Spanish NHS Statistical Site

Table 3 Impact of health care provision on total, sex-, cause-, and cause and sex- specific mortality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Males and Females						Females		
	Specif. 1	Specif. 2	Specif. 3	Specif. 1	Specif. 2	Specif. 3	Specif. 1	Specif. 2	Specif. 3
Panel A. Dep variable: Log total mortality rate									
Hospital personnel	0.0043	-0.0062*	-0.0059	0.0029	-0.0069**	-0.0088*	0.0058	-0.0054	-0.0028
	(0.0078)	(0.0030)	(0.0040)	(0.0073)	(0.0026)	(0.0046)	(0.0085)	(0.0038)	(0.0050)
Hospital beds	0.0618	-0.0013	-0.0086	0.0638	-0.0049	-0.0221	0.0589	0.0022	0.0070
	(0.0475)	(0.0067)	(0.0165)	(0.0457)	(0.0084)	(0.0179)	(0.0504)	(0.0113)	(0.0225)
Copayment dummy	-0.0097	0.0021	-0.0041	-0.0163	-0.0027	-0.0016	-0.0027	0.0076	-0.0069
	(0.0214)	(0.0073)	(0.0113)	(0.0205)	(0.0093)	(0.0130)	(0.0229)	(0.0104)	(0.0133)
Access restrictions dummy	-0.0237	-0.0068	0.0006	-0.0171	0.0014	0.0123	-0.0309	-0.0159**	-0.0125
	(0.0309)	(0.0049)	(0.0078)	(0.0300)	(0.0096)	(0.0111)	(0.0327)	(0.0072)	(0.0132)
Panel B. Dep variable: Log cancer mortality rate									
Hospital personnel	0.0123	0.0056	-0.0037	0.0135	0.0080	-0.0028	0.0101	0.0014	-0.0050
	(0.0076)	(0.0060)	(0.0041)	(0.0082)	(0.0069)	(0.0036)	(0.0073)	(0.0052)	(0.0076)
Hospital beds	0.0386	-0.0135	-0.0029	0.0333	-0.0260	-0.0276	0.0480	0.0079	0.0383
	(0.0520)	(0.0211)	(0.0192)	(0.0539)	(0.0232)	(0.0175)	(0.0510)	(0.0231)	(0.0303)
Copayment dummy	-0.0024	0.0187	0.0160	-0.0083	0.0167	0.0168	0.0066	0.0201	0.0125
	(0.0182)	(0.0140)	(0.0130)	(0.0155)	(0.0141)	(0.0113)	(0.0255)	(0.0163)	(0.0202)
Access restrictions dummy	-0.0399	-0.0277*	-0.0264**	-0.0312	-0.0168	-0.0149	-0.0552	-0.0459***	-0.0452**
	(0.0289)	(0.0159)	(0.0115)	(0.0296)	(0.0195)	(0.0123)	(0.0325)	(0.0153)	(0.0207)
Panel B. Dep variable: Log cerebrovascular disease mortality rate									
Hospital personnel	-0.0046	-0.0264***	-0.0268***	-0.0084	-0.0275***	-0.0203***	-0.0022	-0.0260***	-0.0316***
	(0.0140)	(0.0066)	(0.0051)	(0.0139)	(0.0086)	(0.0058)	(0.0147)	(0.0064)	(0.0063)
Hospital beds	0.1409*	0.0033	0.0391	0.1608**	0.0410*	0.0341	0.1276	-0.0238	0.0415
	(0.0803)	(0.0295)	(0.0560)	(0.0702)	(0.0219)	(0.0444)	(0.0900)	(0.0417)	(0.0778)
Copayment dummy	0.0097	-0.0333	-0.0557	0.0036	-0.0262	-0.0026	0.0126	-0.0384	-0.0944
	(0.0472)	(0.0288)	(0.0364)	(0.0445)	(0.0288)	(0.0232)	(0.0536)	(0.0382)	(0.0568)
Access restrictions dummy	-0.0746	-0.0440**	0.0222	-0.0844	-0.0497*	0.0261	-0.0684	-0.0415	0.0191
	(0.0509)	(0.0195)	(0.0380)	(0.0527)	(0.0279)	(0.0303)	(0.0533)	(0.0255)	(0.0528)
Panel A. Dep variable: Log digestive system mortality rate									
Hospital personnel	-0.0023	-0.0149**	-0.0146**	-0.0027	-0.0128	-0.0094	-0.0025	-0.0176	-0.0238
	(0.0082)	(0.0057)	(0.0059)	(0.0088)	(0.0088)	(0.0146)	(0.0130)	(0.0117)	(0.0197)
Hospital beds	0.1412**	0.0366	0.0338	0.1299**	0.0472	0.0186	0.1588**	0.0299	0.0613
	(0.0560)	(0.0336)	(0.0378)	(0.0529)	(0.0294)	(0.0446)	(0.0615)	(0.0478)	(0.0530)
Copayment dummy	-0.0093	-0.0164	0.0070	-0.0179	-0.0223	0.0183	0.0030	-0.0071	-0.0031
	(0.0430)	(0.0311)	(0.0266)	(0.0478)	(0.0388)	(0.0446)	(0.0460)	(0.0353)	(0.0326)
Access restrictions dummy	-0.0548	-0.0300	-0.0012	-0.0365	-0.0066	0.0238	-0.0779	-0.0577	-0.0335
	(0.0484)	(0.0342)	(0.0249)	(0.0513)	(0.0378)	(0.0376)	(0.0508)	(0.0369)	(0.0316)
Panel A. Dep variable: Log external causes mortality rate									
Hospital personnel	0.0100	-0.0107	-0.0322	-0.0063	-0.0218	-0.0433	0.0680	0.0410	0.0064
	(0.0112)	(0.0135)	(0.0301)	(0.0181)	(0.0221)	(0.0364)	(0.0443)	(0.0335)	(0.0266)
Hospital beds	-0.0860	-0.1733**	-0.2210**	-0.0863	-0.1891**	-0.1860**	-0.0795	-0.1020	-0.2619*
	(0.0673)	(0.0632)	(0.0976)	(0.0590)	(0.0694)	(0.0868)	(0.1016)	(0.0878)	(0.1298)
Copayment dummy	0.0604	-0.0016	-0.0244	0.0455	0.0059	0.0068	0.0576	-0.0275	-0.1169
	(0.0818)	(0.0573)	(0.0669)	(0.0611)	(0.0533)	(0.0484)	(0.1306)	(0.0831)	(0.1223)
Access restrictions dummy	-0.0819	-0.0376	0.0110	-0.0773	-0.0293	0.0453	-0.0490	-0.0347	-0.0504
	(0.0902)	(0.0713)	(0.0698)	(0.0679)	(0.0542)	(0.0622)	(0.1475)	(0.1247)	(0.1194)

Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business cycle, population, & social controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Region-specific time trends	No	No	Yes	No	No	Yes	No	No	Yes
Clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	324	324	324	324	324	324	324	324	324

Notes: *** 99%, ** 95%, * 90% significance level. Each column in each panel comes from a different regression. The dependent variables are indicated in each panel.
Source: Spanish NHS Statistical Site and INE Demographic Indicators.

Table 4 Impact of health care provision on age-specific mortality

	(1) Specification 1	(2) Specification 2	(3) Specification 3
Panel C. Dep variable: Log 25-34 years mortality rate			
Hospital personnel	-0.0110	-0.0021	-0.0005
	(0.0195)	(0.0166)	(0.0269)
Hospital beds	-0.1110**	-0.1873***	-0.1994**
	(0.0517)	(0.0420)	(0.0867)
Copayment dummy	-0.0114	0.0215	-0.0954
	(0.0771)	(0.0646)	(0.0701)
Access restrictions dummy	-0.0379	-0.0144	0.0864
	(0.0915)	(0.0745)	(0.0855)
Panel D. Dep variable: Log 35-44 years mortality rate			
Hospital personnel	-0.0097	-0.0114**	-0.0073
	(0.0078)	(0.0050)	(0.0111)
Hospital beds	0.0141	-0.0415	-0.1188
	(0.0410)	(0.0502)	(0.0952)
Copayment dummy	-0.0277	-0.0149	0.0180
	(0.0364)	(0.0328)	(0.0486)
Access restrictions dummy	0.0322	0.0281	0.0294
	(0.0424)	(0.0424)	(0.0639)
Panel E. Dep variable: Log 45-54 years mortality rate			
Hospital personnel	-0.0155	-0.0228	-0.0180
	(0.0131)	(0.0154)	(0.0207)
Hospital beds	0.0417	0.0365	-0.0425
	(0.0294)	(0.0283)	(0.0393)
Copayment dummy	-0.0204	-0.0406*	-0.0262
	(0.0290)	(0.0221)	(0.0317)
Access restrictions dummy	-0.0101	0.0070	0.0196
	(0.0307)	(0.0266)	(0.0370)
Panel F. Dep variable: Log 55-64 years mortality rate			
Hospital personnel	0.0130*	0.0056	-0.0100**
	(0.0070)	(0.0058)	(0.0045)
Hospital beds	0.0402	0.0077	-0.0006
	(0.0236)	(0.0147)	(0.0224)
Copayment dummy	0.0477**	0.0259**	-0.0069
	(0.0193)	(0.0115)	(0.0156)
Access restrictions dummy	-0.0319	-0.0237	-0.0133
	(0.0216)	(0.0190)	(0.0196)
Panel A. Dep variable: Log 65-74 years mortality rate			
Hospital personnel	-0.0051	-0.0116***	-0.0125**
	(0.0051)	(0.0035)	(0.0055)
Hospital beds	0.0364	-0.0235	0.0121
	(0.0294)	(0.0161)	(0.0302)
Copayment dummy	0.0038	0.0109	-0.0087
	(0.0150)	(0.0121)	(0.0171)
Access restrictions dummy	-0.0131	-0.0154	0.0071
	(0.0214)	(0.0190)	(0.0172)
Panel A. Dep variable: Log 75-84 years mortality rate			
Hospital personnel	-0.0041	-0.0071**	0.0001
	(0.0042)	(0.0033)	(0.0057)
Hospital beds	0.0325	-0.0102	-0.0082
	(0.0247)	(0.0175)	(0.0253)
Copayment dummy	0.0256	0.0104	0.0211
	(0.0173)	(0.0088)	(0.0171)
Access restrictions dummy	-0.0278	-0.0199	-0.0174
	(0.0209)	(0.0134)	(0.0143)
Panel A. Dep variable: Log 85 years and older mortality rate			
Hospital personnel	-0.0058*	-0.0055*	0.0016
	(0.0031)	(0.0027)	(0.0063)
Hospital beds	0.0090	-0.0113	0.0061
	(0.0170)	(0.0163)	(0.0181)
Copayment dummy	0.0200	0.0087	-0.0187
	(0.0167)	(0.0129)	(0.0116)
Access restrictions dummy	-0.0294*	-0.0154	0.0013
	(0.0168)	(0.0091)	(0.0132)
Region fixed effects	Yes	Yes	Yes

	(1)	(2)	(3)
Year fixed effects	Yes	Yes	Yes
Business cycle, population, & social controls	No	Yes	Yes
Region-specific time trends	No	No	Yes
Clustered standard errors	Yes	Yes	Yes
N	324	324	324

Notes: *** 99%, ** 95%, * 90% significance level. Each column in each panel comes from a different regression. The dependent variables are indicated in each panel.
Source: Spanish NHS Statistical Site and INE Demographic Indicators.

Table 5. Impact of health care provision on infant mortality

	(1) Specific. 1	(2) Specific. 2	(3) Specific. 3
Panel A. Dep variable: Log infant mortality rate (0-24 months)			
Hospital personnel	-0.0083	-0.0158	0.0048
	(0.0148)	(0.0215)	(0.0385)
Hospital beds	-0.0440	-0.0452	0.0220
	(0.1090)	(0.1039)	(0.1446)
Copayment dummy	0.0460	-0.0804	0.0466
	(0.1157)	(0.1101)	(0.1156)
Access restrictions dummy	0.0323	0.1157	0.1330
	(0.1192)	(0.1113)	(0.1215)
Panel B. Dep variable: Log late foetal deaths rate			
Hospital personnel	-0.0089	-0.0363*	-0.0800**
	(0.0148)	(0.0192)	(0.0372)
Hospital beds	0.1321	0.1591	0.1846
	(0.1117)	(0.1453)	(0.2742)
Copayment dummy	0.0868	-0.0085	-0.1463
	(0.0999)	(0.1096)	(0.1146)
Access restrictions dummy	-0.0299	0.0269	0.2413*
	(0.0672)	(0.0541)	(0.1359)
Panel C. Dep variable: Log neonatal mortality rate (0-28 days)			
Hospital personnel	-0.0025	-0.0138	0.0062
	(0.0248)	(0.0313)	(0.0482)
Hospital beds	-0.0679	-0.0386	-0.0399
	(0.1387)	(0.1602)	(0.2659)
Copayment dummy	0.0710	-0.0256	0.1369
	(0.1408)	(0.1326)	(0.1419)
Access restrictions dummy	0.0092	0.0978	0.1719
	(0.1638)	(0.1493)	(0.1370)
Panel D. Dep variable: Log post-neonatal mortality rate (28 days-24 months)			
Hospital personnel	-0.1391	-0.1226	0.0067
	(0.1208)	(0.1123)	(0.0583)
Hospital beds	-0.2610	-0.2499	-0.0889
	(0.3309)	(0.3435)	(0.5107)
Copayment dummy	-0.2391	-0.3060	-0.2131
	(0.2317)	(0.2576)	(0.1861)
Access restrictions dummy	0.1616	0.2036	0.2927
	(0.2452)	(0.2190)	(0.2039)
Region fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Business cycle, population, & social controls	No	Yes	Yes
Region-specific time trends	No	No	Yes
Clustered standard errors	Yes	Yes	Yes
N	324	324	324

Notes: *** 99%, ** 95%, * 90% significance level. Each column in each panel comes from a different regression. The dependent variables are indicated in each panel.
Source: Spanish NHS Statistical Site and INE Demographic Indicators.

Table 6 Impact of health care provision on external causes of mortality

	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	Males and Females			Males			Females		
	Specif. 1	Specif. 2	Specif. 3	Specif. 1	Specif. 2	Specif. 3	Specif. 1	Specif. 2	Specif. 3
Panel A. Dep variable: Log suicide mortality rate									
Hospital personnel	-0.0205	-0.0255	-0.0756	-0.0284	-0.0359	-0.0816	0.0270	0.0416	-0.0331
	(0.0222)	(0.0308)	(0.0540)	(0.0247)	(0.0353)	(0.0556)	(0.0310)	(0.0532)	(0.0625)
Hospital beds	-0.1616*	-0.1783*	-0.1747	-0.1332	-0.1374	-0.0832	-0.2016	-0.2942	-0.5428*
	(0.0781)	(0.0882)	(0.1528)	(0.0793)	(0.0870)	(0.1518)	(0.1435)	(0.2101)	(0.2792)
Copayment dummy	-0.0257	-0.0135	0.0762	-0.0269	-0.0147	0.1052	-0.0102	-0.0419	-0.1471
	(0.0559)	(0.0686)	(0.0826)	(0.0470)	(0.0620)	(0.0611)	(0.1203)	(0.2379)	(0.4158)
Access restrictions dummy	0.0084	0.0146	-0.0912	-0.0210	-0.0220	-0.0943	0.1571	0.2469	-0.0531
	(0.0510)	(0.0610)	(0.1135)	(0.0485)	(0.0633)	(0.1040)	(0.1273)	(0.2196)	(0.3140)
Panel B. Dep variable: Log other external mortality rate									
Hospital personnel	0.0172	-0.0087	-0.0270	-0.0006	-0.0197	-0.0370	0.0743	0.0383	0.0053
	(0.0146)	(0.0142)	(0.0306)	(0.0211)	(0.0236)	(0.0372)	(0.0501)	(0.0349)	(0.0320)
Hospital beds	-0.0654	-0.1830**	-0.2359**	-0.0727	-0.1883**	-0.2142**	-0.0518	-0.1286	-0.2488*
	(0.0930)	(0.0756)	(0.0952)	(0.0825)	(0.0721)	(0.0878)	(0.1235)	(0.0952)	(0.1256)
Copayment dummy	0.0974	0.0102	-0.0602	0.0933	0.0128	-0.0255	0.0617	0.0172	-0.1119
	(0.0973)	(0.0675)	(0.0791)	(0.0764)	(0.0649)	(0.0653)	(0.1471)	(0.1040)	(0.1340)
Access restrictions dummy	-0.1105	-0.0511	0.0385	-0.1073	-0.0493	0.0782	-0.0691	-0.0432	-0.0392
	(0.1075)	(0.0761)	(0.0775)	(0.0822)	(0.0555)	(0.0706)	(0.1652)	(0.1352)	(0.1238)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business cycle, population, & social controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Region-specific time trends	No	No	Yes	No	No	Yes	No	No	Yes
Clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	324	324	324	324	324	324	324	324	324

Notes: *** 99%, ** 95%, * 90% significance level. Each column in each panel comes from a different regression. The dependent variables are indicated in each panel.
Source: Spanish NHS Statistical Site and INE Demographic Indicators.

Table 7 Impact of regional unemployment on total, sex-, cause-, and cause and sex- specific mortality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Males and Females			Males			Females		
	Specification 1	Specification 2	Specification 3	Specification 1	Specification 2	Specification 3	Specification 1	Specification 2	Specification 3
Panel A. Dep variable: Log total mortality rate									
Regional unemployment rate	-0.0061***	-0.0052**	-0.0008	-0.0058***	-0.0048**	-0.0008	-0.0064**	-0.0055**	-0.0009
	(0.0020)	(0.0020)	(0.0005)	(0.0018)	(0.0017)	(0.0007)	(0.0023)	(0.0023)	(0.0007)
Panel B. Dep variable: Log cancer mortality rate									
Regional unemployment rate	-0.0035	-0.0023	0.0014*	-0.0027	-0.0014	0.0018*	-0.0049*	-0.0037	0.0006
	(0.0021)	(0.0020)	(0.0008)	(0.0021)	(0.0018)	(0.0010)	(0.0023)	(0.0023)	(0.0011)
Panel B. Dep variable: Log cerebrovascular disease mortality rate									
Regional unemployment rate	-0.0140***	-0.0127***	-0.0066**	-0.0127***	-0.0110***	-0.0025	-0.0150***	-0.0140***	-0.0097**
	(0.0028)	(0.0029)	(0.0030)	(0.0032)	(0.0030)	(0.0025)	(0.0032)	(0.0034)	(0.0042)
Panel A. Dep variable: Log digestive system mortality rate									
Regional unemployment rate	-0.0060	-0.0035	0.0028	-0.0036	-0.0011	0.0063	-0.0089**	-0.0064*	-0.0020
	(0.0042)	(0.0039)	(0.0033)	(0.0045)	(0.0046)	(0.0049)	(0.0037)	(0.0031)	(0.0016)
Panel A. Dep variable: Log external causes mortality rate									
Regional unemployment rate	-0.0067	-0.0090*	-0.0051**	-0.0063	-0.0094**	-0.0058*	-0.0054	-0.0039	-0.0015
	(0.0044)	(0.0050)	(0.0022)	(0.0036)	(0.0040)	(0.0027)	(0.0069)	(0.0083)	(0.0036)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health care provision & policy controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Demographic controls & region-specific time trends	No	No	Yes	No	No	Yes	No	No	Yes
Clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	324	324	324	324	324	324	324	324	324

Notes: *** 99%, ** 95%, * 90% significance level. Each column in each panel comes from a different regression. The dependent variables are indicated in each panel.
Source: Spanish NHS Statistical Site and INE Demographic Indicators.

Appendix

Table A.1

Variable	Description	mean	sd	min	max
Regional Unemployment Rate	Percentage	14.89	7.32	4.10	35.67
Devolution	=1 if region with competences in health expenditure and management	0.85	0.36	0.00	1.00
Private Hospital Ratio	Share of hospital beds managed privately	0.23	0.12	0.00	0.43
Population 55- 64 years old	Share of population aged 55-64 years old	0.11	0.01	0.08	0.15
Population 65-74 years old	Share of population aged 65-74 years old	0.09	0.01	0.06	0.12
Population 85 years old or older	Share of population aged 85 years old or older	0.02	0.01	0.01	0.05
Female population	Share of female population	0.51	0.01	0.49	0.52
Young dependency rate	Ratio of population aged under 16 to 16-64 population	23.79	4.13	15.97	38.21
Aged dependency rate	Ratio of population aged over 65 to population aged 16 to 64 years old	25.82	5.39	15.32	37.28