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TESIS DOCTORAL

Implicaciones del Gasto Sanitario sobre la Salud y la Economía

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Santander, mayo de 2015

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DOCTORAL THESIS

Implications of Health Expenditure on Health and the Economy

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Introducción

1. Objeto de la Investigación: Gasto Sanitario, Salud y Economía

La sanidad es una de las bases fundamentales del Estado del Bienestar actual. Así, en la mayoría de los países de la Organización para la Cooperación y el Desarrollo Económico (OCDE) se han producido a lo largo de los últimos años importantes logros, entre los que se encuentran la universalización de la asistencia sanitaria, la mejora del estado de salud de la población o el aumento del grado de satisfacción de los ciudadanos con el sistema sanitario.

Asimismo, se debe tener en cuenta que los países pueden optar por distintos tipos de financiación: la pública, la privada, o una combinación de ambas. Y es que muchos de los países pertenecientes a la OCDE funcionan con sistemas de descentralización de la gestión y financiación de la sanidad. Dicho grado de descentralización sanitaria de cada país, está ligado a condicionantes de carácter político por un lado, y por otro, al tipo de modelo público (Seguridad Social o Sistema Nacional de Salud) vigente en cada caso.

A su vez, el nivel de gasto sanitario que realiza cada país está condicionado por su nivel de renta. De hecho, a la vista de la evidencia empírica, dicha renta agregada es uno de los factores más importantes al intentar explicar el comportamiento del gasto sanitario (Mehrara, Musai y Amiri, 2010). No obstante, como muestra la amplia literatura académica acerca de los determinantes de dicho gasto sanitario (Dreger y Reimer, 2005; López-Casasnovas y Saez, 2007; o Cantarero y Lago-Peñas, 2010), el nivel del mismo que realizan los distintos países viene condicionado tanto por factores de demanda como de oferta. Entre los principales factores se encuentran la dinámica poblacional, el sistema sanitario que tenga el país (o la forma de financiación que se utilice en cada caso), las preferencias de los ciudadanos, o del partido político que esté gobernando, los avances en tecnologías médicas, la innovación, etcétera.

Tanto en España como en el resto de países europeos (tal y como indican las encuestas nacionales de salud) la población es demasiado dependiente del sistema sanitario y su cartera de servicios, lo cual se refleja en el número de visitas médicas, las hospitalizaciones, las altas, las estancias, los medicamentos recetados y/o consumidos, etc. Así, en sus informes periódicos "*Health at a Glance*" (Panorama de la Salud) la OCDE indica que el consumo de servicios sanitarios de las personas mayores de 65 años es superior a la del resto de colectivos, pudiendo llegar a producir un efecto "crowding-out" sobre el resto de gastos públicos. Y a su vez, esto puede afectar a los pilares básicos del Estado del Bienestar, esto es, a la Educación, Sanidad, Pensiones y Servicios Sociales.

Ante estas circunstancias, la tesis que se presenta intenta profundizar en el análisis de las distintas implicaciones socioeconómicas del gasto sanitario. Para ello, se

toma como punto de partida el estudio de los principales determinantes del mismo en los países de la OCDE.

De hecho, el objetivo de política sanitaria de cualquier país debe ser garantizar y mejorar el estado de salud de sus habitantes, así como las condiciones de accesibilidad y equidad en el sistema. Para ello, los distintos gobiernos deben realizar una asignación eficiente de sus recursos presupuestarios. La "priorización" juega pues un papel esencial en el ámbito de la Economía de la Salud. Pero la disponibilidad tanto de información adecuada como de herramientas de análisis puede ayudar en la toma final de decisiones.

Así, el estudio de la relación de complementariedad existente entre la salud, la renta, la educación y la participación del sector público, es vital para el diseño y evaluación de las políticas y estrategias públicas que llevan a cabo los gobiernos, encaminadas a mejorar tanto la calidad de vida como la eficiencia y equidad distributiva. Por consiguiente, el objetivo concreto de esta tesis doctoral es analizar los efectos macro y micro económicos del gasto sanitario tanto sobre los resultados en salud como en los estilos de vida.

2. Motivación General: Antecedentes

Existe una amplia literatura académica acerca de los determinantes del gasto sanitario, y más explícitamente, acerca de la relación entre dicho tipo de gasto y renta. Este tipo de estudios argumenta que no sólo existe una fuerte correlación positiva entre ellos (ambos medidos habitualmente en términos per cápita) de los países desarrollados, sino que es

precisamente la renta la que explica un alto porcentaje de la variación del gasto sanitario.

No obstante, uno de los debates académicos en la Economía de la Salud (y en la econometría aplicada) se ha centrado en lo siguiente: si la elasticidad renta del gasto sanitario es mayor o menor que la unidad. Así, entre los estudios más recientes que tratan esta cuestión se encuentran los de Chakroun (2010), Baltagi y Moscone (2010), Farag *et al*., (2012), o Woodward y Wang (2012). Estos últimos trabajos, utilizan bien técnicas de series temporales bien de datos de panel. Así, Chakroun (2010) para 17 países de la OCDE durante el periodo 1975-2003, encuentra que la elasticidad renta del gasto sanitario oscila entre 0,70-0,90. Por su parte, Baltagi y Moscone (2010) para 20 países de la OCDE y el periodo 1971-2004 obtienen elasticidades entre 0,45 y 0,90. Resultados similares son mostrados en Farag *et al*., (2012) con una muestra de 173 países (desarrollados y en desarrollo) para 1995-2006. Por su parte, Woodward y Wang (2012) para el caso de Estados Unidos 1960-2008, obtienen elasticidades renta del gasto sanitario superiores a la unidad.

A su vez, y dada la reciente evolución de los Estados de Bienestar en los países desarrollados, se han publicado también diversos estudios que analizan la influencia de la sanidad en la economía. Entre otros, González-Páramo (1994) analiza distintas teorías, considerando la relación entre sanidad y crecimiento económico. Así, en su modelo de crecimiento para países de la OCDE encuentra una asociación positiva entre gasto sanitario y mejoras productivas. En la misma línea, Wang (2011) estudia la posible existencia de una relación de causalidad entre el incremento de los gastos sanitarios y el crecimiento económico para un conjunto de 31 países, utilizando una metodología de panel con cuantiles. Sus resultados muestran una influencia positiva del

aumento del gasto en el crecimiento económico para aquellos países con niveles medios-altos de bonanza económica.

Por su parte, Albert y Davia (2004) estudian los rendimientos no monetarios de la educación sobre la salud con datos del PHOGUE (Panel de Hogares de la Unión Europea). Asimismo, con objeto de estimar los efectos de la educación sobre los salarios, elaboran un indicador sintético de salud. Éste, recoge tanto la autoevaluación como medidas objetivas de salud, tales como padecimiento de enfermedades crónicas y/o dificultades físicas o mentales, visitas médicas, estancias hospitalarias, etc. Sus resultados muestran que la educación sirve para aumentar los salarios y el estado de salud de los individuos. Adicionalmente, Balia y Jones (2008); Park y Kang (2008); Ovrum (2011); Tubeuf, Jusot y Bricard (2012) o Brunello *et al.* (2015) entre otros autores, estudian los efectos de la educación en los hábitos de vida saludables. Así, Balia y Jones (2008) muestran cómo los estilos de vida afectan de manera importante a la desigualdad en la mortalidad, reduciéndose también el papel directo que la situación socioeconómica pueda tener. De esta forma, se enfatiza el papel que los estilos de vida tienen en el capital salud. Por su parte, Park y Kang (2008) obtienen que si bien la educación favorece la actividad deportiva, no es un factor explicativo importante de otros hábitos y estilos de vida como son el consumo de alcohol y tabaco. En la misma línea, Ovrum (2011) analiza la importancia que el estatus socioeconómico tiene sobre la actividad física y el consumo de frutas y verduras. El trabajo concluye que son los niveles socioeconómicos superiores los que tienen una mayor probabilidad de tener hábitos de alimentación más saludables. A su vez, Tubeuf, Jusot y Bricard (2012) construyen un modelo dinámico para estudiar distintos factores determinantes de la salud así como la relación entre las condiciones de los primeros años de vida y la salud

posterior de los individuos, mostrando la importancia del papel mediador de la educación y los estilos de vida. Finalmente, Brunello *et al.* (2015) analizan el efecto causal de la educación sobre la salud, atendiendo también a dicho efecto mediador atribuible a los hábitos y estilos de vida (consumo de alcohol, tabaco, ejercicio físico e índice de masa corporal). Estos autores apelan a la importancia de entender las relaciones salud-educación a fin de luchar contra las inequidades en salud.

En base a lo anterior, se justifica el interés práctico del análisis relativo a los diferentes estudios sobre los determinantes del gasto sanitario y los efectos del mismo sobre la salud y la economía, pudiendose aportar en esta tesis doctoral así nueva evidencia empírica.

3. Metodología y Datos

A fin de llevar a cabo esta tesis se combinan diversos métodos cuantitativos con fundamentos teóricos relacionados básicamente con la economía de la salud. Lo ideal sería tomar como base a un número elevado de variables, sin embargo la modelización está restringida tanto por la disponibilidad de datos como por la calidad de los mismos. Se pretende trabajar con distintas técnicas econométricas como son, entre otras, modelos de panel dinámicos, de elección discreta, de conteo y técnicas de "*matching*" (emparejamiento).

Para ello, se utilizarán datos nacionales e internacionales, considerando a su vez, los distintos niveles de gobierno existentes en cada uno de los países considerados en su caso para la elaboración de las respectivas bases de datos a utilizar en el estudio.

Se emplearán encuestas de salud (microdatos) y otras fuentes de información relacionadas. Las principales fuentes de datos a utilizar en esta tesis serán la *OECD Health Statistics* y la información proporcionada tanto por el Instituto Nacional de Estadística (INE) como por el Ministerio de Sanidad, Servicios Sociales e Igualdad. Adicionalmente, se emplearán datos de la BD.MORES. El software utilizado, principalmente, es Stata 11.2.

En lo que respecta a las bases de datos, señalar en primer lugar, que la *OECD Health Statistics* es la fuente de información más importante en la actualidad para comparar los indicadores de salud de los distintos sistemas sanitarios internacionales. Además, tanto su frecuencia (renovable anualmente) como el hecho de que se utiliza en todo tipo de trabajos académicos relacionados con estas cuestiones, apoyan la fiabilidad y pertinencia de su uso. Ésta facilita información relativa al estado de salud, los recursos sanitarios, la utilización, o la financiación. Asimismo, en lo que respecta a las partes finales de esta tesis doctoral en las que se trabajará con los microdatos de las últimas encuestas de salud disponibles para España, cabe señalar, que forman parte de una investigación que el INE realiza en virtud de un acuerdo de colaboración con el Ministerio de Sanidad, Servicios Sociales e Igualdad. Dichas encuestas están dirigidas a las familias/hogares, y su finalidad principal es obtener datos sobre el estado de salud y los factores determinantes del mismo desde la perspectiva de los ciudadanos. Proporcionan así resultados tanto nacionales como por comunidades autónomas sobre los determinantes y estado de salud, así como de la asistencia sanitaria y estilos de vida.

4. Aportaciones de la Tesis: Grado de Innovación

La correlación positiva existente entre salud y renta es una de las más estudiadas a nivel internacional (Bloom y Canning, 2000). A nivel micro, es de esperar que la salud aumente con el nivel educativo y los salarios, a la vez que los salarios lo hagan con la salud y el nivel educativo debido a la mejora de la productividad que proporcionan las inversiones en capital humano (Albert y Davia, 2004). Asimismo, existe una amplia evidencia empírica sobre la transmisión del estado de salud de los padres a sus descendientes (Rivera, Currais y Rungo, 2008; Pascual y Cantarero, 2009; Currie, 2009). De tal forma, que la justificación económica y social de la provisión sanitaria realizada por el sector público puede venir en ese sentido, así como el estudio de la importancia de su gasto y sus efectos económicos.

De este modo, el objetivo concreto de esta tesis doctoral será analizar los efectos macro y micro de dicho gasto sanitario sobre los resultados en salud y el ciclo económico. Con ello, se pretende realizar una aportación original a los trabajos académicos ya publicados en el campo de la economía de la salud apoyándonos así en la información más reciente sobre la materia. Así, se estudiarán los efectos de los "shocks" causados por la crisis económica en la salud tanto a nivel macro como microeconómico.

La tesis doctoral se desarrolla en cuatro secciones (artículos/capítulos). Estos capítulos aunque independientes, estarán relacionados entre sí. Cada uno de ellos aborda el estudio de diferentes aspectos de la economía de la salud utilizando diversas metodologías y haciendo uso a su vez de todos los datos disponibles en cada caso. Así, en los dos primeros capítulos se trabajará con datos agregados, mientras que en los dos últimos se emplearán microdatos.

- Capítulo 1: Renta y gasto sanitario.
- Capítulo 2: Salud y crecimiento económico.
- Capítulo 3: Determinantes socioeconómicos, utilización sanitaria y necesidades de salud insatisfechas.
- Capítulo 4: Economía y estilos de vida.

De esta forma, el primer capítulo de la tesis doctoral, versará sobre la relación entre la renta y el gasto sanitario. A partir del mismo, en los siguientes tres capítulos continuaremos profundizando en el estudio de los efectos del gasto sanitario sobre la salud y la economía. Por tanto, se pretende explorar en ellos las relaciones entre sanidad, educación y crecimiento económico, así como los efectos de la salud y el mercado laboral.

El Capítulo 1 analiza los principales determinantes del gasto sanitario y su dinámica. El estudio utiliza una metodología de panel (tanto lineal como dinámico) para 14 países de la OCDE durante el periodo 1971-2009. El modelo, construido sobre la base del desarrollado por Newhouse (1977), sugiere que si bien el cuidado de la salud es un bien necesario en el corto plazo, no se puede rechazar que sea un bien de lujo en el largo plazo. Nuestros resultados proporcionan así una fuerte evidencia empírica sobre un fenómeno relevante: que los gastos sanitarios de un año están bastante condicionados por los de los anteriores (lo que se conoce como "efecto anclaje"). Curiosamente, nuestros hallazgos ponen de manifiesto el aumento de la inelasticidad de la renta en el tiempo, junto con la existencia a su vez de una gran heterogeneidad entre países. Por último, este capítulo apoya la hipótesis de convergencia condicional en el gasto sanitario entre los países. En el diseño de políticas que faciliten la sostenibilidad de los sistemas de salud, destacamos que, *ceteris paribus*, cuanto mayor sea la participación

pública, menor es la tasa de crecimiento del gasto sanitario. Una alta proporción de niños y personas mayores sobre el conjunto de la población en edad de trabajar, influye a su vez de manera inversa. El capítulo, proporciona de nuevo evidencia empírica sobre un hecho notable: que el progreso tecnológico podría reducir, en el largo plazo, la elasticidad renta del gasto sanitario. Todo ello a su vez amenaza la sostenibilidad financiera de los sistemas sanitarios.

El Capítulo 2 estudia los efectos del capital salud sobre el crecimiento económico. El trabajo se realiza para las 17 Comunidades Autónomas españolas durante el periodo 1980-2007 siendo la metodología de panel y el uso de un modelo estructural finalmente las utilizadas. Así, en este segundo capítulo se examinan los efectos de la salud y su gasto asociado sobre el crecimiento económico. La motivación del mismo es el bajo crecimiento de la productividad de la economía española desde mediados de los años 90 y la efectividad de las políticas económicas. A su vez es conocido, que en las economías desarrolladas, el avance de la productividad descansa en el progreso técnico, que depende a su vez del capital humano, el capital tecnológico, etc. En ese contexto, este capítulo pretende arrojar luz sobre el papel económico de otro tipo de capital menos estudiado, como es el capital salud, en el desarrollo de las regiones. El trabajo adquiere a su vez especial relieve en el marco de la Política Regional Europea de impulso a la competitividad, y de cambio a un modelo productivo que genere un mayor valor añadido. Parece necesario entonces dotarse de un marco analítico capaz de evaluar en qué medida el Estado puede desempeñar un papel estratégico en la acumulación del capital-salud y el desarrollo endógeno. En este sentido, la hipótesis que se desprende de la literatura académica más reciente en el campo de la economía de la salud, es que la mortalidad afecta al crecimiento económico por la disminución de los incentivos sobre

el “buen comportamiento” con costes a corto plazo y recompensas a largo plazo. Se proporciona pues evidencia empírica de que una mayor mortalidad infantil tiene un impacto negativo directo sobre el crecimiento del ingreso per cápita. También, en este trabajo se demuestra que un mayor riesgo de muerte temprana se asocia con pérdidas en la acumulación de capital físico y humano, y aumentos de la fertilidad (los cuales, a su vez, reducen aún más el crecimiento económico).

En los últimos dos capítulos de la tesis doctoral, se analizan los efectos de la Gran Recesión sobre los hábitos y estilos de vida de la población española. De igual forma, se comparan esos resultados con los del periodo de bonanza económica. En concreto, se estudia cómo distintas variables socioeconómicas, tales como estatus laboral o nivel educativo, entre otras, afectan a dichas circunstancias y percepciones.

El caso es que en España se han aplicado importantes medidas de austeridad y de consolidación presupuestaria en los últimos años, representadas entre otras, por reducciones en el crecimiento del gasto sanitario público en términos reales (OCDE, 2014). El Capítulo 3, se centra pues en la demanda sanitaria y los cambios existentes consecuencia de la Gran Recesión. En concreto, utilizando datos de la Encuesta Nacional de Salud española, antes de la crisis (2006) y durante la crisis económica (2011-2012), este capítulo examina los factores determinantes de las necesidades insatisfechas de atención de la salud y la utilización de servicios sanitarios (centrada especialmente en visitas al médico general y al especialista). Tanto modelos de conteo como de elección discreta son empleados para analizar las dos variables dependientes antes mencionadas. Se presta así especial interés también al impacto económico de las características laborales. En base a todo lo anterior, nuestro trabajo corrobora al igual que otros que la utilización de servicios de salud se relaciona con factores económicos.

La edad, el género, la salud autopercibida y el nivel educativo son los factores más importantes para explicar las necesidades de utilización y de atención médica no satisfechas, mientras que estar en desempleo no es tan importante en términos explicativos como se esperaba. La importancia de la dimensión regional y la descentralización en el sistema nacional de salud español, también son incluidas en este análisis pues presentan características intrínsecas al mismo que sirven como base para realizar estudios de este tipo.

Finalmente, en el Capítulo 4, a partir de datos de la Encuesta Nacional de Salud española para los años 2006 y 2011-2012, se pone a prueba la hipótesis de que el desempleo se asocia con estilos de vida más negativos, y en concreto en nuestro caso, con un consumo "excesivo" de alcohol. También se postula que dicho consumo "exagerado" de alcohol se relaciona positivamente con la renta real disponible. De este modo, este capítulo se centra en estudiar cómo el fenómeno de "beber en exceso" se relaciona con el propio ciclo económico. El análisis se asocia principalmente con una rama de la literatura académica, que ha sido prolija en su caso y lo sigue siendo ahora y que es aquella que estudia la relación entre salud y las condiciones macroeconómicas. No obstante, se tienen en cuenta también en nuestro trabajo las condiciones individuales en cada caso. Tres enfoques se utilizan para tratar analíticamente los datos de los que hemos dispuesto finalmente: modelos de elección discreta, técnicas de emparejamiento "*matching*", y diferencias-en-diferencias. Se observa así cómo el hecho de estar desempleado reduce la probabilidad de que una persona consuma alcohol de manera "abusiva". En otras palabras, dicho consumo "excesivo" de alcohol se asocia positivamente con el nivel de renta disponible, siendo éste un fenómeno procíclico. Sin embargo, la diferencia entre "parados" y "ocupados" respecto a su comportamiento en

este tipo de hábitos de consumo relacionados con la salud parece que ha desaparecido en el período de crisis con respecto al periodo anterior.

En otro orden de cosas, es importante señalar que diferentes versiones de los cuatro capítulos de esta tesis doctoral han sido presentadas en estos últimos años en diversos seminarios, congresos, encuentros y jornadas de tipo científico, tanto nacionales como internacionales.

El Capítulo 1, surge del trabajo final (tesina) realizado dentro del Máster Oficial en Economía, en el mismo obtuve una alta calificación, circunstancia muy relevante, pues constituye la parte formativa del programa de "*Doctorado en Economía: Instrumentos del Análisis Económico*" con mención de calidad por ANECA así como mención hacia la Excelencia de Ministerio de Educación, Cultura y Deporte del Gobierno de España, en el que fui admitida en octubre de 2011. Para ello, conté también con la colaboración externa Santiago Lago Peñas (Catedrático de Economía Aplicada de la Universidad de Vigo) además de mis directores de tesis. Dicho primer capítulo, ha sido presentado en distintos Seminarios de investigación del Departamento de Economía de la Universidad de Cantabria (Santander, 2012 y 2013); en el XIX Encuentro Nacional de Economía Pública (Santiago de Compostela, 2012); en las XXXII Jornadas Nacionales de la Asociación de Economía de la Salud-AES (Bilbao, 2012) y en la XV Reunión Nacional de Economía Mundial (Santander, 2013).

Por su parte, el Capítulo 2, tiene un carácter fuertemente multidisciplinar pues ha sido elaborado con la colaboración de Javier Llorca Díaz (Catedrático de la Universidad de Cantabria en el Área de Medicina Preventiva y Salud Pública). El Profesor Llorca ha aportado una interesante visión acerca de los determinantes de la salud y las implicaciones de la misma en el devenir de los individuos. Este capítulo, a

su vez, ha dado lugar a diversas comunicaciones científicas presentadas en las XXXIII Jornadas Nacionales de la Asociación de Economía de la Salud-AES (Santander, 2013); en el XXI Encuentro Nacional de Economía Pública (Girona, 2014); en el *11th International Conference of Developments in Economic Theory and Policy* (Bilbao, 2014) y en la *XL International Conference on Regional Science* (Zaragoza, 2014). De igual forma, el Capítulo 3 fue expuesto en el XXII Encuentro Nacional de Economía Pública (Santander, 2015) habiendo obtenido en el mismo interesantes aportaciones de varios de los asistentes a la presentación de dicho trabajo en la mesa específica de economía de la salud que allí se celebró. Finalmente, señalar que el desarrollo del Capítulo 4, ha sido posible gracias a la realización de una estancia predoctoral de tres meses en el prestigioso Departamento de Economía de la *City University London* (Londres, Reino Unido, 2014) bajo la supervisión de la Professor Mireia Jofre-Bonet y con la activa colaboración del grupo de investigación en *Health Economics* de dicha Universidad.

Asimismo, algunos los principales resultados científicos obtenidos ya han sido publicados, o han pasado la primera etapa del proceso de revisión en diferentes *journals* de tipo académico, siendo todos ellos de impacto *JCR en Economía*. En concreto, distintas versiones de los Capítulos 1 y 2 han sido publicadas (en colaboración) en *Economic Modelling*, *Applied Economics* y *Applied Economics Letters*, respectivamente:

- Lago-Peñas, S., Cantarero-Prieto, D., Blázquez-Fernández, C. (2013). On the relationship between GDP and health care expenditure: a new look. *Economic Modelling*, **32**, 124-129.

- Blázquez-Fernández, C., Cantarero-Prieto, D., Perez-Gonzalez, P. (2014). Disentangling the heterogeneous income elasticity and dynamics of health expenditure. *Applied Economics*, **46(16)**, 1839-1854.
- Blázquez-Fernández, C., Cantarero-Prieto, D., Perez-Gonzalez, P., Llorca-Díaz, J. (2015). Does early-life health enhance growth? Evidence from Spain. *Applied Economics Letters*, **22(11)**, 860-864.

A su vez, cabe resaltar que los Capítulos 3 y 4, se encuentran actualmente en proceso de evaluación en dos *journals* de impacto *JCR en Economía*.

Por último, señalar que a lo largo de estos meses, también he asistido a distintos programas (cursos de perfeccionamiento y formación del profesorado de la Universidad de Cantabria (UC), así como a varios cursos de especialización impartidos por el Instituto de Estudios Fiscales en Madrid). También cabe indicar que me he seguido formando con jornadas y seminarios de especialización. Adicionalmente, para mejorar y completar mi formación cursé el máster propio de la UC (en colaboración con la Consejería de Sanidad y Servicios Sociales del Gobierno de Cantabria) en Dirección y Gestión de Servicios Sanitarios (2012), y el máster propio de la UC en Tributación (2013). Todos ellos están relacionados estrechamente con el área de investigación y docencia (economía pública y de la salud) de esta tesis doctoral. Igualmente, obtuve la certificación del nivel C1 en lengua inglesa del Marco Común Europeo de Referencia para las lenguas (2014), y la respectiva acreditación, por parte del Vicerrectorado de Profesorado de la UC, para poder impartir docencia en inglés ya desde el curso académico 2014-2015.

Introduction

1. Purpose of Research: Health Expenditure, Health and the Economy

Health is one of the main basic pillars of modern Welfare States. Thus, over recent years in most of the Organization for Economic Cooperation and Development (OECD) country members have occurred some major achievements, like the universalization of health care, improvements on the health status of the population or the increase in citizens' satisfaction with the health care system.

Furthermore, it must be considered the fact that countries can choose different types of funding: public, private, or a combination on both. In fact, most of the OECD country members have decentralized the management and financing of their health care systems. On the one hand, the degree of health care decentralization of each country is linked to political constraints, on the other hand, it depends on the type of public model (Social Security or National Health System).

At the same time, the level of health expenditure made by each country is determined by its income. Actually, the empirical evidence points out that aggregate

income is one of the most important factors in explaining health expenditure (Mehrara, Musai and Amiri, 2010). However, as shown in the extensive academic literature on the determinants of the health expenditure (Dreger and Reimer, 2005; López-Casasnovas and Saez, 2007; or Cantarero and Lago-Peñas, 2010), the level of heath expenditure is conditioned by both, demand and supply factors. The key factors include population dynamics, the type of health care system (or the form of funding that is used in each case), the preferences of citizens, or the political party that is governing, advances in medical technology, innovations, etcetera.

In fact, both in Spain and in the rest of European countries (as indicated by national health surveys), the population depend too much on the health care system and its services, which is reflected on the number of health care visits, hospitalizations, discharges, length of stays, pharmaceutical consumption, etc. Thus, the OECD in its periodic reports "Health at a Glance" indicates that the utilization of health care services for people over 65 is higher than the one the other groups made, being able to produce a "crowding-out" effect on other public expenditures. Accordingly, this can affect Welfare States' basic pillars, that is, Education, Health, Pensions and Social Services.

Under these circumstances, this thesis aims to deepen in the analysis of the different health expenditure implications. In doing so, the study of the main determinants of health expenditure in the OECD countries is taken as starting point.

Indeed, the goal of health policy of any country should be to ensure and improve its inhabitant's health, as well as the accessibility and equity in the system. To do that, governments should make an efficient allocation of resources. "Prioritization" plays a key role in the field of Health Economics. But both the availability of adequate information and analysis tools can help in the final decision.

Therefore, the study of the complementarity relationship between health, income, education and public sector participation, is vital for the design and evaluation of public policies and strategies performed by governments, to improve both quality of life and efficiency and distributional equity. Consequently, the specific objective of this thesis is to analyse the macro and micro economic effects of health expenditure on health outcomes and lifestyles.

2. General Motivation: Background

There is extensive academic literature on the determinants of health expenditure, and more specifically, about the relationship between health expenditure and income. These kind of studies argue that there is not only a strong positive correlation between health expenditure and income (both in per capita terms) in developed countries, but is precisely income that explains a high percentage of health expenditure changes.

However, one of the academic debates in Health Economics (and in applied econometrics) has been focused on the following: if the income elasticity of health expenditure is greater or less than unit. Thus, among the more recent studies addressing this issue are the ones of Chakroun (2010), Baltagi and Moscone (2010), Farag *et al.*, (2012), or Woodward and Wang (2012). These latest papers use mainly time-series or panel data techniques. Thereby, Chakroun (2010) for 17 OECD countries over the period 1975-2003 found that the income elasticity of health expenditure ranges from 0.70-0.90. Meanwhile, Baltagi and Moscone (2010) for 20 OECD countries and from the period 1971 to 2004 obtained elasticities between 0.45 and 0.90. Similar results are

shown in Farag *et al.*, (2012) with a sample of 173 (developed and developing) countries for 1995-2006. While Woodward and Wang (2012) for the case of the United States from 1960 to 2008, obtained income elasticities greater than unit.

At the same time, given the evolution in developed countries' Welfare States, there have been published several studies examining the role of health in the economy, and their interrelationships. Among others, González-Páramo (1994) discusses various theories, considering the relationship between health and economic growth. Hence, in its growth model for some OECD countries it is found a positive association between health expenditure and productivity improvements. Similarly, Wang (2011) studies the causality of the relationship between the increase in health expenditure and economic growth for a set of 31 countries, using a methodology panel quantiles. The results show a positive effect of these increases on economic growth for countries with medium to high levels of economic prosperity.

Meanwhile, Albert and Davia (2004) study non-monetary returns of education on health using ECHP (European Community Household Panel) data. In addition, in order to estimate the effects of education on wages, a synthetic indicator of health is developed. It collects both self- and objective measures of health such as suffering from chronic diseases and/or physical or mental difficulties, doctor visits, hospital stays, etc. The results show that education increases wages and improve health status of individuals. As well, Balia and Jones (2008); Park and Kang (2008); Øvrum (2011); Tubeuf, Jusot and Bricard (2012) or Brunello *et al*. (2015) among others, study the effects of education on healthy lifestyles. Thus, Balia and Jones (2008) show how lifestyles significantly affect mortality inequality, reducing this effect the direct role that socioeconomic status may have. So, the role lifestyles have on health capital is

emphasized. Meanwhile, Park and Kang (2008) find that while education promotes sport activities, it is not as explanatory for other habits and lifestyles like alcohol and tobacco consumption. Similarly, Øvrum (2011) discusses the importance that socioeconomic status has on physical activity and on the consumption of fruits and vegetables. The paper concludes that higher socioeconomic status are more likely to have healthier attitudes. Tubeuf, Jusot and Bricard (2012) built a dynamic model to study various determinants of health and the relationship between early-life conditions and the subsequent health of individuals, in doing so, they include the mediating role of education and lifestyles. Finally, Brunello *et al.* (2015) analyse the causal effect of education on health, considering the attributable mediator role effect of the habits and lifestyles have (tobacco and alcohol consumption, physical activity and body mass index). These authors highlight the importance of understanding health-education relationships in order to struggle against health inequities.

Based on the foregoing, the practical interest of the analysis of the different studies on the determinants of health expenditure and its effects on health and the economy is justified. Thus, this thesis would provide new empirical evidence on it.

3. Methodology and Data

To accomplish this thesis, quantitative methods are combined with theoretical foundations. Take as base a large number of variables would be ideal, however, modelling is restricted both by the availability and the quality of data. It is planned to

work with different econometric techniques such as, dynamic panel data models, discrete choice models, counting ones and matching techniques, among others.

To do so, national and international data will be used, considering in turn the various levels of government for the elaboration of the respective databases used in the study. Health surveys (microdata) and other sources of information related are also applied. The main data sources utilized in this thesis are the OECD Health Statistics and information provided by the Spanish National Institute of Statistics (INE) and the Ministry of Public Health, Social Services and Equality. Additionally BD.MORES data. The software primarily used is Stata 11.2.

In regard to databases, firstly, it should be noted that the OECD Health Statistics is nowadays the most important source of information to compare health indicators of different international health care systems. Furthermore, its frequency (annually renewable) and that it is used in a wide range of academic papers, support the reliability of its use. It provides information on health status, health resources, utilization, or financing. Additionally, on the final sections of this thesis in which we will work with microdata from the latest Spanish National Health Surveys, it should be indicated, they are part of a research that the INE performed under an agreement with the Ministry of Public Health, Social Services and Equality. These surveys are directed at families/households, and its main purpose is to obtain data on health status and determinants from citizens' viewpoint. Thus it provides both national and regional data on the determinants and health status, as well as healthcare and lifestyles.

4. Contributions of the Thesis: Degree of Innovation

The positive correlation between health and income is one of the best known relations in international development (Bloom and Canning, 2000). At the micro level, it is expected that health increases with educational attainment and wages, while wages do with health and education due to productivity improvements that provide investments in human capital (Albert and Davia, 2004). Also, there is plenty of empirical evidence on health status transmission from parents to their children (Rivera, Currais and Rungo, 2008; Pascual and Cantarero, 2009; Currie, 2009). Therefore, the economic and social justification of health provision by the public sector can come in that sense, as well as the study of the importance of its expenditure and economic effects.

Consequently, the specific objective of this thesis is to analyse the macro and micro health expenditure effects on health outcomes and the economic cycle. With the latest information on the subject is intended to make an original contribution to the academic studies in the field of health economics. In addition, the effects of "shocks" caused by the economic crisis would be reflected and studied.

The thesis is divided in four sections (papers/chapters). These chapters though independent, are connected. Hence, each of which deals with the study of different aspects of health economics using different methodologies and all available data in each case. Thus, in the first two ones we will work with aggregate data, while in the latest microdata will be used.

- Chapter 1: Income and health expenditure.
- Chapter 2: Health and economic growth.

- Chapter 3: Socioeconomic determinants, health care utilization and unmet health care needs.
- Chapter 4: Economy and lifestyles.

Thus, the first chapter of the thesis, will be focused on the relationship between income and health expenditure. From this, the following three chapters will continue to deepen the study of health expenditure effects on health and the economy. Therefore, it is intended to analyse the relationships among health, education and economic growth. Also, the effects of health and the labour market.

Chapter 1 discusses the main determinants of health expenditure and its dynamics. The study uses a panel data methodology (both linear and dynamic) for 14 OECD countries over the period 1971-2009. The model built upon one developed by Newhouse (1977), suggests that health care is a necessity in the short-run but it cannot be rejected to be a luxury good in the long-run. Our results provide strong empirical evidence that health expenditure one year is conditioned by previous ("anchoring effect"). Interestingly, our findings demonstrate increasing inelasticity of income over time, together with the existence turn large heterogeneity between countries. Finally, this chapter supports the hypothesis of conditional convergence in health expenditure across countries. In designing policies which facilitate the sustainability of national health systems, we emphasize that *ceteris paribus* the greater the participation of public health, the lower the growth rate of health expenditure. Meanwhile, high share of children and elderly over working age population opposite influences. This chapter also provide empirical evidence that technological progress could reduce the long-run income elasticity for health care, which in turns, threaten the sustainability of health care systems.

Chapter 2 studies the effects of health capital on economic growth. The study is performed for the 17 Spanish regions during the period 1980-2007, using a structural and panel data models as methodology. Thus, in this second chapter health effects and its associated expenditure on economic growth are examined. The motivation for it, is the low productivity growth of the Spanish economy since the mid-90s and the effectiveness of economic policies. That is, in developed economies, the productivity growth rests on technical progress, which in turn depends on human capital, technological capital, etc. In this context, this chapter aims to shed light on the role of other less studied capital, such as health, in developing regions. The study in turn takes on special importance under the European Regional Policy boosting competitiveness, and change to a production model that generates added value. Therefore, it seems necessary to acquire an analytical framework to assess to what extent the State can play a strategic role in the accumulation of health-capital and the endogenous development. In this sense, the hypothesis that emerges from the most recent academic literature is that mortality affects economic growth by reducing incentives for "good behaviour" with short-term costs and long-run payoffs. We provide empirical evidence that higher infant mortality has a direct negative impact on per capita income growth. Also, that a greater risk of early-life death is associated with losses on accumulation of both physical and human capital, and fertility gains, which in turn more even reduces growth.

In the last two chapters of the thesis, the effects of the Great Recession on the habits and lifestyles of the Spanish population are analysed. Similarly, these results are compared with those of the pre-crisis period. Specifically, how different socioeconomic variables, such as labour status or educational level, affect these circumstances and perceptions.

The fact is that in Spain there have been significant austerity measures in recent years, represented among others, by cuts in the growth of public health expenditure in real terms (OECD, 2014). Chapter 3 focuses on health care demand and the existing changes derived from the Great Recession. Specifically, using data from the Spanish National Health Survey, before the crisis (2006) and through the economic crisis (2011-2012), this chapter examines the determinants of unmet needs for health care and the utilization of health services (particularly focusing on visits to general practitioner and specialist). Both discrete choice and count data models are employed to study these two main dependent variables. Special attention is paid to labour status characteristics. The analysis shows that the utilization of health care services is related to economic factors. Age, gender, self-assessed health and education level are the most important factors in explaining the utilization and unmet health care needs, while being unemployed is not as important, in explanatory terms, as expected. Demand-induced supply plays a major role since health care is decentralized to regions. In addition, the regional dimension in the national health system is also considered.

In Chapter 4, drawing on data from the Spanish National Health Survey for the years 2006 and 2011-2012, it is tested the hypothesis that unemployment is associated with heavy drinking. We also hypothesize that heavy drinking is positively related with real disposable income. Thereby, this paper is focused on how heavy drinking is related with the economic cycle. The analysis relates mainly with one strand of literature, the one on the relationship between health and macroeconomic conditions. Although in this paper individual level conditions are analysed. Three approaches are used to analyse the data: discrete-choice models, matching techniques, and differences-in-differences estimation. In is showed that being unemployed reduces the probability of being a

heavy drinker. In other words, that heavy drinking is positively associated with disposable income and it would be a pro-cyclical phenomenon. Nonetheless, the difference between unemployed and employed seems to has disappeared in the crisis period.

In another vein, note that in recent years different versions of the four chapters have been presented in various seminars, conferences and meetings, both national and international.

Chapter 1, arises from the final project carried out in the Master, which is the formative part from the "*Doctorado en Economía: Instrumentos del Análisis Económico*" with quality mention by ANECA and references to Excellence by the Ministry of Education, Culture and Sports of Spain, where I was admitted in October 2011. To this I counted for external collaboration, Professor of Applied Economics Santiago Lago Peñas (University of Vigo) in addition to my thesis supervisors. This chapter, has been presented in various Seminars of the Department of Economics-University of Cantabria (Santander, 2012 and 2013); at the XIX Public Economics Meeting (Santiago de Compostela, 2012); at the XXXII Conference of the Association of Health Economics (Bilbao, 2012) and at the XV World Economy Meeting (Santander, 2013). Meanwhile, Chapter 2, is multidisciplinary as it has been done in collaboration with Professor Javier Llorca Díaz, Preventive Medicine and Public Health-University of Cantabria. This in turn has led to various submissions to the XXXIII Conference of the Association of Health Economics (Santander, 2013); at the XXI Public Economics Meeting (Girona, 2014); at the 11th International Conference Developments in Economic Theory and Policy (Bilbao, 2014) and at the XL International Conference on Regional Science (Zaragoza, 2014). Similarly, Chapter 3

was exposed in the XXII Public Economics Meeting (Santander, 2015). Finally, highlight Chapter 4 has been made possible by conducting a predoctoral short research stay of three months in the prestigious Department of Economics, City University London (London, UK, 2014) under the supervision of Professor Mireia Jofre-Bonet and the collaboration of the research group in Health Economics from that University.

Furthermore, the results have been published, or have passed the first stage of the review process in different journals, all of them with JCR impact factor. Particularly, versions of Chapters 1 and 2 have been published (in collaboration) in *Economic Modelling*, *Applied Economics* and *Applied Economics Letters*, respectively. In turn, it should be noted that Chapters 3 and 4, are still under review.

- Lago-Peñas, S., Cantarero-Prieto, D., Blázquez-Fernández, C. (2013). On the relationship between GDP and health care expenditure: a new look. *Economic Modelling*, **32**, 124-129.
- Blázquez-Fernández, C., Cantarero-Prieto, D., Perez-Gonzalez, P. (2014). Disentangling the heterogeneous income elasticity and dynamics of health expenditure. *Applied Economics*, **46(16)**, 1839-1854.
- Blázquez-Fernández, C., Cantarero-Prieto, D., Perez-Gonzalez, P., Llorca-Díaz, J. (2015). Does early-life health enhance growth? Evidence from Spain. *Applied Economics Letters*, **22(11)**, 860-864.

Finally note that, during these months, I have also attended various courses (training courses and teacher training at the University of Cantabria (UC), as well as several specialized courses offered by the Institute of Fiscal Studies in Madrid), conferences and seminars. Additionally, to improve and complete my education I attended the Master in Management of Health Services (University of Cantabria and

Department of Health, Government of Cantabria, 2012) and the Master in Taxation (University of Cantabria, 2013). Both of them, are closely related to the area of research and teaching (public economics and health) of this thesis. I also obtained the Certificate of Advanced English (C1) and so, I am accredited for teaching in English at the University of Cantabria (2014).

Chapter 1

Disentangling the income elasticity and dynamics of health expenditure

1.1. Introduction

How much did improving income rise health care? Since Grossman (1972b), there has been huge theoretical literature on health as a form of capital stock. So, the correlation between economic performance and health is one of the best-known relations in international development. Higher per capita income gives citizens greater access over many of the goods and services that promote health: nutrition, medicines, schooling, and good quality health services (Bloom and Canning, 2000). In this study, we empirically examine the effects of income on health care spending for a sample of fourteen OECD countries, and its dynamics over 1971-2009.

We build on previous studies in three ways. First, the focus of our study is on understanding the determinants of per capita level of health care expenditure. The

abovementioned studies hardly distinguish between short- and long-term, nor take into account income clusters of countries and the differences in time. In this study, our main goal will be testing for differences between short-run and long-run income elasticity, when controlling for demographic structure, the percentage of public health care expenditure over the total and technological change. A simple empirical model, built upon one developed by Newhouse (1977), provides a straightforward method for testing of on hypotheses derived from economic theory[1]. Second, we then specify a new model by allowing for health spending convergence across countries, based on the neoclassical growth theory (Barro and Sala-i-Martin, 1995). Third, afterwards the study carries out diverse sensibility tests, looking at differences between subgroups of countries and subperiods of time.

When estimating the effects of income on health care spending for the period 1971 to 2009, we adopt the panel data approach. We first assume a linear and homogeneous relationship between the variables. Nonetheless, in a second stage, we also use a dynamic panel data model by applying the improved Generalized Method of Moments (GMM) by Arellano and Bover (1995) and Blundell and Bond (1998). For studying the income elasticity of health care dynamics, the full sample is split into two subperiods: the initial period (1971-1990) and the subsequent period (1991-2009). Furthermore, we divided the full sample of countries into two subgroups based on a cluster analysis for the initial observations of health care expenditure and income (that is, for year 1971).

Our study contains various innovative approaches. Firstly, as far as we are concerned, our main contributions to the existing literature consist in analysing

[1] According to a generally accepted rule, income elasticity less than unit classify health expenditure as a "necessary" good. Similarly, if elasticity is higher than unit health care will be classified as a "luxury" good.

empirically short-run versus long-run income elasticity of health care, testing for the luxury good hypothesis. In doing so, we transmit a distinction on previous contributions, as the ones by Newhouse (1977) or Sen (2005), while harmonize recent topics in health economics research. Secondly, our findings may help to explain recent outcomes by economists, viz, huge health care spending heterogeneity across countries, increasing income inelasticity over time along with threshold effect. Thirdly, from a policy economic perspective, our study encourages the debate about implications of government's involvement for the provision of health services, and therefore on the sustainability of national health care systems.

The remainder of the study is structured as follows. Section 1.2 shows the related literature on health care expenditure determinants and its dynamics. Section 1.3 provides an overview of the empirical model and a brief description of the data. Section 1.4 presents the results derived from the model. The final section summarizes and concludes.

1.2.Literature review

Our research is closely related to a number of theoretical and empirical papers. On the theoretical side, our study is closest in spirit to Newhouse (1977) seminal paper that high levels and growth rates of health spending may be justified by income growth. Our study is also related to Newhouse (1992), which provides a survey of possible explanations for the rise of health spending as a share of Gross Domestic Product. In addition to rise in per capita income, he considers explanation driven by changes in

demographic issues and in national health policies. Yet, Newhouse argues the bulk of the increase is attributable to technological change. This explanation has received growing attention through the last decade from health economists; for example, Jones (2004), and Hall and Jones (2007).

With respect to the empirical evidence, the open debate over the last few years pointed out the size of income elasticity over health expenditure, and whether it is greater or less than unit (Bac and Le Pen, 2002). In this regard, it should be noted from Table 1.1 that most studies obtained income elasticity of demand for health care around 1.1-1.4 or even more. Besides Newhouse's (1977) seminal paper, for example: Leu (1986); Parkin, McGuire and Yule (1987); Gerdtham *et al.* (1992a, b); Hitiris (1997); Roberts (2000); Mehrara, Musai and Amiri (2010); Liu, Li and Wang (2011), Hui-Kuang, Wang and Chang (2011) and Woodward and Wang (2012). However, Gerdtham *et al.* (1998) estimated coefficients around 0.2-0.9, as was also found by Sen (2005), Chakroun (2010), Baltagi and Moscone (2010) and Farag *et al.* (2012).

Table 1.1. A summary survey of previous studies on national health care expenditure

REFERENCE	CROSS-SECTIONS	TIME-PERIOD	METHODOLOGY	INCOME ELASTICITY
Newhouse (1977)	13 developed countries	1970	Cross section.	1.15-1.31
Leu (1986)	19 OECD countries	1974	Cross section.	1.18-1.36
Parkin, McGuire and Yule (1987)	18 OECD countries	1980	Cross section.	1.12-1.18
Gerdtham *et al.* (1992 a and b)	19 OECD countries	1987	Cross section.	1.33
Hitiris (1997)	10 OECD countries	1960-1991	Panel Data.	1.14-1.17

Gerdtham *et al.* (1998)	22 OECD countries	1970-1991	Panel Data.	0.74
Roberts (2000)	10 European countries	1960-1993	Hitiris replicated model (1997).	1.00
Sen (2005)	15 OECD countries	1990-1998	Panel data.	0.21-0.51
Chakroun (2010)	17 OECD countries	1975-2003	Multivariate regression model.	0.70-0.90
Baltagi and Moscone (2010)	20 OECD countries	1971-2004	Panel data.	0.45-0.90
Mehrara, Musai and Amiri (2010)	16 OECD countries	1993-2007	Panel data.	2.59
Liu, Li and Wang (2011)	22 OECD countries	1960-2002	Semiparametric panel varying coefficient model.	1.60
Hui-Kuang, Wang and Chang (2011)	25 countries: Taiwan and 24 OECD countries	1992-2007	Quantile regressions.	1.20-1.47
Woodward and Wang (2012)	United States	1960-2008	Time series.	1.39
Farag *et al.* (2012)	173 developing and developed countries	1995-2006	Panel data.	0.82-0.90

Furthermore, there is a bulky of papers focused on the evolution of health care systems, based on several approaches, i.e.: intrastate or international comparisons studies, on time series or on the neoclassical growth theory, etc. Hence, Nixon (1999) supports the existence of both convergence and integration of health care expenditure in the European Union (UE) countries. Kerem, Puss and Maldre (2008) indicate that —although the increase of economic integration facilitates economic growth— the mere fact of the EU enlargement does not bring along an automatic homogenization of health care expenditure. Wang (2009) obtains moderate evidence of convergence in total health care expenditure —and diverse performance of the expenditure components—

across the US states. Finally, Leiter and Theurl (2012) find that OECD countries do not move towards a common mean and the rate of convergence is decreasing over time. Additionally, rising trends in health expenditure —and explanations for health care expenditures growth differences across countries (Barros, 1998) — during the last four decades had concerned about the sustainability of national health care systems (Pammolli, Ricccaboni and Magazzini, 2012). This topic had become intriguing to economic researchers, and so a growing literature has recently emerged (Chakroun, 2010; Bilgel and Tran, 2013; Kumar, 2013).

1.3.Empirical model and data

As identified in previous section, the acknowledgeable literature on health economics has suggested income and non-income determinants are both important drivers of health care expenditure. So in a first step, a linear and homogeneous panel data model for health expenditure (as dependent variable to be analysed) based on Newhouse (1977), Gerdtham (1992) and Roberts (1999) is specified. In a more formal way, our model becomes:

$$y_{it} = f\left(\mathbf{x}_{it}, \boldsymbol{\beta}\right) + \boldsymbol{\varepsilon}_{it} \tag{1.1}$$

where y_{it} is the natural logarithm of per capita health spending at the tth observation for the ith country; $f(\bullet)$ denotes health care expenditure structure; x_{it} is the corresponding matrix of explanatory variables; β is a vector of parameters to be estimated. The ε_{it}'s are

random errors assumed to be independent and identically distributed with mean zero and variance σ_{ε}^{2} .

Previously highlighted by other researches, the preliminary estimates of the linear panel Equation (1.1) reveal a number of problems to deal with: i.e. residuals suffer from first-order autocorrelation and reveals group-wise heteroscedasticity. So, firstly, after initial estimates of the linear one-way fixed effect model, we use a Feasible Generalized Least Squares (FGLS) estimator, introducing temporal effects (two-way estimation) in order to prevent any possible problem. This procedure allows estimation in presence of first order autocorrelation within panels and cross-sectional correlation, and heterocedasticity across panels. Then, the general linear model can be expressed as:

$$y_{it} = x'_{it}\beta + \alpha_i + \mathrm{d}_t + \varepsilon_{it} \qquad (1.2)$$

where α_i is a country specific effect and d_t is a time dummy variable. On a second step, we use a dynamic panel data approach. Specifically, the system-GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) is employed. The main advantage of system-GMM lies in the fact that unlike within or between methods, it uses the estimation in levels and exploits not only the variation in data over time but also between countries. Moreover, this methodology sets additional enough criteria that correlations between unobserved fixed effects and explanatory variables are constant over time. System-GMM method combines the standard set of equations in first differences with suitably lagged levels as instruments. Furthermore, the Arellano-Bond methodology tests for the hypothesis of absence of serial correlation and the standard errors of the estimates are robust to heteroscedasticity.

A general dynamic panel data in the first order specification from Equation (1.2) can be written as follows:

$$\boldsymbol{y}_{it} = \boldsymbol{x}_{it}^{'}\boldsymbol{\beta} + \theta\, \boldsymbol{y}_{i,t-1} + \alpha_i + \boldsymbol{\varepsilon}_{it} \tag{1.3}$$

Note we included on the right hand side of Equation (1.3) the lagged dependent variable, in order to capture the inertia of health care expenditure. Also, to determine if there exist an "anchorage effect"; that is, if the spending on a year is conditioned by the previous one or not. We now have in the equation the entire history, so any impact of $\boldsymbol{x}_{it}$ represents the effect of new information (Greene, 2012). This study aims to test whether health expenditure is a necessary or a luxury good. Therefore, after a direct estimation of Equations (1.2) and (1.3), β income coefficient will give short-run elasticity, while the long-run elasticity would be β income coefficient in the long-term model. This parameter is not directly estimable, so to calculate it the estimated coefficients of the short-term model (1.33) are used. Then, long-run elasticity can be recovered by using:

$$\eta \equiv \frac{\beta_{income}}{1-\theta} \tag{1.4}$$

This study also focuses on both possible breaks and convergence in health care expenditure between countries. Are there automatic forces that lead to convergence over time in per capita health expenditure, or whether the relative position of each country tends to stabilize over time? At some risk of oversimplifying, we interpret convergence as the possible existence of a tendency towards the reduction over time of health care expenditure differential between countries. This concept of convergence is the so-called *sigma*-convergence, measured by the standard deviation of the logarithm of the variable (De la Fuente, 2000). It does not necessary imply to withdraw inequality, but it does mean that the distribution will tend to stabilize in the long-run, provided some structural

characteristics remain unchanged. These questions correspond to the concepts of absolute and conditional *beta*-convergence from the neoclassical growth theory (Barro and Sala-i-Martin, 1995). While it is assumed that sample countries converge to the same steady state in the former, each country converges to its own steady state in the latter. In both cases, the growth rate of health spending will be positively related to the distance that separates an economy from its steady state (Nixon, 1999).

Then, subtracting the lagged dependent variable from both sides of the Equation (1.3), the dynamics of the health care expenditure for a general case yields[2]:

$$\Delta \boldsymbol{y}_{it} = \boldsymbol{x}_{it}^{'}\boldsymbol{\beta} + (\theta - 1)\, \boldsymbol{y}_{i,t-1} + \alpha_i + \mathrm{d}_t + \boldsymbol{\varepsilon}_{it} \qquad (1.5)$$

While unconditional convergence focuses the analysis from Equation (1.5) on the lagged value of health expenditure, conditional convergence also considers income and other explanatory variables. Next, we explore the dynamics of these in terms of the impact of per capita health care level on the evolution of the relative expenditure of two countries. On the one hand, if $\theta < 1$ the coefficient of the lagged variable $(\theta - 1) < 0$; then, growth rate of health care falls with the expenditure level and this implies that per capita health care expenditure tends to converge across countries. On the other hand, if $\theta > 1$ it follows that $(\theta - 1) > 0$; thus, the growth rate of health care increases with the level of expenditure, and per capita health care expenditure across countries increases without bounce.

Basic data used in this analysis are taken from the OECD Health Data (2012), the main and largest available source of information to compare health care systems[3].

[2] Again, we use a FGLS estimator introducing temporal effects.

[3] OECD Health Data allows doing benchmarking and international comparisons of different health systems. Additionally both, its frequency (annually renewable) and that it is used in a wide range of academic papers, support the reliability of its utilisation.

Empirical results are based on a balanced panel dataset for fourteen countries over the period 1971-2009: Australia, Austria, Canada, Finland, Iceland, Ireland, Japan, New Zealand, Norway, Portugal, Spain, Sweden, United Kingdom and the United States. The benefits of using a balanced panel data set consist in that it allows doing the analysis of stationarity of the variables. Most of the tests require that the panels be strongly balanced.

In this study, we consider as dependent variable the log of per capita health care expenditure (*expenditure*), expressed in $US purchasing power parities (PPP). The list of explanatory variables is based on data availability for a balanced panel and they were used by knowledgeable scholars (i.e.: Baltagi and Moscone, 2010)[4]. It includes, first, lagged dependent variable ($expenditure_{t-1}$) to account for the anchorage effect. Second, log of PPP per capita GDP (*income*) to analyse the income elasticity of health care expenditure. As shown in Figure 1.1., similar increases in health expenditure could be observed through our country sample. Third, a ratio of demographic dependency (*dependency*) to capture the impact the proportion of children and elderly have on health expenditure[5]. It is expected that young and old people use more health care services than working age population. Hence, Alemayehu and Warner (2004) estimate the magnitude and age distribution of lifetime health care expenditures; in this regard, Jones (2004) reflects the fact that people at a given level of live expectancy suffer from more severe, and costly, medical problems. Fourth, the percentage of public health care

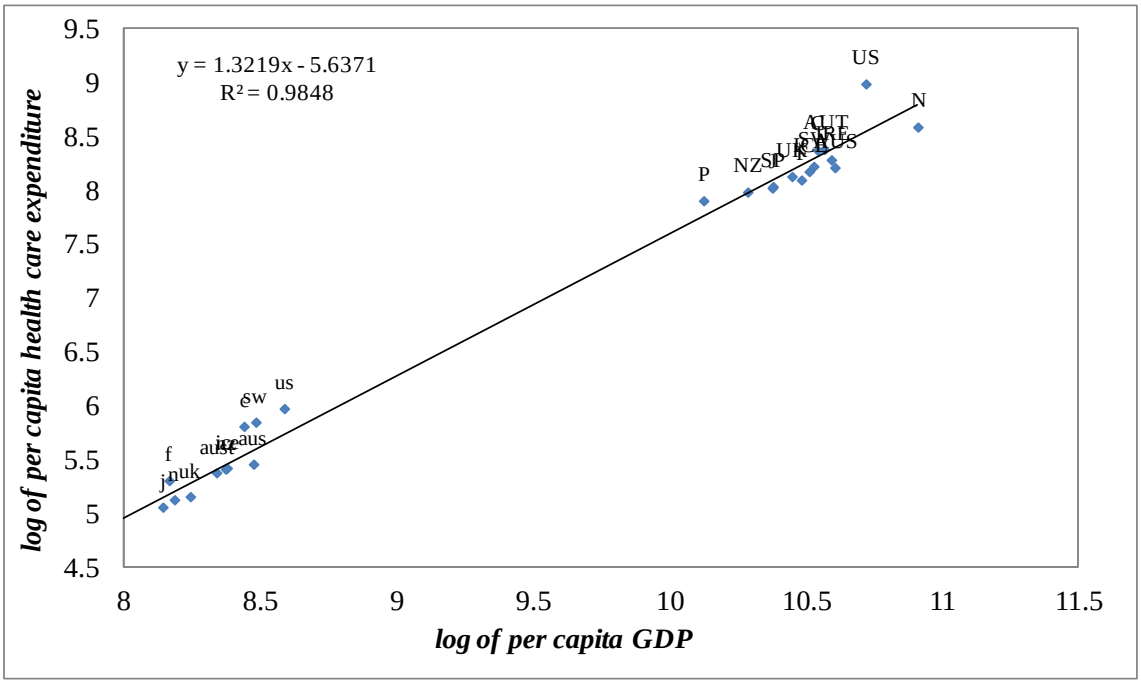
[4] These are some of the reasons for using these explanatory variables despite other (i.e.: lifestyles or supply side variables) in our model.

[5] By definition, the dependency ratio is the relationship between the age population potentially dependent between the potentially active age population. There are three main ways to calculate it: i) "total dependency ratio" (defined as the population aged 0-14 and the population aged over 65 divided by the working age population), which is considered in this study; ii) "dependency ratio of young" (defined as the population aged 0-14 divided by the working age population); and iii) "dependency ratio of older" (defined as the population aged over 65 divided by the working age population).

expenditure over the total (*public share)* that stands for health policies[6]. Could public and private choices on health care affect total health care expenditures? Newhouse (1992) speculates that the spread of insurance has steadily reduced price for consumer and so driven up demand for medical services. Finally, a temporal trend is included, in order to proxy for unobserved factors linked to technology (including new health technologies). Also, in order to check for the sensitivity of the results to specification problems *(technology).* In this respect, Newhouse (1992) points out that technological change means not only new types of physical capital, but also new procedures; that is what he calls "the march of science and the increased capabilities of medicine". Table 1.2 presents the details concerning the definitions and sources of the variables.

[6] Countries can choose different types of funding: public, private, or a combination of both. Considering that the degree of health decentralization of each country is linked to the political constraints and with the type of model (Social Security or National Health System) valid in each case, it should be noted that the greater degree of decentralization takes place in essentially private models. Then, depending on whom got health powers, resources will be got by different ways, and may be taxes will be one of the most important ways to slow the growth of national health expenditures (Baicker and Skinner, 2011).

Figure 1.1. Per capita health expenditure vs. income, 1971 and 2009



Notes: Australia(aus), Austria(aust), Canada(c), Finland(f), Iceland(ice), Ireland(ire), Japan(j), New Zealand(nz), Norway(n), Portugal(p), Spain(sp), Sweden(sw), United Kingdom(uk) and the United States(us). Abbreviations of the countries in lowercase letters refer to data for 1971, while those in capital letters are for the year 2009.

Table 1.2. Variables and data sources

Variable	Definition	Data Source
expenditure	Per capita total health care expenditure. Expressed in $US Purchasing Power Parities (PPP) and natural logarithms.	OECD Health Data (2012).
income	Per capita Gross Domestic Product. Expressed in $US PPP and natural logarithms.	OECD Health Data (2012).
dependency	Dependency ratio defined as the population aged 0-14 and the population aged over 65 divided by the working age population.	Authors' elaboration based in OECD Health Data (2012).
public share	Public health care expenditure as percentage of total health expenditures.	OECD Health Data (2012).
technology	A temporal trend, in order to proxy for unobserved factors linked to technology (including new health technologies).	Authors' elaboration.

1.4.Results

In this section we present the results from the estimation of the panel data models, controlling for various periods of time and different samples of countries, although before we proceed to perform some preliminary tests. Given that our empirical study is based on a time-series cross-country panel data, we first analyse all variables within Equations (1.2) and (1.3) to ensure that there aren't spurious regressions in our estimates. With this aim, various unit root tests for panel data that consider non-stationary series under the null hypothesis are carried out. Firstly, we perform first generation of panel unit root tests (which do not take into account cross-country dependence). Table 1.3 shows the results. In this regard, Levin-Lin-Chu (2002), and Im-Pesharan-Shin (2003) on the annual data indicate all variables were stationary (*public share* is the exception). However, a common feature of these econometric tests is that they suffer from loss of power when individual specific trends are included (Baltagi, 2008). So we carry out the Breitung (2000) test that indicates the hypothesis that all variables are unit root is never rejected.

Table 1.3. First generation of panel unit root tests

Test / Variable	INTERCEPT ONLY				INTERCEPT and TREND			
	expenditure	*income*	*dependency*	*public share*	*expenditure*	*income*	*dependency*	*public share*
LLC (2002)	-9.17 ***	-11.62 ***	-8.52 ***	-0.29	-4.82 ***	-2.41 ***	-6.53 ***	-1.14
IPS (2003)	-8.54 ***	-11.40 ***	-2.40 ***	-1.18	-2.70 ***	1.42	2.01	4.66 ***
Breitung (2000)					6.33	10.31	8.62	-0.19

Notes: Null hypothesis Levin-Lin-Chu (LLC, 2002): Unit root (assumes common unit root process). Null hypothesis Im, Pesaran and Shin (IPS, 2003): Unit root (assumes individual unit root process). Null hypothesis Breitung (2000): Panels contain unit roots. ***, **, and * denote significant at 1%, 5%, and 10% respectively.

Secondly, Pesaran (2007) second generation CIPS test (which assumes cross-section dependence) are reported in Table 1.4. We present results for lag orders p = 0, 1, 2 and 3, finding that in most cases variables are non-stationary. We then apply panel cointegration tests due to Westerlund (2007), for fourteen series and three covariates. Tests reveal the null hypothesis cannot be rejected at conventional levels[7]. To sum up, the general picture that emerges from this strand of hypothesis tests supports the argument for a balanced relationship between variables in the long-run, which guarantee for the stable equilibrium of the model. It is known that when the series are integrated of the same order, they are cointegrated.

Table 1.4. Second generation CIPS test: Pesaran (2007)

Variable	**INTERCEPT ONLY**			
	number of lags			
	0	*1*	*2*	*3*
expenditure	-1.97	-1.91	-1.99	-2.13 *
income	-1.49	-1.90	-1.83	-1.69
dependency	-1.58	-3.13 ***	-2.68 **	-2.52 ***
public share	-2.20 **	2.19 **	-2.38 ***	-2.45 ***
Variable	**INTERCEPT and TREND**			
	number of lags			
	0	*1*	*2*	*3*
expenditure	-2.87 ***	-2.83 **	-2.66 *	-2.42
income	-2.12	-2.66 *	-2.30	-2.07
dependency	-1.20	-3.16 ***	-2.79 **	-2.38
public share	-2.81 **	-2.59	-2.72 **	-2.76 **

Notes: Null hypothesis CIPS: series are I(1). ***, **, and * denote significant at 1%, 5%, and 10% respectively.

[7] Pt=-9.90 and Pa=-26.35 support the null hypothesis that the whole panel is cointegrated, whereas Gt=-3.03 and Ga=-31.34 also support that at least one of the panel units presents cointegration.

1.4.1. Elasticity across countries

We now examine the effect of income and other explanatory variables on health expenditure, using OECD data for fourteen countries over the period 1971-2009. Table 1.5 contains estimation results based on the FGLS estimates from Equation (1.2), which are highly significant with expected signs in most of the explanatory variables. Income elasticity of health expenditure around 0.9 suggests health should be classified as a necessary good[8], although it should be considered with caution in column (iii). These results are robust to the inclusion of other variables. On the one hand, the coefficient on the dependency ratio is statistically significant and exerts a positive influence on health care expenditure. It is expected that young and old people use more health care services than working age population. In fact, both variables have been separately identified by the literature as having a role in determining health care expenditures (Baltagi and Moscone, 2010). On the other hand, the estimated coefficient on public share is also significant with a negative sing. That is, countries with higher share of public expenditures should have lower per capita health spending. It should be noted, however, that Baltagi and Moscone (2010) obtain coefficients that are not statistically significant.

[8] Confidence interval at 95% ranges from 0.83 to 1.06. So, if the classification rule is based upon comparison to 1.0, statistically strictly the statement could be incorrect.

Table 1.5. Estimation of the health care expenditure from the linear model. Dependent variable: *expenditure*

Variable / Specification	(i)	(ii)	(iii)
income	0.87 ***	0.86 ***	0.94 ***
	(0.06)	(0.06)	(0.06)
dependency		0.44 **	0.53 **
		(0.23)	(0.22)
public share			-0.32 ***
			(0.08)
Wald chi2	8039.84	7808.31	8441.26
Prob > chi2	0.00	0.00	0.00
AR(1) coefficient	0.92	0.92	0.91

Notes: Coefficient on *income* yields the short-run elasticity. Standard errors are reported in brackets. Number of observations: 546. ***, ** and * denote significant at 1%, 5%, and 10% respectively.

Table 1.6 reports the estimates from the dynamic panel data Equation (1.3). We present results for both, without and with technical progress, in Panels A and B respectively. Our findings support the null hypothesis that health care is a necessity good in the short-run, as income elasticity around 0.2 is largely smaller than in the linear model. However, the long-run income elasticity from Equation (1.4) grows sharply and differs between panels. Note when the technology progress is omitted (Panel A) coefficient on long-run elasticity exceeds the unity, and so health care seems to be a luxury good. Otherwise, it remains smaller than unit and health care should be classified as a necessary good. Observe also the 1.0 rule has limitations, especially when elasticities of 0.2 and 0.9 are both classified as "necessities"; these numbers are economically and statistically quite different. Both dependency and public share variables are insignificant, and these findings are accord with previous studies on the OECD countries (Baltagi and Moscone, 2010). The estimated coefficient on the technology implies a significant positive effect (Panel B), which correspond to the impact of technical progress on health care expenditure over years. It is also noteworthy that lagged dependent variable is always positive and significant. Coefficient on the

lagged dependent variable is less than one in absolute terms to guarantee the stability of the model. So a year's health expenditure is conditioned at 80% by the one from the previous year, despite the presence of explanatory variables that represent the effect of new information. This confirms the existence of anchorage effect, which means that health expenditure is likely to change in a slowly way over the years. In sum, the estimated short-run and long-run elasticities are correctly signed in our preferred specification (iii). Furthermore, both the size and the significance are remarkable stable in all of the alternative specifications.

Table 1.6. Estimation of the health care expenditure from the dynamic model. Dependent variable: *expenditure*

Variable / Specification	*PANEL A*			*PANEL B*		
	(i)	**(ii)**	**(iii)**	**(i)**	**(ii)**	**(iii)**
$expenditure_{t-1}$	0.83 ***	0.82 ***	0.82 ***	0.80 ***	0.80 ***	0.80 ***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
income	0.18 ***	0.20 ***	0.20 ***	0.17 ***	0.17 ***	0.18 ***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)
dependency		0.13	0.13		0.04	0.02
		(0.10)	(0.10)		(0.11)	(0.11)
public share			0.01			0.06
			(0.10)			(0.10)
technology (x 10)				0.03 **	0.03 **	0.03 **
				(0.00)	(0.00)	(0.00)
Long-run elasticity[a]	1.07 ***	1.11 ***	1.12 ***	0.86 ***	0.88 ***	0.87 ***
	(0.04)	(0.05)	(0.05)	(0.12)	(0.14)	(0.14)
Arellano-Bond test for AR(1) in first differences	-2.58	-2.56	-2.56	-2.56	-2.56	-2.56
p-value	0.01	0.01	0.01	0.01	0.01	0.01
Arellano-Bond test for AR(2) in first differences	-2.19	-2.19	-2.20	-2.20	-2.20	-2.17
p-value	0.03	0.03	0.03	0.03	0.03	0.03

Notes: Coefficient on *income* yields the short-run elasticity. Robust standard errors are reported in brackets. [a]Standard errors calculated from Equation (4) using the delta method. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Number of observations: 532.

Now we briefly discuss the robustness of the results presented above. Concretely, we check the sensitivity of the estimates to income and health spending heterogeneity in the sample of OECD countries used in our empirical analysis, and also to alternative definitions of the time sample. Economic and social heterogeneity across countries, despite the ongoing process of global integration, was far from being negligible in the period under analysis (López-Bazo, Vayá and Artís, 2004). The empirical model previously estimated imposes common effects for all the countries in the sample.

Firstly, we find out about health care differences over time. As shown by Carrion-i-Silvestre (2005), the debate about health care expenditure should be addressed taking into account structural breaks, if not the estimation of the parameters could be biased. Thus, we initially analyze the existence of possible trend breaks for per capita health expenditure, over the period under analysis. Based on recent papers focused on testing for structural breaks in panel data models (i.e.: Liu, Li and Wang, 2011) —and from a graphic outlook in order to homogenize the evolution for the 14 countries—, we split the sample time into four subperiods: 1971-1975, 1976-1991, 1992-2001 and 2002-2009 (Figure A1.1 and Table A1.1 in the Appendix)[9]. Afterwards, to give greater statistical reliability to the estimates, we only consider two long periods: 1971-1990 and 1991-2009. Table 1.7 reports the results for income elasticity of health expenditure when performing specification (iii). This is the most complete, and therefore the sensitivity analysis is focused on it. There, we primary reproduce that specification from Table 1.6. We found, first, the smaller the sample period, the greater the elasticity; and

[9] This type of subdivisions is common in growth processes for Western economies.

second, when taking into account technical progress, elasticity seems to be somewhat higher in the former period (1971-1990) than in the latter one (1991-2009)[10].

Secondly, we deal with heterogeneity across countries. As noted above in the empirical model and data section, in specifying the regression models of Equations (1.2) and (1.3) we assumed that its specifications are applied to all the observations. This is likely not true for some of the countries in our sample, suggesting possible omitted variable bias in the estimation results discussed above. To test for the significance of these bias, we split the sample of countries into two groups based on a cluster analysis for the initial observations of health care expenditure and income (that is, for year 1971). The *upper*-group (higher initial levels of *expenditure* and *income*) consists of: Australia, Austria, Canada, Finland, Iceland, New Zealand, Sweden, United Kingdom and the United States. Meanwhile, the *lower*-group (lower initial levels of *expenditure* and *income*) consists of: Ireland, Japan, Norway, Portugal and Spain. Based on the estimates, Table 1.7 reports the average income elasticity of per capita health care expenditure, which seems to be higher in the *upper*-economies. Here, when technical progress is included, the estimated coefficient on the average long-run elasticity is about unit, compared with an average elasticity for the *lower*-countries of 0.62. So, the long-term elasticity for a *lower*-country is up to 40% less than for an *upper*-one. That is, spending on health care seems to be a need among the *lower*-countries and a luxury in the *upper*-group. Then, this may indicate the existence of a threshold effect, from which income elasticity increases. Average elasticities of this size are plausible on a priori grounds, i.e.: OECD (2011) supports richer countries spend more in health goods than the poorer ones.

[10] It should be noted that estimates take into account all the regressors, which vary across the estimations. Then, it could explain for instance that both sub-sample estimates are higher than in the complete one.

Table 1.7. Sensitivity to alternative specifications. Dependent variable: *expenditure*

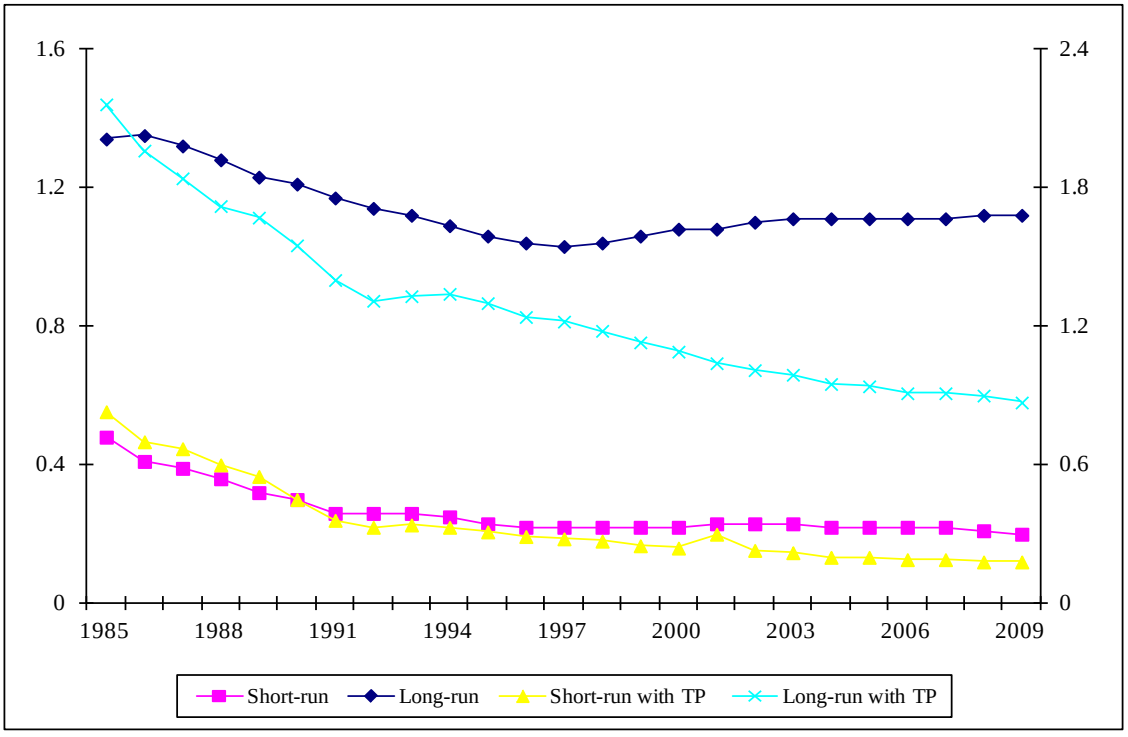
		Short-run elasticity			Long-run elasticity [a]	
		Linear	*PANEL A*	*PANEL B*	*PANEL A*	*PANEL B*
Full set of sample countries	1971-2009	0.94 ***	0.20 ***	0.18 ***	1.12 ***	0.87 ***
		(0.06)	(0.03)	(0.05)	(0.05)	(0.14)
Subperiod of time	1971-1990	1.24 ***	0.30 ***	0.47 ***	1.21 ***	1.55 ***
		(0.07)	(0.07)	(0.07)	(0.08)	(0.14)
	1991-2009	1.03 ***	0.29 ***	0.29 ***	1.41 ***	1.36 ***
		(0.07)	(0.06)	(0.07)	(0.05)	(0.27)
Subsample of countries	Upper	1.09 ***	0.20 ***	0.18 ***	1.12 ***	0.99 ***
		(0.09)	(0.06)	(0.07)	(0.08)	(0.19)
	Lower	0.86 ***	0.16 ***	0.12 ***	1.06 ***	0.62 ***
		(0.09)	(0.03)	(0.03)	(0.07)	(0.07)

Notes: *Upper*-group (higher health expenditure and income initial levels): Australia, Austria, Canada, Finland, Iceland, New Zealand, Sweden, UK and US; *lower*-group (lower health expenditure and income initial levels): Ireland, Japan, Norway, Portugal and Spain. Robust standard errors are reported in brackets. Technology variable is omitted in Panel A, whereas it is included in Panel B. [a]Standard errors calculated from Equation (1.4) using the delta method. ***, **, and * denote significant at 1%, 5%, and 10% respectively.

1.4.2. Dynamics of health care expenditure

One approach to assess stability is to study whether health care elasticity has changed as time goes on. Firstly, starting with a sample of 15 years from 1971 to 1985, Equation (1.3) is estimated recursively by adding one extra observation at a time up to 2009. Figure 1.2 plots the results from the recursive estimates for the full sample observations. When assuming non-technical progress, the long-term elasticity does not show any trend, and its values seem to converge to 1.1. Short-term elasticity initially presents a downward trend though its values are very close to a quarter since 1991, and these results agree with FGLS estimates. However, in the more likely scenario of technical progress, elasticity shows decreasing trends in both the short- and long-term, even below one in the long-run.

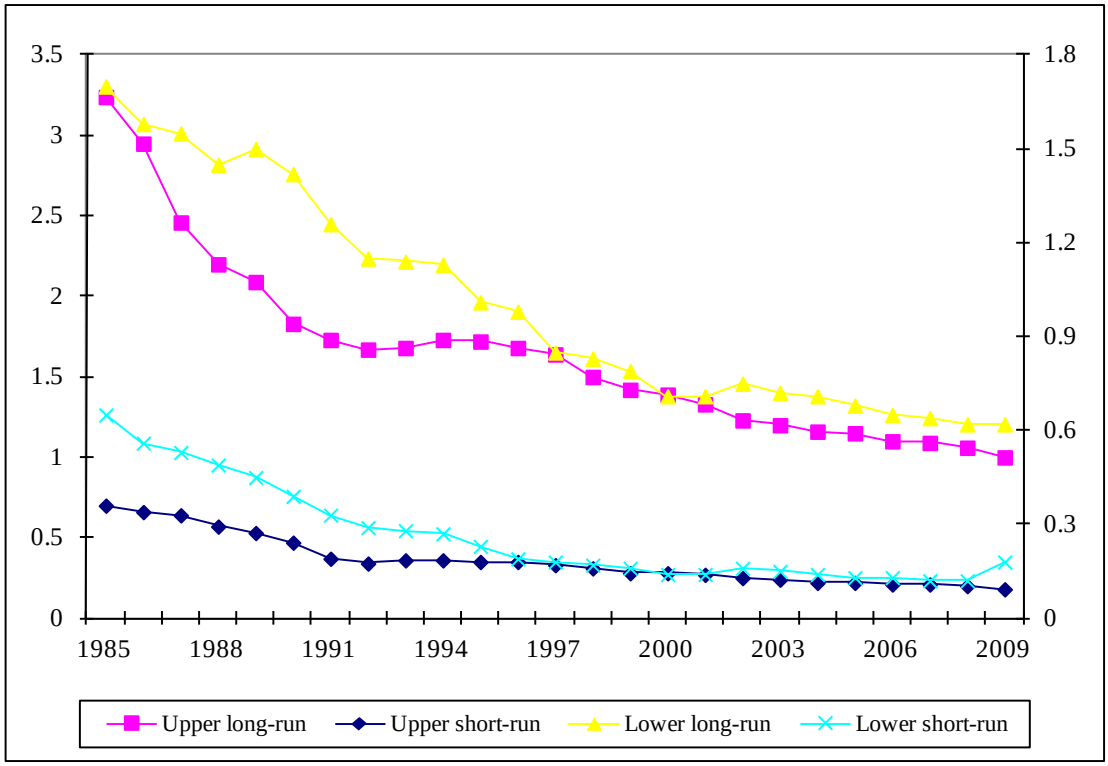
Figure 1.2. Recursive estimates of the income elasticity for the sample countries



Notes: Short- and long-run elasticity without technical progress (TP), left scale; short- and long-run elasticity considering technical progress, right scale.

Secondly, should the downward trend for the elasticity observed in Figure 1.3, when assuming technical progress, be interpreted as evidence towards a greater concern in health care? There are several reasons that could be responsible for the downward trend. First, as the sample size time increases from 15 to 39 observations elasticity converges to the long-run values. Second, the long-run elasticity from Equation (1.4) falls because the coefficient on income (numerator of the statistic) is reduced over time, while the coefficient on the lagged variable (in the denominator) remains broadly stable. Third, drops of the coefficient on income occurred primarily among *lower*-countries whereas it was less dramatic in initially *upper*-countries, if any.

Figure 1.3. Recursive estimates of the income elasticity for two clusters of countries considering technical progress

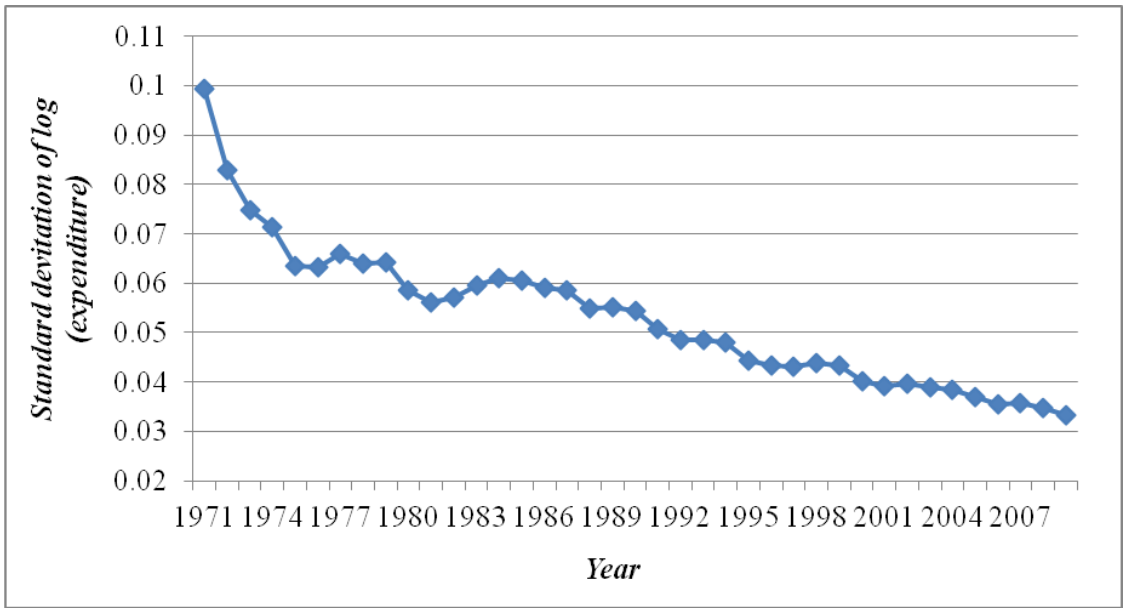


Notes: Upper and *lower* long-run left scale; *upper* and *lower* short-run right scale.

Thirdly, the specifications discussed above focus on income and do not include a variable to represent the scope of less developed countries catch-up to the health care

levels prevailing in the industrial countries. To this end, we carry out two approaches rooted on the traditional concept of economic convergence from the neoclassical growth theory (Barro and Sala-i-Martin, 1995). They were recently considered for health care expenditure in Nixon (1999), Kerem, Puss and Maldre (2008), Wang (2009) or Leiter and Theurl (2012). Figure 1.4 provides evidence to support *sigma*-convergence. The level of inequality fell sharply early years, was stabilized after the second half of the 70s, and continued falling gently into the 90s and 2000. Over the period, as a whole, the statistic falls by approximately two thirds, from 0.10 in 1971 to 0.03 in 2009.

Figure 1.4 *Sigma*-convergence of health spending in OECD countries



On a second step we conducted the analysis for *beta*-convergence from Equation (1.5), in which the dependent variable is the growth rate of per capita health care expenditure. Table 1.8 shows estimates for unconditional convergence regressions in the first column, and conditioning for income and other explanatory variables in successive columns. In the absence of the conditioning variables for the full set of

observations, the rate of convergence was estimated to be the traditional 2% per year. Figure 1.5 plots the inverse relation between the average growth rate from 1971 to 2009 vs. health expenditure in 1971 (initial year). It indicates that health care spending tends to grow faster between initially *lower*-economies, though the process of convergence is very slow. Nonetheless, it is interesting to note that when controlling for possible differences across national steady state the rate of convergence rose to 9%, and countries converged rapidly to the same spending pattern. Another interesting finding is that the coefficient on the share of public health expenditure becomes negative and significant at conventional levels. Indeed, the coefficient on income is significantly positive in all specifications.

Figure 1.5. *Beta*-convergence in OECD countries, 1971-2009

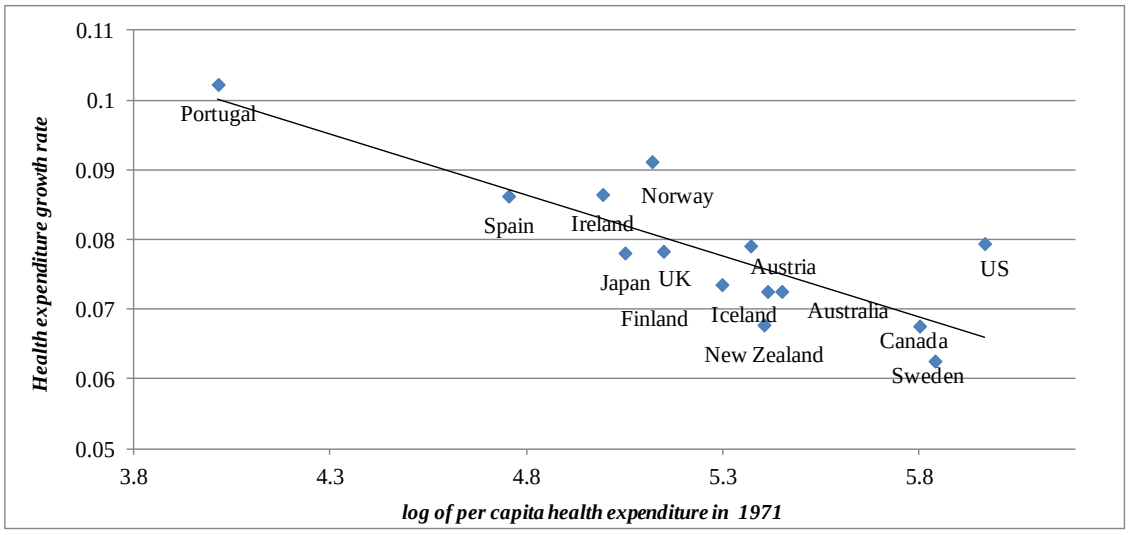


Table 1.8 also deals with convergence across samples of countries. To check for different patterns of convergence, we used the two groups of countries previously defined, that is, the *lower*- and *upper*-groups of countries and estimate the counterpart of Equation (5). Perhaps not surprisingly, it should be stressed how estimates show

marked instability over the period 1971-2009. On the one hand, the rate of convergence ranges from 9%, in the *upper*-group, to 13% for the *lower*-one. On the other, dependency ratio becomes significant positive for the latter, but not for the former. This finding is likely due to ageing population of countries like Japan, Portugal and Spain. Finally, the estimated coefficient on public share for the period 1991-2009 reflects the tendency of the originally *lower*-countries to develop public health systems; therefore, to experience relatively lower growth of health care spending. Note the coefficient on public health care expenditure for *lower*-countries over the period 1991-2009 is near four folds the one for *upper*-countries (i.e. -0.09 vs. -0.34). Therefore, growth rates pick up changes in relative social and institutional issues.

Table 1.8. Estimation of the growth equation with sensitivity to alternative specifications. Dependent variable: Δ *expenditure*

Variable	*Full set of sample countries*											
	1971-2009				1971-1990				1991-2009			
expenditure$_{t-1}$	-0.02 ***	-0.07 ***	-0.07 ***	-0.09 ***	-0.02 ***	-0.08 ***	-0.08 ***	-0.09 ***	-0.01 ***	-0.05 ***	-0.05 ***	-0.10 ***
income		0.10 ***	0.10 ***	0.12 ***		0.10 ***	0.10 ***	0.11 ***		0.09 ***	0.09 ***	0.15 ***
dependency			0.01	0.06			-0.01	0.02			0.03	0.13 **
public share				-0.09 ***				-0.06 ***				-0.13 ***

Variable	*Upper-group sample countries*											
	1971-2009				1971-1990				1991-2009			
expenditure$_{t-1}$	-0.01	-0.08 ***	-0.08 ***	-0.09 ***	-0.00	-0.08 ***	-0.09 ***	-0.09 ***	-0.00	-0.06 ***	-0.06 ***	-0.08 ***
income		0.19 ***	0.20 ***	0.19 ***		0.19 ***	0.20 ***	0.19 ***		0.16 ***	0.16 ***	0.15 ***
dependency			-0.07	-0.04			-0.15 *	-0.12			0.04	0.11
public share				-0.04 **				-0.02				-0.09 ***

Variable	*Lower-group sample countries*											
	1971-2009				1971-1990				1991-2009			
expenditure$_{t-1}$	-0.02 ***	-0.11 ***	-0.14 ***	-0.13 ***	-0.03 *	-0.13 ***	-0.20 ***	-0.21 ***	-0.01	-0.09 ***	-0.11 ***	-0.06 **
income		0.12 ***	0.16 ***	0.17 ***		0.14 ***	0.28 ***	0.34 ***		0.10 ***	0.11 ***	0.13 ***
dependency			0.11 **	0.15 ***			0.23 ***	0.34 ***			0.15 *	0.20 ***
public share				-0.07				-0.10				-0.34 ***

Notes: Upper-group (higher health expenditure and income initial levels): Australia, Austria, Canada, Finland, Iceland, New Zealand, Sweden, UK and US; l*ower*-group (lower health expenditure and income initial levels): Ireland, Japan, Norway, Portugal and Spain. ***, **, and * denote significant at 1%, 5%, and 10% respectively.

1.5. Conclusions

The results found in this study for a sample of 14 OECD countries over the period 1971-2009, are similar to those obtained in recent papers which use panel data techniques. It supports the hypothesis that health care is a necessity in the short-run, though it cannot be strongly rejected to be a luxury good in the long-run. In this respect, the evidence put forward reveals substantial territorial variations in the effect of income and socioeconomic characteristics, when controlling by initial levels of both per capita income and health expenditure. In particular, we find that long-term income elasticity across the *lower*-countries is, on average, up to 40% less than the obtained between the *upper*-ones. These findings ultimately imply that spending on health care should always be a need for *lower*-countries, even in the long-term, and thus the need of covering costs of living becomes more complex the higher the income (threshold effect).

Also, our results indicate that about 80% of a year's health expenditure is conditioned by the previous one despite the presence of other explanatory variables. The anchorage effect might be behind the features observed, and already reported in the recent literature, about the sustainability of national health care systems. This would be due, everything else being equal, the fact that national health expenditures are likely to change in a very slowly way over the years.

Both, initial health expenditure-income clusters and temporal breakdown, suggest that income elasticity should lead national standards of health care spending converge in the long-run. However, other socioeconomic characteristics as the forms —public or private— of supply health services reflect the tendency of the originally *lower*-countries to develop public health systems. Therefore, to experience significant

lower growth of health care spending than the *upper*-ones. Demographic dependency, generally, opposite influences.

From a policy economic perspective, rising trends in health expenditure had concerned about the sustainability of national health care systems. However, our results confirm that nowadays same health policies can have different effects, depending on the framework in which it is implemented. For example, public health expenditure cuts could increase private health expenditure (related with income) with an indeterminate effect on total health expenditure. The evidence for a diverse sample of countries suggests that, when controlling for the baseline, public participation might be significant for limiting the growth of health spending. Similarly, there is also evidence that greater health expenditures do not unavoidably reverse in health outputs improvements. On the one hand, spending on health care seems to be increasingly decoupled from income changes between some countries. On the other, if cuts are in necessary investments there will be significant health spending increases over the long-run (OECD, 2010 and 2012).

Finally, it is worth stressing that technological innovation —while enabling extraordinary achievements in improving health— exerts additional pressure on health spending by introducing drugs and high-cost techniques in the OECD countries. Technological change has significantly shifted out the frontier medical condition that can be treated (Jones, 2004; García and Manrique, 2012). Consequently, a cost-effectiveness analysis for health care expenditures should be done.

Chapter 2

Does early-life health enhance growth? Evidence from Spain

2.1. Introduction

Since Grossman (1972b), there has been a huge literature on health as a form of capital stock in complex ways. So, at present the role of health capital in economic growth is one of the best-known relations in international development (Bloom and Canning, 2000). This correlation has been traditionally seen as a causal link in only one direction: wealth allows better access to food, investments in health care or education (Pritchett and Summers, 1996). In this regard, Preston (1976) emphasized that economic growth is the most important determinant of life expectancy. However, in recent years a sizeable body of research has addressed the reverse causation, i.e. healthy populations increase labour productivity and per capita income. The World Health Organization Commission on Macroeconomics and Health (2001) indicated that there are several ways that disease impedes economic well-being and development. In this context, economic literature has

developed models where health is incorporated in traditional growth ones (Howit, 2005; Van Zon and Muysken, 2005; Weil, 2007; or Aghion, Howit and Murtin, 2011).

The aim of this study is to analyse the empirical relationship between early-life health and economic growth across Spanish regions over the period of 1980 to 2007. According to OECD Health Statistics (2014), the index of per capita income for Spain rose from 74.1 in 1980 to 83.7 in 2007 (based on PPS EU-15=100). Meanwhile, the index for infant mortality rate fell from 100.2 to 97.5. It is worth noting that the negative correlation between those variables could be modified in recent years because of the Great Recession started in 2008 (Svensson and Krüger, 2012). Thus, the rates of income and mortality in 2012 were 77.7 and 96.3, respectively. These data widely justify addressing the relationship between early-life health and economic growth. Moreover, there is little research on the health-related growth in countries of southern Europe, let alone on regions which exhibit less extraneous variation than those.

This study contributes to the recent literature concerning health capital as a determinant of economic growth. There are at least two causal links running from health to economic growth: one direct, the other indirect. The former is related to the idea that healthier populations tend to have higher labour productivity and per capita income. The latter states that healthier people who live longer have stronger incentives to invest in developing skills, generate more investment in physical capital, and trigger subsequent declines in fertility. All these mechanisms can lead to increase per capita income (Bloom and Canning, 2000).

Several features distinguish this study from its predecessors. Initially, as far as we are concerned it is among the first to disentangle the health-related growth for the Spanish regions, when using infant mortality as a proxy for health status. Qualitatively,

choosing infant mortality rather than life expectancy for health does not seem to make a big difference. As said by Annoni and Dijkstra (2013), health is one of the basic pillars of competitiveness that is captured through six indicators. Infant mortality correlates to 5% with road fatalities, healthy life expectancy, cancer disease death rate and heart disease, and to 10% with suicide. In doing so, we transmit a distinction on previous contributions. Then, it supposes a different point of view from Rivera and Currais (2004) that analysed how the composition of public health spending affects productivity. Also, it departs from Oliva-Moreno (2012) that studied labour productivity losses associated with illnesses.

Besides, this study uses an innovative method for testing of on hypotheses derived from economic theory viz., whether health improves growth. This approach was introduced by Lorentzen, McMillan and Wacziarg (2008, hence LMW) to focus on channels through growth is affected by health, i.e. investment, education and fertility. It encompasses both direct and indirect effects of health on growth. Hence, we first estimate direct effects of infant mortality on per capita income growth through both linear and dynamic panel models. We then use a structural system to also capture likely indirect effects. There is a growing consensus in the literature on indirect large effects that improving health has on accelerating economic growth.

Lastly, from an economic policy perspective this study encourages debates about the implications of government's involvement for the provision of health —namely the cost and benefits of health care programs, and the sustainability of national health care systems. According to OECD (2014), Spain's child poverty has risen to 21% against an EU average of 13% in the years of financial crisis and downturn. Besides, health care powers have been decentralized to the regions, since the early eighties until 2002,

following an asymmetric process. Definitely, it enlarges the consciousness on the determinants of economic growth, which is crucial to policymakers when designing public policies.

The remainder of this study is organized as follows. Section 2.2 shows the related literature on health-related growth. Section 2.3 describes the model to be estimated, data variables and empirical strategy. Section 2.4 presents the results. Finally, Section 2.5 concludes and points out the main policy implications.

2.2. Literature review

With respect to the empirical evidence on health-related growth, the focus of researchers has shifted from the exploration of direct effects to the indirect ones. To begin with the direct growth-effects of health, Bloom, Canning and Sevilla (2005) observed that a 1% increase in adult survival rates increases labour productivity by about 2.8%. In this regard, Aghion, Howit and Murtin (2011) found that only the reduction in mortality rates below forty generates productivity gains in OECD countries. Meanwhile, Acemoglu and Johnson (2007) studied the effect of life expectancy on economic performance, using a model based on a predicted mortality instrument. Unlike previous papers, they found that there is no evidence that the large increase in life expectancy raised per capita income. In spite of, Bloom, Canning and Fink (2013) revisited Acemoglu and Johnson (2007) and showed that their main result is mostly driven by a priori exclusion of initial life expectancy. Additionally, Cervellati and Sunde (2011) suggested that life expectancy may have direct effects on economic

growth. These appear to be non-monotonic and depend on the level of demographic development. Finally, French (2012) positively tested for some OECD countries that better health improves income while the latter in turn also affects health.

On the other hand, Mayer (2001) studied the long-term impact of health on economic growth in Latin America. He found that a permanent increment of 0.8-1.5% of annual income is associated with adult and, unexpectedly, old aged health improvements. Moreover, he points out that the channels of causation from health to income are diverse, and some of them may be indirect. In the same line, LMW explored three channels whereby adult mortality may affect growth. They found that a greater risk of death during the prime productive years is associated with higher levels of risky behaviour, higher fertility, and lower investment in physical capital. Instead, Cooray (2013) supported that health capital does not have a robust and significant effect on economic growth, unless through their interactions with health expenditure and education. At this regard, Kumar and Chen (2013) argued that health and education contributed on the growth rate of total factor productivity. They pointed out the importance of including health capital on the policies design, which contributes to technology diffusion.

2.3.Model and data

In this section we briefly review the conceptual framework, data, and strategy employed in this study. Different empirical contributions of the literature, focussing on the

causality between the level of health and economic growth, provide a motivation for the model discussed below.

2.3.1. Theoretical framework

There is a large body of research devoted to health economics, which supports the premise that health status is a determinant for economic growth i.e. Howit (2005) or Van Zon and Muysken (2005). The testable hypothesis is that mortality affects economic growth by diminishing incentives for behaviour with short-run costs and long-run payoffs. The main assumptions of the problem to be studied can be illustrated within the framework of Acemoglu and Johnson (2007). We consider a closed-economy in continuous time *t*, where a unique consumption good (Y) is produced with a constant returns to scale aggregate production function. Generalising, the model structure takes the following form

$$Y_{it} = (A_{it}H_{it})^{\alpha} K_{it}^{1-\alpha} , \qquad (2.1)$$

where $0<\alpha< 1$; *i* and *t* index region and time respectively; *A* is the level of technology; *K* denotes physical capital; and *H* is the aggregate human capital given by $H = h\,N$, where *h* is human capital per person and *N* is the total population. Substituting into Equation (2.1) and taking logs, the level of log per capita income can be written as

$$\log y_{it} = \alpha \log A_{it} + \alpha \log h_{it} - (1-\alpha) \log N_{it} + (1-\alpha) \log K_{it} , \qquad (2.2)$$

where $y = Y/N$.

Equation (2.2) shows that per capita income is driven positively by technology, human capital and capital stock, and negatively by population. We now briefly discuss each element on the right hand side, assuming a steady state as an approximation. First,

we follow the method introduced by Bils and Klenow (2000) that build on the earlier work of Mincer (1974) and the large literature on schooling and wages. The individual human-capital h is proportional to $\exp(l_h)$, where l_h is the average number of years of educational attainment. Second, we can write the population level N by equating the flow of deaths with the flow of total births. While the former depends on the mortality rate, the latter is related to fertility. Lower mortality increases population size since more people survive at each point in time. Also, greater longevity may lead to changes in the decisions of parents to their children (planned fertility) (Kalemli-Ozcan, 2008). Third, to arrive to a measure of K we assume the stock of capital at any moment would be determined by the Solow model. It can be shown that the effect of changes of capital stock would then appear in terms of investment rate. Fourth, let $A_{it} = A_i$, which is consistent with some baseline differences in technical progress across regions.

Therefore, subtracting the lagged dependent variable from both sides of Equation (2.2) yields the reduced-form growth model

$$\Delta \log y_{it} = \eta_i + \log y_{it-1} + log\ imr_{it} + log\ X_{it} + Z_{it} + \varepsilon_{it}, \qquad (2.3)$$

where η denotes unobserved time-invariant region-specific effects, X stands for channel variables (investment, school and fertility), and Z is a collection of control variables. In Equation (2.3) the dependent variable is the growth rate of per capita income and the variable of interest is health status, which we proxy for infant mortality rate, *imr*. The lagged log of per capita income captures the hypothesis of convergence.

Next, we turn to specify the channel equations as:

$$log\ X_{it} = \eta_i + \log y_{it-1} + log\ imr_{it} + Z_{it} + \xi_{it}\ . \qquad (2.4)$$

Last, according to LMW we specify a system of structural equations from Equations (2.3)−(2.4), making explicit the causal relations between economic growth, the channels linking it to infant mortality, and the mortality variable as:

$$\Delta \log y_{it} = \eta_i + \log X_{it} + \mu_{it} \tag{2.5}$$

and

$$\log X_{it} = \eta_i + \log imr_{it} + \upsilon_{it} . \tag{2.6}$$

Then, this structural-form model contains two main equations, i.e.: an income growth specification derived from an augmented Solow model (Equation (2.5)), and a channel specification based on the health economics literature (Equation (2.6)).

2.3.2. Data and variables

This study tested health-related growth with panel data for the Spanish regions. The level of disaggregation corresponds to NUTS2 in the Eurostat nomenclature of territorial units. We exploit databases that are widely used to investigate regional and health economics issues in Spain. In particular, we focus on the regional database BD.MORES which collects data from 1980 to 2007. All monetary data are quoted at 2000 constant prices. Output is measured as gross value added. We exclude the real estate sector, which includes imputed rents of owner-occupied properties, because of its volatility (Tortosa and Peiró, 2012). The housing bubble, which burst around 2008, started in the early nineties in Spain. So, much of the sample period was affected by this event. The list of main variables used in our econometric analysis includes investment share, education attainments, and fertility and infant mortality rates. Regarding control variables we use health power. In Spain since 1978 a centralized state has turned into a

decentralized one, associated with the devolution of power to the regions. The coexistence of several models concerning the degree of health power makes Spain a singular case. Table 2.1 provides details concerning the definitions and sources of the variables, and Table 2.2 summarizes the descriptive statistics.

Table 2.1. Variables and data sources

Variable	Definition	Units	Data Source
y	Per capita income (per capita gross value added, GVA).	Thousands of euros (2000 constant prices)	Regional database of the Spanish economy (BD.MORES)
imr	Infant mortality rate.	Ratio. Deaths per thousand inhabitants 0-4 years	Spanish National Institute of Statistics (INE)
health power	Health care power, 1 when the region gets it, 0 otherwise.	Dummy	Authors' elaboration
investment	GFCF/GVA.	Ratio	BD.MORES
school	Human capital.	Average schooling years based on 1970 General Education Law	Valencian Economic Research Institute (IVIE)
fertility	Fertility rate.	Ratio. Births per thousand women	INE

Table 2.2. Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.	Observations
y (per capita income)	11.21	3.28	4.39	20.20	476
imr	1.59	0.63	0.54	3.60	476
health power	0.43	0.50	0.00	1.00	476
investment	0.20	0.04	0.08	0.44	476
school	7.55	1.12	5.12	10.51	476
fertility	42.64	10.43	23.38	82.77	476

Over the sample period, the Spanish National Health Service is characterized by two main features. First, universal access to health care for all Spanish citizens, and second, a fast asymmetric decentralization of health care to regions. Related to health care powers, the process began in 1981 and ended in 2002, according to three models distinguished among the 17 regions:

(i) Two "foral" regions (Basque Country (1987) and Navarre (1991)) that were both fiscally and politically accountable for the running of almost all public service provision within their boundaries. While they were granted autonomy in financing health care, they also enjoyed a high level of tax autonomy.

(ii) Five regions (Catalonia (1981), Andalusia (1984), Valencian Community (1987), Galicia (1991), and Canary Islands (1994)) kept health powers, but with fiscal responsibility limited. They were held politically more than fiscally accountable. Most resources devoted to health care in those regions came from specific grants, with self-financing strongly constrained and playing a minor role.

(iii) The remaining regions (Aragon, Asturias, Balearic Islands, Cantabria, Castile-La Mancha, Castile and Leon, Madrid, Extremadura, La Rioja, Murcia) had no

health powers until 2002. So, the central government carried out all responsibility for health care there until this date.

The process of health care decentralization has then extended to all regions. The new effective system departs from the previous model of specific health care financing, by integrating it into the general one. Nowadays, health care financing is covered through regional taxes, shared taxes and block-grants from the central government, and pharmaceutical co-payments.

2.3.3. Empirical strategy

We first evaluate the direct impact of infant mortality on economic growth. In order to estimate Equation (2.3) we start by applying linear panel data models. Though, it is well known in studying growth regressions that problems of endogeneity and reverse causality arise. We then use the generalized method of moment estimator (GMM). Besides, as Bond, Hoeffler and Temple (2001) suggest that more plausible results can be achieved using the system-GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), it is also applied.

Next, we estimate Equation (2.4) by applying instrumental variable (IV) estimators (Schaffer, 2010). We then examine infant mortality related to investment share, education attainments, and fertility rate with two goals. On one hand, these relationships are interesting in their own right as evidence for the horizon effect of mortality. On the other hand, it is a first step toward the latter decomposition of the total effect of infant mortality on income growth through the channels. Last, we focus on the different channels through growth is affected by health, for which we specified the

structural model Equations (2.5)−(2.6). Econometric methodology relies on Three-Stage Least Squares estimation (3SLS), where dependent variables are explicitly taken to be endogenous to the system and are treated as correlated with the disturbances in the system's equations[11]. Summing up, the effect of each channel on income growth multiplied by the effect of infant mortality on this channel would provide the indirect effect of health on growth.

The remaining issue to discuss is how we obtain valid instruments for mortality and the channels. In some referred studies for countries, climatic factors and geographic characteristics are used. However, for regions within a country such differences might not be sensitive. So, we instrument for lagged variables of both infant mortality and the channels whenever they appear on the right-hand-side of equations[12]. These are obviously not exogenous, but with regard to the current values of the endogenous variables, they may be regarded as having already been determined. The deciding factor is whether or not they have uncorrelated with the current disturbances, which we may assume (Greene, 2012). We also examine the issue of the validity of instruments through tests of overidentifying restrictions.

2.4.Results

In this section we apply the estimation procedure described above to the model. Our agenda is twofold. We first estimate models that account for the mortality status of

[11] As infant mortality is treated here as an endogenous regressor, we relate it to its lagged values used as instruments.
[12] For the sake, LMW obtained broadly consistent results when instruments for geography characteristics or lagged variables were used.

Spanish regions over the period 1980-2007. Then, in line of the typical pattern of channel equations, we also check the relative importance of these channels through which growth is affected. As regard to identification, two points need to be made. On the one hand, it is important to emphasize that our study does not quantify the reducing-income effect of poor health as distinct from the horizon effect of infant mortality. On the other hand, it should be noted that extended life may result in an increase in working years. Health improvements enhancing the quality of life may boost the per capita income each year of life (Mirvis and Bloom, 2008).

2.4.1. Reduced-form regressions

Our econometric estimates for the baseline model (3) are reported in Table 2.3. The results for the linear panel levels, GMM and system-GMM estimators are qualitatively similar. On the whole, we notice that results support the hypothesis of the impact of the channels on per capita income growth. The coefficients on the investment share and education attainments have the expected positive sign and are strongly significant. So is the coefficient on lagged income, the negative sign is consistent with the hypothesis of convergence between regions. If we believe the Sys-GMM estimates in column 5, for example, the convergence effect would imply a catch-up of about 4% between Madrid (top) and Extremadura (bottom)[13]. In addition, it is noteworthy the corresponding coefficients suggest a negative effect of infant mortality. According to our findings, a 1% increase in the infant mortality rate would reduce per capita income growth by

[13] With respectively 14,870 and 7,240 euros of per capita income (sample average) in Madrid and Extremadura, respectively, the convergence effect vehicles a catch-up of 0.05xlog (14,870 /7,240)) = 3.9 percentage points.

around 2%. In accordance to our GMM results, it should reduce up to 1.3% growth rate of per capita income in the sample period[14]. Further, we tested for potential specification problems. On the one hand, the Hausman tests for unobservable heterogeneity lead to reject in column 2 the null hypothesis that differences in linear panel estimates are not systematic. Thus, we used the fixed effects instead of random effects estimator. On the other hand, the Sargan tests of over-identifying restrictions do not detect any problems with the validity of the instruments.

Table 2.3. Estimates of the growth regression. Dependent variable: per capita income growth

	Linear Panel		**GMM**		**Sys-GMM**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
log y_{-1}	-0.021 **	-0.191 ***	-0.067 ***	-0.154 ***	-0.053 ***	-0.113 ***
	(2.03)	(7.23)	(4.45)	(6.52)	(4.27)	(6.31)
log imr	-0.009		-0.023 **		-0.015 *	
	(1.07)		(2.44)		(1.86)	
health power	0.002	-0.017 **	0.005	-0.009	0.004	-0.012 **
	(0.34)	(2.01)	(0.76)	(1.22)	(0.66)	(2.02)
log investment		0.037 **		0.025 *		0.019
		(2.28)		(1.65)		(1.61)
log school		0.042 ***		0.030 ***		0.024 ***
		(5.63)		(4.59)		(4.76)
log fertility		-0.030		-0.016		-0.007
		(1.60)		(0.89)		(0.55)
constant	0.076 ***	0.333 ***	0.190 ***	0.264 ***	0.155 ***	0.170 ***
	(2.92)	(3.57)	(5.22)	(3.17)	(2.22)	(2.75)
Hausman test: *p*-value	0.38	0.00				
Sargan test: *p*-value			0.22	0.65	0.42	0.62
Observations	459	459	408	408	408	408

Notes: z and t-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Instruments: lagged values of the endogenous variables.

[14] Being infant mortality 2 per thousand (time average for La Rioja) instead of 1.14 per thousand (the one for Balearic Islands) implies a growth gap of -0.023 x log ((2/1.14)) = 1.3 percentage points.

The next step has been to estimate Equation (2.4) that allows for the impact of health on the channels of growth. The results are displayed in Table 2.4. To address endogeneity issues, mortality, investment, school, and fertility are instrumented by their lagged variable. In all regressions we failed to reject the null hypothesis of validity of the instruments. Overall, the estimated relations between health and the three channels are consistent with the hypothesis stated above. Our estimates indicate a long-run relationship between those variables. The elasticity of investment and education to infant mortality is significant negative, while it is positive for fertility, as suggested by theory. Using estimates in the regression of column (2), a one standard deviation increase in infant mortality (equal to 0.39) is associated with 3.5 percentage points difference in investment. It is also worth mentioning that health power exerts a positive impact on the channels.

Table 2.4. IV estimates of the channel equations

	investment		***school***		***fertility***	
	(1)	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
log imr	-0.207 ***	-0.090 **	-2.321 ***	-1.439 ***	0.317 ***	0.224 ***
	(6.16)	(1.99)	(23.91)	(16.62)	(11.09)	(5.89)
health power	0.110 ***	0.082 ***	0.484 ***	0.271 ***	0.027	0.049 **
	(4.41)	(3.38)	(6.73)	(5.83)	(1.28)	(2.40)
log y_{-1}		0.251 ***		1.889 ***		-0.198 ***
		(4.21)		(16.58)		(3.95)
Sargan test: *p*-value	0.11	0.25	0.09	0.59	0.38	0.68

Notes: Observations: 442. *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Instruments: lagged values of the endogenous variables.

2.4.2. Structural model regressions

As discussed in the previous section, we assume that infant mortality may impact investment in physical and human capital, as well as fertility, which in turn affect growth. We proceed with the econometric exercise by estimating the system of structural equations. Now let us briefly describe the corresponding estimation results. On the one hand, the estimated elasticities of income growth to the channels to some extent differ from those of reduced-form regressions (column 1 of Table 2.5 versus Table 2.3). On the other hand, the elasticities of the channels with respect to infant mortality are quite consistent with the ones previously found (column 2 of Table 2.5 versus Table 2.4). This again connects with a significant impact (negative for investment and school, and positive for fertility) from infant mortality. At this stage of the analysis, the overall impact on income growth from health can be straightforwardly computed. On the basis of the parameters reported in columns 1−2, our overall impact of health on growth through the three channels jumps to -0.10. We can now attempt to capture the order of magnitude of the indirect impact by comparing overall to direct elasticity. Taking into account that the point estimate of our baseline model equals to -0.02 the former is fivefold as large compared to the latter.

Table 2.5. System estimates of the infant mortality effects. 3SLS estimation

	Effect of channel on growth	**Effect of infant mortality on channel**
	(1)	***(2)***
investment effect	0.199 ***	-0.182 ***
	(3.16)	(4.87)
school effect	0.032 ***	-1.144 ***
	(4.02)	(-16.66)
fertility effect	-0.189 ***	0.191 ***
	(3.29)	(5.42)
TOTAL EFFECT		-0.108

Notes: z-statistics in parentheses; ***, **, and * denote significant at 1%, 5%, and 10% respectively.

Overall, our results support the hypothesis that early-life health can be seen as a robust determinant of the growth rate of per capita income. Our findings support both the effect of health on channels and the effect of these on growth matter for income growth. While the impact seems to occur directly, somewhat unsurprisingly it is likely to work more strongly through investment in physical and human capital, as well as fertility. It is also of interest to note that the accuracy of our estimates is very strong. All statistics are high, for instance *p*-values below 0.01, thereby indicating the robustness of our regressions.

2.5. Conclusions

Recent literature provides mixed answers regarding the effect of health on economic growth. In this study we investigate these effects for the Spanish regions over the period

1980-2007. Our findings support those in the literature who found that worse health status, in the sense of higher early-life death, is growth-reducing. Along with Aghion, Howit and Murtin (2011) and Mayer (2001) we show the positive effect of health on accelerating economic growth. Besides, in line with Lorentzen, McMillan and Wacziarg (2008) we found there is supportive evidence of even larger indirect impacts driven through the growth channels.

Our results have a number of consequences from a policy economic perspective. On the one hand, early-life health would be related to the economy. As said by Muižnieks (2013), budgetary adjustments in the years of financial downturn have had a disproportionate impact on children's access to health care in Spain. As a result, one of the main objectives for policymakers should be clearly directed to improve population health, especially at an early age. This assumption is on primary importance in current debates on the cost and benefits of health care programs. On the other hand, being health one of the most sensitive indicators to reflect development, it is important to aware its significance in order to avoid social inequalities. In accordance to OECD (2014), Spain's poorest has been affected the most among OECD countries during the crisis years of 2008-2013. Indeed, children are highly sensitive to the quality of health and other social services provided to them.

Because health-related growth is an area in which greater effort must be made to generate empirical information for policymakers, this article could be extended. It would be valuable to test the results by using other health proxies than infant mortality, and also to focus on specific causes of death. These and other extensions of the analysis of this study are left for further research, when there will be available new data on health indicators.

Chapter 3

Health care utilization and unmet needs among the working-age population in Spain

3.1. Introduction

There is growing consensus in the literature that inequality is a robust and powerful determinant both of the pace of medium-term growth and of the duration of growth spells (Ostry, Berg and Tsangarides, 2014). Inequality undermines progress in health and education, causes investment-reducing instability, and undercuts social cohesion. In relation to health, inequality may be harmful for growth because it deprives the poor of the ability to stay healthy and accumulate human capital (Perotti, 1996; Galor and Moav, 2004). In addition, it would be ethically undesirable. Since Arrow (1963) and Grossman (1972a, b), several papers have studied the relationship between

socioeconomic factors −such as income, gender, education or labour status− and health care utilization (Clavero-Barranquero and González-Álvarez, 2005; Devaux, 2015). Generally, they show the lower the socioeconomic level, the higher the expected health care demand.

Recent literature has documented that inequality has increased over the last decades in developed economies (Piketty, 2014). For instance, according to the International Labour Organization (2014), Spain and the United States are the two OECD countries where inequality between the first and tenth population decile increased most over the period 2007-2013. As to the former, changes in the distribution of wages and job losses accounted for 90% of the increase in inequality. As to the latter, changes up to 140%. Also, it is important to highlight that Spain exhibits very high unemployment rates through the Great Recession. Consistent with OECD Statistics (2014) it rose from 8.5% to 24.9% between 2006 and 2012, while for the OECD countries it was 6.2% and 8.1% respectively. For health care utilization, OECD Health Statistics (2014) show that doctor's consultations per capita decreased in Spain from 8.1 in 2006 to 7.4 in 2011-2012, whereas for the OECD countries increased from 6.6 to 7.0.

Our objective is to study whether socioeconomic characteristics can help to explain demand for health care in Spain, and to what extent. We consider unmet health care needs and health care utilization since they thoroughly cover the demand side of health care. In order to do so, we test for the influence of a set of indicators on health attendance both before (2006) and through the economic crisis (2011-2012). In this context, special attention is paid to labour status. Economic shocks entail disturbances on labour market which may lead to behavioural changes in individuals. There are two issues underlying this study. First, what are the determinants for the demand for health

care services? While this study does not examine the effects of health supply, this may still affect the importance of unmet needs and health care services an individual faces. Second, does it change as a result of economic downturns? There are furthermore possible reasons why the determinants for the demand for health care examined here would differ across the business cycle. Indeed, studies on health care utilization are conditioned by the available data. In recent years, due to the Spanish National Health Survey (SNHS) new data, empirical applications have been developed for the demand for health services (i.e.: Urbanos-Garrido, 2011). Although that applies to a lesser extent regarding unmet health care needs.

This study contains various innovative approaches. Firstly, to the best of our knowledge, it is among one of the first to analyse unmet health care needs in Spain with SNHS. Secondly, we distinguish between different stages of the economic cycle, prior the onset of the Great Recession and through it. Our identification strategy consists of exploiting time differences in the demand for health. Finally, we add to the debate by addressing the role of the health care regional system. We find that labour status is hardly significant for unmet needs through the crisis, while it does not exert any significant effect on the utilization of health care services. The effects are mostly concentrated on social characteristics as age, gender, educational level or self-assessed health. Furthermore, our results support significant changes on health attendance from the period prior the financial downturn. From a policy economic perspective, this study points out the awareness of some specific behavioural changes that could emerge during economic downturns.

The structure of the study is the following one. In Section 3.2 it is showed a review of previous literature. Section 3.3 contains the methodological aspects and the

dataset. The estimation results are presented in Section 3.4 and discussed in Section 3.5. Finally, Section 3.6 summarizes and concludes.

3.2. Previous literature

Our research is closely related to recent theoretical and empirical works focused on unmet health care needs and demand for health care. As far as we know, these ones are mostly single-country studies, some of them based on general population samples and others on specific subgroups. Relative to the first topic, Baggett *et al*. (2010) reported for American homeless adults substantial unmet needs for multiple types of health care. Similarly, Cavalieri (2013) found for Italy that poor health and low income households were associated with higher probability of forgoing or delaying care. Also, Chaupain-Guillot and Guillot (2015) pointed out for European Union countries —plus Norway and Iceland— that the probability of experiencing unmet health care needs considerably varies across countries.

Back to health care utilization, Kraut *et al.* (2000) examined whether prior use of health services predicts subsequent risk of unemployment, and the acute effects of exposure to unemployment on health care utilization. The authors found for randomly selected residents in Canada that hospitalization would increase after a period of unemployment. Similar results were obtained by Linn, Sandifer and Stein (1985) for a sample of American veterans, showing an increase in the utilization of health services by unemployed people. However, as said by Åhs and Westerling (2006), results regarding positive association between unemployment and health care consumption are

far from conclusive. As for non-labour characteristics, Van der Heyden *et al*. (2003) found that underachiever individuals in Belgium make more often use of the general practitioner, and are more frequently admitted to hospital, than those with higher education. Though, after controlling for health status and demographic characteristics, people with higher socio-economic status report more often specialist visits. Similarly, Morris, Sutton and Gravelle (2005) showed for England how low-income individuals and ethnic minorities have lower use of secondary health care, despite having higher use of primary one.

The empirical evidence for Spain basically consists of works related to the demand for health care, hardly any references on unmet needs. To the best of our knowledge, this paper is along ones of the first which analyse unmet health care needs for the Spanish case. We can mention the one by Calzón *et al.* (2015) which using data from the Living Conditions Surveys analysed the impact that socioeconomic inequality have had on unmet dental care needs before (2007) and during (2011) the crisis. In addition, García-Gómez *et al.* (2015) investigated the determinants of several long term care services and unmet needs for non-institutionalised disabled population in 2008 using the Spanish Disability and Dependency Survey. As stated by Lostao *et al.* (2001), lower socioeconomic groups exhibit higher rates of medical visits than the upper ones for the same level of need. Yet, it is worth mentioning that the relationship decreased throughout the time span. Meanwhile, García-Pérez *et al.* (2007) showed that labour status or educational level do not influence when been adjusted by income. Conversely, González-Álvarez and Clavero-Barranquero (2008) and Regidor *et al.* (2008) found inequity in visits to general practitioner favouring low socioeconomic levels, the opposite in specialist visits. Finally, Abásolo, Negrín-Hernández and Pinilla (2014a, b)

examined the utilization of health care services and its waiting times. As they shown, there is evidence of inequity in the access to specialist and hospital care services which advantages the highest socioeconomic levels.

3.3.Methods and data variables

3.3.1. Empirical model and strategy

Our objective is to study the effect that socioeconomic characteristics of the individuals –with special attention to labour status– have on the demand and utilization of health care in Spain, prior and after the onset of the Great Recession. The decision making process underlying the demand is based on the individual's perception of medical symptoms and the incentive towards action (Rivera, 2004). Two theoretical approaches are worth mentioning in this regard. First, Grossman (1972a, b) emphasize the role played by patient's choice, next the traditional consumer theory. Second, Zweifel (1981) points out that physician as patient's agent determines the amount of medical services used by the patient, once the first visit has been done.

Primarily, we study the determinants of unmet needs for health care. The econometric approach should take into account that the dependent variable (y_i^*) is dichotomic. Hence, we use discrete choice models which take the general form

$$y_i^* = x_i'\beta + \varepsilon_i \,, \tag{3.1}$$

where x_i is a vector of characteristics for individual i, and ε_i is the error term. In light of Equation (3.1), we specified the empirical model for unmet health needs (UHN) as

$$UHN_i = \beta_0 + \beta_1 labour_i + \beta_2 SAH_i + X_i'\gamma + \eta_r + \varepsilon_i\,, \tag{3.2}$$

where *labour* measures labour status, 1 if the individual declares to be unemployed, 0 otherwise. The vector X_i contains a set of explanatory variables such as demographic (age, gender and nationality) and social ones (education attainment and marital status). Besides, we include self-assessed health (SAH) because not doing so the impact of other variables might be biased. If someone feels bad, the probability of demanding health care services will increase and vice versa. Our goal is that *SAH* captures subjective feeling, while the other explanatory variables may control for objective characteristics. Finally, η_r represents a dummy variable to capture unobserved region-specific effects (López-Casasnovas, Costa-Font and Planas, 2005). If we assume that the error term has a standard normal distribution, we obtain the probit model, while assuming a standard logistic distribution we get the logit one. These models are usually estimated by maximum likelihood method. Here, we rely on the results obtained by the probit model[15].

Next, we focus on health care utilization. In practice, we measure it by means of the number of general practitioner or specialist visits in a given period. Accordingly, our econometric approach should take into account that the dependent variable takes non-negative integer values, and so the suitable framework is count data modelling (Cameron and Trivedi, 1986; Jones *et al*., 2013). The Poisson or negative binomial model, as appropriate[16], has the following form

$$E(u_i|x_i) = \exp(x_i\,\beta), \tag{3.3}$$

[15] We also obtained the corresponding coefficients from the logit model. However, there are not significant differences between them (Amemiya, 1981).

[16] The Poisson distribution is the benchmark in count data applications. This assumes that the conditional mean of the dependent variable is equal to the conditional variance. However, in the presence of overdispersion, the Poisson model is no longer efficient being preferable the use of negative binomial one.

where u_i denotes health care utilization and x_i is a vector of characteristics for individual i. Clearly the above Equation (3.3) can be specified equivalently as:

$$E(u_i|x_1 \dots x_k) = \exp(\beta_0 + \beta_1 labour_i + \beta_2 SAH_i + X_i'\gamma + \eta_r). \quad (3.4)$$

Below, we provide the estimates for Equations (3.2) and (3.4). We also report marginal and average effects.

3.3.2. Data and descriptive statistics

The present analysis requires both individual-level data on adult's characteristics and a source of time variation in them. This is the reason to use microdata drawn from the SNHS for 2006 and 2011-2012, before and through the Great Recession. The SNHS is a research operation that the Spanish National Institute of Statistics carries out based on a partnership agreement with the Ministry of Public Health, Social Services and Equality. It is a representative survey of Spanish population and it is directed at households and individuals. Within each, an adult (aged 16 and older) is selected to fill all the questionnaires. Surveys report national and regional data for different issues associated with health status, health care and health care determinants. Thus, they are comparable to other European health databases. The survey sample consists of approximately 31,300 and 24,000 dwellings, distributed into 2,236 and 2,000 census sections, for 2006 and 2011-2012, respectively. Here, three caveats need to be made: (i) survey data for the intervening years 2007-2010 are unavailable; (ii) it is not a panel survey in which a sample of households had been interviewed year after year so we work with different individuals on each occasion; (iii) we restricted the sample to working-age population

(16-65 years) since special emphasis is placed on the impact of labour status. Table 3.1 provides the definition of all the variables used in this analysis.

Table 3.1. Definition of variables

Variables		**Definition**
Unmet health needs	*UHN*	1 if the individual reported that, at least once in the last 12 months, he/ she needed a medical examination or treatment but did not consult, whatever the reason was
Health care utilization	*n_visits_gp*	Number of visits to general practitioner in the last 4 weeks
	n_visits_sp	Number of visits to specialist in the last 4 weeks
Age	*Age*	Age in years
	< 26	1 if person is in this age intervals
	26-35	
	36-45	
	46-55	
	56-65	
Gender	*Female*	1 if female
Education level	*Primary*	1 if primary education or below (*Reference*)
	Secondary	1 if compulsory secondary education
	Pre-university	1 if non-compulsory and pre-university secondary education
	Labour training	1 if specific labour training
	University	1 if university graduate
Marital status	*Married*	1 if married (*Reference*)
	Single	1 if single
	Separated/Divorced	1 if separated or divorced
	Widowed	1 if widowed
Citizenship	*National*	1 if Spanish
Self-assessed health	*SAH*	1 if person reports very good or good health status
	Very good	1 if person reports very good health status (*Reference*)
	Good	1 if person reports good health status
	Fair	1 if person reports fair health status
	Bad or very bad	1 if person reports bad or very bad health status

Labour	*Unemployed*	1 if the person reports to be unemployed
Region (Autonomous Communities)	*Reg1*	Andalusia (*Reference*)
	Reg2	Aragon
	Reg3	Asturias
	Reg4	Balearic Islands
	Reg5	Canary Islands
	Reg6	Cantabria
	Reg7	Castile and Leon
	Reg8	Castile-La Mancha
	Reg9	Catalonia
	Reg10	Valencian Community
	Reg11	Extremadura
	Reg12	Galicia
	Reg13	Madrid
	Reg14	Murcia
	Reg15	Navarre
	Reg16	Basque Country
	Reg17	La Rioja
	Reg18	Ceuta and Melilla

Notice that all dependent variables are self-reported measures. Thus, *UHN* is a dummy variable which takes 1 if the individual reported that at least once in the last 12 months, he/she has needed a medical examination or treatment but did not consult, 0 otherwise. Questions are phrased as follows: "Was there any time during the last 12 months when, in your opinion, you needed a medical examination or treatment but you did not receive it?" Those who answer in the affirmative way are then asked to give the main reason why they did not see a doctor when they needed to. As Table 3.2 shows, "other reasons" is the main motive both in 2006 and 2011-2012. It represents nearly half of reported unmet needs (once added "wait-and-see" attitude, which did not appear explicitly in the 2006 survey). The other reason often quoted is "waiting list" with about one-third. Besides, demand for medical services is measured through two dependent variables. On the one hand *n_visits_gp*, number of visits to general practitioner in the

last four weeks. On the other hand *n_visits_sp*, number of visits to the specialist in the same period.

Table 3.2. Main reason for unmet health needs (percentage)

Reason	Pre-crisis (2006)	Crisis (2011-2012)
Financial reasons	5.64	4.52
Waiting list	32.03	37.62
Lack of time	7.67	8.57
Distance, transportation difficulties	2.63	0.71
Fear	2.41	1.19
"Wait-and-see" attitude	-	18.81
Other reasons	49.62	28.57
TOTAL	100.00	100.00

Notes: individuals aged 16-65 having reported unmet needs for health care in the twelve last months.

3.4.Results

In what follows, we comment on our results in relation to each of the models specified in Section 3.1 in turn. The sign of the coefficients shows the qualitative effect of the explanatory variables. Moreover, to gain better understanding of the quantitative implications, we also report the marginal effects (for continuous variables) and the average effects (for binary explanatory variables). We first focus on the impact of socio-economic characteristics on the probability of experiencing unmet health needs. Table 3.3 reports probit estimates from Equation (3.2). We present two alternative specifications. Model I provides our results for the basic category of explanatory

variables, while Model II presents an extension of the basic model by including the estimates with respect to the reference category.

Broadly speaking, the results are quite consistent across specifications. Focusing on labour status the pre-crisis relationship between *unemployed* and the probability of declaring *UHN* is not statistically significant. Though, we estimate barely significant positive effects after the crisis. The coefficient on *unemployed* is significant positive at the 5% level for Model I (10% for Model II). Thus, it can be said that there is some indication of a positive labour effect on *UHN*, while not estimated with great precision. As can furthermore be seen in Table 3.4, the chance of an unemployed declares having *UHN* increased by 0.5% significant at the 10% level through the crisis. This crisis-worsen effect also applies to separated/divorced and non-national (immigrant) people. All those individuals have higher probability of experiencing *UHN* after the onset of the recession. However, some interesting differences stand out.

It is noteworthy from Table 3.4 that the probability of reporting *UHN* is weaker among elderly, men, people reporting very good health and with academic underachievement. Particularly during the crisis the elder the person, the more aware he/she is about their medical consultations. Furthermore, our estimates show the lower *SAH*, the higher the probability of experiencing *UHN*. When comparing very good or good *SAH* individuals and those in lower categories, the probability was negative by 5.2% prior the crisis and by 2.8% after it. These results reflect the fact that less healthy individuals are more frequently faced with the decision to delay or decline treatment or medical care. As regards the education attainments, we find upper probabilities between persons with higher levels than among those with lower ones. Indeed, estimates from the marginal effects indicate that labour-training and university individuals are two

times more likely to forgo than those pre-university. Finally, it is important to highlight that compared to Andalusia all regions are more likely to report *UHN* (the exceptions are Galicia and Basque Country during the crisis).

Table 3.3. Unmet needs for medical care. Probit model estimation

Variable	Pre-crisis (2006)		Crisis (2011-2012)	
	Model I	**Model II**	**Model I**	**Model II**
Unemployed	0.050	0.034	0.108 **	0.103 *
Age	-0.003 **		-0.004 **	
< 26		*Ref.*		*Ref.*
26-35		0.109 *		-0.096
36-45		0.025		-0.155 *
46-55		-0.021		-0.307 ***
56-65		-0.096		-0.286 ***
Female	0.196 ***	0.196 ***	0.120 ***	0.097 **
Self-assessed health	-0.514 ***		-0.503 ***	
Very good		*Ref.*		*Ref.*
Good		0.259 ***		0.235 ***
Fair		0.646 ***		0.599 ***
Bad or very bad		0.916 ***		0.962 ***
Education level				
Primary	-0.088 ***	*Ref.*	-0.242 ***	*Ref.*
Secondary		0.103 **		0.031
Pre-university		0.103 **		0.235 ***
Labour training		0.161 ***		0.330 ***
University		0.017		0.320 ***
Marital status				
Married	0.008	*Ref.*	-0.062	*Ref.*
Single		-0.006		-0.005
Widowed		0.028		-0.005
Separated/Divorced		0.045		0.234 ***
National	-0.050	-0.047	-0.149 **	-0.161 **
Region (Autonomous Communities)				
Andalusia	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Aragon	0.283 ***	0.286 ***	0.081	0.073
Asturias	-0.024	-0.024	-0.011	-0.038
Balearic Islands	0.584 ***	0.593 ***	0.720 ***	0.735 ***

Canary Islands	0.248 ***	0.229 **	1.045 ***	1.045 ***
Cantabria	-0.010	-0.033	-0.237	-0.224
Castile and Leon	0.216 **	0.227 **	0.166	0.147
Castile-La Mancha	-0.051	-0.035	0.428 ***	0.494 ***
Catalonia	0.325 ***	0.333 ***	0.311 ***	0.302 ***
Valencian Community	0.627 ***	0.639 ***	-0.021	-0.024
Extremadura	-0.197	-0.192	0.142	0.133
Galicia	0.391 ***	0.390 ***	-0.441 **	-0.444 **
Madrid	0.084	0.112	-0.165	-0.157
Murcia	0.128	0.122	-0.331 *	-0.351 *
Navarre	0.615 ***	0.620 ***	0.592 ***	0.611 ***
Basque Country	0.186 *	0.191 *	-0.540 ***	-0.539 ***
La Rioja	1.265 ***	1.152 ***	0.265 *	0.241 *
Ceuta and Melilla	0.756 ***	0.772 ***	0.637 ***	0.665 ***
constant	-1.609 ***	-2.556 ***	-1.543 ***	-2.526 ***
Number of observations	21,952	21,920	15,278	15,262

Notes: ***, **, and * denote significant at 1%, 5%, and 10% respectively. *Ref.*: category of reference.

Table 3.4. Marginal effects (dy/dx) of unmet needs for medical care. Probit model estimation

Variable	Pre-crisis (2006)		Crisis (2011-2012)	
	Model I	**Model II**	**Model I**	**Model II**
Unemployed	0.004	0.003	0.005 *	0.004 *
Age (x10)	-0.002 **		-0.002 **	
< 26		*Ref.*		*Ref.*
26-35		0.009 *		-0.004
36-45		0.002		-0.006 *
46-55		-0.002		-0.010 ***
56-65		-0.007		-0.010 ***
Female	0.016 ***	0.015 ***	0.05 ***	0.004 **
Self-assessed health	-0.052 ***		-0.028 ***	
Very good		*Ref.*		*Ref.*
Good		0.021 ***		0.009 ***
Fair		0.073 ***		0.037 ***
Bad or very bad		0.143 ***		0.094 ***
Education level				
Primary	-0.007 ***	*Ref.*	-0.008 ***	*Ref.*
Secondary		0.009 **		0.001

Pre-university		0.009 **		0.009 ***
Labour training		0.015 **		0.018 **
University		0.001		0.016 ***
Marital status				
Married	0.001	*Ref.*	-0.003	*Ref.*
Single		-0.001		-0.000
Widowed		0.002		-0.000
Separated/Divorced		0.004		0.011 ***
National	-0.004	-0.004	-0.007 *	-0.007 *
Region (Autonomous Communities)				
Andalusia	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Aragon	0.029 ***	0.029 ***	0.004	0.003
Asturias	-0.002	-0.002	-0.000	-0.001
Balearic Islands	0.075 ***	0.075 ***	0.060 ***	0.060 ***
Canary Islands	0.025 **	0.022 **	0.112 ***	0.109 ***
Cantabria	-0.001	-0.003	-0.008	-0.007
Castile and Leon	0.021 *	0.022 *	0.008	0.007
Castile-La Mancha	-0.004	-0.003	0.027 ***	0.032 ***
Catalonia	0.034 ***	0.035 ***	0.017 **	0.016 **
Valencian Community	0.083 ***	0.084 ***	-0.001	-0.001
Extremadura	-0.014	-0.013	0.007	0.006
Galicia	0.043 ***	0.042 ***	-0.012 ***	-0.012 ***
Madrid	0.007	0.010	-0.006	-0.005
Murcia	0.012	0.011	-0.010 **	-0.010 ***
Navarre	0.082 ***	0.080 ***	0.044 ***	0.044 ***
Basque Country	0.018	0.018	-0.014 ***	-0.013 ***
La Rioja	0.260 ***	0.252 ***	0.014 *	0.012 *
Ceuta and Melilla	0.115 ***	0.116 ***	0.050 ***	0.052 ***

Notes: dy/dx is for discrete change of dummy variable from 0 to 1. ***, **, and * denote significant at 1%, 5%, and 10% respectively. *Ref.*: category of reference.

Next, we turn to analyse the determinants for the utilization of health care services (general practitioner and specialist). Table 3.5 reports the Poisson/Negative binomial estimates from Equation (3.4). As indicated in the previous section, the natural starting point for count data models is to test for overdispersion in Poisson regression models. As shown in the table, in all but one specification the test results do not reject this model as an adequate explanation for the process underlying health utilization.

Then, we find that the coefficients on *unemployed* are not significantly different from zero. It is noteworthy that this statement holds regardless of whether it is general practitioner or specialist, either before or during the economic crisis. By contrast, *SAH* has the hypothesized effects on both general practitioner and specialist visits, before and through the crisis. Not surprisingly, the worse the *SAH*, the more frequent doctor visits. As can be seen in Table 3.6, individuals reporting bad or very bad health are about two times more likely to visit a doctor than those stating good health (other things being equal).

Last but not least, the effects of the crisis on the remaining variables are quite different for general practitioner and specialist visits. As to the former, no changes were observed with respect to the period before the onset of the crisis. As to the latter, changes are evident. As a result, age, education, widowhood nationality and somehow region, which were statistically significant at conventional levels in 2006, are not different from zero in 2011-2012. Table 3.6 reveals average effects up to 10.7% for individuals aging 26-55 related to those younger prior the crisis, in regressions limited to specialist. However, this effect becomes statistically non-significant through the crisis. Also, it is worth mentioning that prior the crisis education is roughly significant negative for general practitioner and significantly positive for specialist. As shown by Sarma and Simpson (2006), education is associated with medical knowledge. So, highly educated people prefer visiting a specialist over a general practitioner. Turning to the regional effect, it can be observed how Andalusian patients generally would make a greater utilization of health care services.

Table 3.5. Health care utilization. Poisson/Negative binomial model estimation

Variable	General Practitioner		Specialist	
	Pre-crisis (2006)	Crisis (2011-2012)	Pre-crisis (2006)	Crisis (2011-2012)
Unemployed	-0.028	-0.029	-0.088	-0.072
Age				
< 26	*Ref.*	*Ref.*	*Ref.*	*Ref.*
26-35	-0.023	0.669	0.179 **	0.072
36-45	0.003	0.083	0.142 *	0.037
46-55	0.015	-0.067	0.146 *	-0.071
56-65	0.005	-0.137	0.037	-0.183
Female	0.005	0.016	0.020	0.027
Self-assessed health				
Very good	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Good	0.065	0.166	0.002	0.119
Fair	0.328 ***	0.385 ***	0.293 ***	0.272 **
Bad or very bad	0.603 ***	0.622 ***	0.868 ***	0.519 ***
Education level				
Primary	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Secondary	0.037	0.009	0.116 **	-0.071
Pre-university	-0.038	-0.125 *	0.238 ***	-0.041
Labour training	0.002	0.150	0.126 *	-0.121
University	-0.120 ***	-0.081	0.316 ***	0.011
Marital status				
Married	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Single	-0.002	-0.004	0.015	-0.057
Widowed	-0.062	-0.055	-0.254 ***	-0.053
Separated/Divorced	0.066	-0.030	0.045	-0.100
National	-0.055	0.230 **	0.222 **	0.127
Region (Autonomous Communities)				
Andalusia	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Aragon	0.001	-0.093	0.172 **	0.230
Asturias	-0.219 ***	0.150	-0.117	0.253 *
Balearic Islands	-0.133 **	0.243 *	0.054	0.222
Canary Islands	-0.192 ***	0.112	0.026	-0.010
Cantabria	-0.144 **	-0.249	-0.181 *	-0.241
Castile and Leon	-0.177 ***	-0.063	-0.181 *	-0.085
Castile-La Mancha	-0.009	-0.213	0.072	-0.072
Catalonia	-0.264 ***	-0.134	0.288 ***	-0.064
Valencian Community	-0.039	0.072	0.060	0.159
Extremadura	0.036	-0.132	-0.193 *	-0.227

Galicia	-0.058	-0.017	-0.059	0.079
Madrid	-0.062	0.081	0.264 ***	0.180
Murcia	-0.019	-0.252 *	0.013	-0.181
Navarre	-0.091	-0.030	0.122	0.191
Basque Country	-0.155 **	-0.059	0.112	0.078
La Rioja	-0.036	0.175	0.124	0.261 *
Ceuta and Melilla	-0.297 ***	0.002	-0.300 *	0.253
constant	0.012	0.045	-1.277 ***	-0.001
Alpha *p*-value	0.451	1.000	0.000	1.000

Notes: ***, **, and * denote significant at 1%, 5%, and 10% respectively. Observations: 7,694 for 2006 and 1,095 for 2011-2012. The use of Poisson or the negative binomial estimator is determined by the Alpha parameter. If Alpha *p*-value < 0.05 it is estimated the negative binomial model. *Ref.*: category of reference.

Table 3.6. Marginal effects (dy/dx) for health care utilization. Poisson/Negative binomial model estimation

Variable	General Practitioner		Specialist	
	Pre-crisis (2006)	Crisis (2011-2012)	Pre-crisis (2006)	Crisis (2011-2012)
Unemployed	-0.029	-0.045	-0.048	-0.095
Age				
< 26	*Ref.*	*Ref.*	*Ref.*	*Ref.*
26-35	-0.025	0.107	0.107 **	0.099
36-45	0.003	0.134	0.083 *	0.051
46-55	0.016	-0.104	0.086 *	-0.093
56-65	0.007	-0.210	0.021	-0.237
Female	0.005	0.025	0.011	0.037
Self-assessed health				
Very good	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Good	0.070	0.268	0.001	0.163
Fair	0.377 ***	0.640 ***	0.175 ***	0.379 **
Bad or very bad	0.819 ***	1.190 ***	0.689 ***	0.819 ***
Education level				
Primary	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Secondary	0.041	0.015	0.068 **	-0.094
Pre-university	-0.040	-0.199 *	0.145 ***	-0.055
Labour training	0.002	0.220	0.075 *	-0.154
University	-0.125 ***	-0.124	0.200 ***	0.015
Marital status				
Married	*Ref.*	*Ref.*	*Ref.*	*Ref.*

Single	-0.002	-0.006	0.008	-0.075
Widowed	-0.065	-0.084	-0.129 ***	-0.070
Separated/Divorced	0.073	-0.047	0.026	-0.129
National	-0.061	0.327 **	0.114 **	0.162
Region (Autonomous Communities)				
Andalusia	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Aragon	0.001	-0.139	0.105 **	0.343
Asturias	-0.214 ***	0.253	-0.063	0.380 *
Balearic Islands	-0.136 **	0.428	0.031	0.330
Canary Islands	-0.190 ***	0.185	0.015	-0.013
Cantabria	-0.145 ***	-0.347	-0.095 **	-0.288
Castile and Leon	-0.177 ***	-0.096	-0.095 *	-0.110
Castile-La Mancha	-0.010	-0.302	0.039	-0.093
Catalonia	-0.257 ***	-0.199	0.185 ***	-0.084
Valencian Community	-0.042	0.116	0.035	0.228
Extremadura	0.039	-0.194	-0.100 *	-0.274
Galicia	-0.061	-0.026	-0.033	0.109
Madrid	-0.066	0.130	0.168 ***	0.258
Murcia	-0.020	-0.353 **	0.008	-0.224
Navarre	-0.094	-0.046	0.073	0.280
Basque Country	-0.157 **	-0.089	0.067	0.109
La Rioja	-0.038	0.299	0.075	0.395
Ceuta and Melilla	-0.279 ***	0.004	-0.147 **	0.383

Notes: dy/dx is for discrete change of dummy variable from 0 to 1. ***, **, and * denote significant at 1%, 5%, and 10% respectively. *Ref.*: category of reference.

3.5.Discussion

Recent literature provides mixed answers concerning the demand for health care. We hypothesized that labour status should play a major role, though it is not clearly reflected by the results. Our findings suggest that there is higher probability for an unemployed reporting *UHN* than for those not unemployed through the crisis. In this regard, being in poor health and living in a low-income household were previously found, as in Cavalieri (2013) for Italy, to be associated with a higher probability of

forgoing or delaying care. That also applies for *UHN* and employed people. By contrast, we find that being unemployed is not statistically significant for health care utilization. Our results are in accordance with Åhs and Westerling (2006), and to some extent against most of the literature which indicates that the unemployed use health care more frequently than the employed (i.e.: Kraut *et al*., 2000). We suggest that our results must be considered in light of the Spanish National Health System that is characterised by universal coverage and tax funding.

Next, we focus on the effects of other explanatory variables. Regarding *UHN*, our results are in line with Chaupain-Guillot and Guillot (2015) that present lower probability among the elderly. Likewise, they stress the strong relationship between having *UHN* and both *SAH* and education level. Regarding the latter, the effect is to some extent unexpected, as educated individuals tend to be much concerned about health as extension of human capital. We also show that women are more likely to forgo than men.

Relative to health care services utilization, our results are along with Van der Heyden *et al*. (2003) for Belgium. Broadly speaking, the effects on this issue are mostly concentrated on social characteristics. In our view, our findings relate to implemented health policy over the sampling time. Indeed, Spain applied austerity measures through the financial downturn, among others health expenditure cuts with impact on health care supply. Urbanos-Garrido and Lopez-Valcarcel (2015) point out that the effects shown here could be amplified when the recession comes to an end.

For regions, it should be noted that the statistical significance of the estimates varies across them and between periods. Our findings support that demand-induced supply plays a major role, as health care is completely decentralized to regions since

2002. The main reasons can be summarized in two basic variables: expenditure and financing (Costa-Font and Pons-Novell, 2007). The study carried out by Montero and Jiménez (2008) indicates that there are differences in health expenditure by regions, mainly in complementary services supply and coverage. As regards the organization of outpatient health care services, whereas the choice of general practitioner is possible, access to specialist care services is restricted by gatekeeping system. As indicated by Lopez-Valcarcel, Urbanos-Garrido and Ortega (2004) the main regional inequalities are: (i) complementary services supply and the coverage of (and access to) some health care programs; (ii) the distribution of hospital beds across regions; (iii) profit oriented private care; and (iv) the availability of high-tech health care services.

Finally, it is important to highlight the research limitations and extensions of this study. Despite the SNHS allows incorporating individual-specific characteristics, data drawback are both lack of objectivity in the responses and missing values. Regarding health care utilization, it should be noted that the number of visits asked for are only related to the last month. But instead of dampening researchers' spirits, these limitations should serve to spur further research into an issue of vital importance to Spain's citizens. Because health inequality is an area in which greater effort must be made to generate empirical information for policymakers, this study could be extended. For example, it would be valuable to test the results by using other methods and control variables or making a multi-country study. These and other extensions of this study are left for further research, when there will be available new data on health indicators.

3.6. Conclusions

In this study, data from the Spanish National Health Survey were used to examine the determinants for unmet health care needs and health care utilization in Spain, prior the onset of the Great Recession and through it. Our estimation results sum as follows. First, we find that labour status is not a strong determinant at this regard. Second, our results support those in the literature for which that the above mentioned variables are mainly related to social characteristics as age, gender, education level or self-assessed health. Third, we also find significant differences from the period prior the financial downturn. In the present analysis, the Great Recession undermined access to health care for those most disadvantaged or at risk of social exclusion. We hypothesize that our findings could be relevant for current debates in the literature on health economics. This issue is a crucial source of information when it comes to stay healthy and promote human capital attainments.

From a policy economic perspective, this contribution would be valuable to policymakers when planning to improve health services management. Then, the regional factor is relevant when implementing social policies aimed at moderating adverse effects. Achieving health equity means that people can develop their full potential regardless of health status or other circumstances determined by social factors.

Chapter 4

Do the unemployed hit the bottle during an economic downturn? The case of Spain

4.1.Introduction

While it is generally acknowledged that long-term economic growth enhances health (Newhouse, 1977 and 1992), the impact of short-term economic shifts remains open to debate (Catalano *et al*., 2011). During recent years, considerable attention has been paid to health and other social costs of the financial troubles suffered by individuals during an economic downturn (Arkes, 2007; Tefft, 2011; Cooper, McCausland and Theodossiou, 2006). Nevertheless, other studies indicate that recessions may have some unexpected, positive, effects on health. For example, Ruhm (2000) found that an increase in the jobless rate is associated with a reduction in smoking and obesity, an

increase in physical activity, and diet improvements. Likewise, Gerdtham and Ruhm (2006) found that both total mortality and mortality due to several common causes increase when the jobless rate decreases.

This study contributes to the recent literature concerning the health and behavioural effects of cyclical economic downturns[17]. Therefore, among the thirty-four countries that constitute the OECD, Spain provides a good chance to examine this causal relationship for the following two reasons.

First, since the start of the Great Recession, in 2008, Spain has experienced a record increase in its unemployment rate, relative to that of other OECD countries. According to Eurostat, this rate rose from 8.3% to 26.4% between 2007 and 2013, while for the EU-27 it rose from 7.2% to 10.9%. More recent data suggest that after the prolonged period of job losses, the unemployment rate has stabilized at a very high level (ECB, 2014). Furthermore, the output gap for 2011-2012 was on average -4.8% (European Commission, 2014). As a result, between 2007 and 2011 Spain suffered a greater increase in employment inequality than did any other OECD country (OECD, 2014).

Second, the Mediterranean tradition of viticulture is so deeply rooted in Spain. Then, alcohol consumption in general, has become trivialized. Alcohol abuse has not been taken sufficiently seriously[18,] despite there are studies, including one based on Spanish data, indicating that it can have deadly consequences (e.g., Fierro *et al*., 2008).

[17] They have long been associated with changes in health-related activities such as smoking, alcohol consumption, exercise, and diet. In recent years, some researchers have added sleep duration to this list. For example, Antillón, Lauderdale and Mullahy (2014) find that time allotted to sleep in the U.S. is countercyclical with respect to employment conditions.

[18] Alcohol has addictive properties that can contribute to the development of heavy drinking, leading to alcohol-related physical and mental disorders (Serecigni, 2008). However, some studies have found a correlation between moderate alcohol consumption and a below-average rate of premature mortality.

In addition, another based on U.S. data, highlight the toll that it takes, not only in terms of behavioural disorders but also in terms of economic costs (Bouchery *et al*., 2011).

The aim of this study is to determine the extent to which the socioeconomic issues, and specifically unemployment, faced by drinkers contribute to the perpetuation of alcohol abuse. Unemployment is suspected to be one of the main culprits. In the case of Spain, it is reinforced by the fact there is widespread uncertainty among the unemployed as to the job market's eventual recovery. To determine whether —and if so, to what extent— alcohol abuse among the adult Spanish population is associated to economic downturns, we focus on the recent economic crisis as reflected in data from the Spanish National Health Survey for two periods: 2006 (before the Great Recession) and 2011-2012 (during the Great Recession). The application of three different approaches —discrete-choice models, matching techniques, and differences-in differences estimation— to these data enables us to determine how drinking patterns are related with the economic cycle.

Several features distinguish this study from its predecessors. First, it focuses on unemployment and alcohol dependence in Spain. Second, it does so in terms of two opposite phases of the economic cycle. Third, from an economic-policy perspective, it highlights specific health risks associated with particular phases in the economic cycle: crucial information when it comes to designing public-health policies.

The remainder of this study is organized as follows. In Section 4.2 we present a survey of the literature. In Section 4.3 we describe our methods and data variables. In Section 4.4 we present our empirical results. Finally, in Sections 4.5 and 4.6 we discuss the results and conclude.

4.2.Previous research

Data from Spain is chosen for the current analysis as the Great Recession, providing a clearer before and after scenario than in other places. Therefore, this analysis relates mainly with one strand of literature, the one on the relationship between health and macroeconomic conditions. Although in this study individual level conditions are analysed.

In the literature on the relationship between macroeconomic conditions and alcohol consumption, there is not a consensus on how the effect of the business cycle affects these behaviours (Xu, 2013). So, the debate between the countercyclical and the pro-cyclical results continues unabated (Catalano *et al*., 2011). According to Pacula (2011), the discrepancies across studies may be due to omitted-variable bias or differences in methodology or divergences between developing and developed countries.

The literature generally shows positive health behavioural effects of economic downturns in developed countries (Ásgeirsdóttir *et al.*, 2015). If this is the case, then alcohol consumption is pro-cyclical. One explanation is that, since alcohol is one among many standard consumer goods, the purchase of which depends on a range of factors, chiefly disposable income, savings, interest rates, age, education, and family size. A decline in income due to unemployment will lead to a decline in alcohol consumption[19].

Thus, Ruhm (1995) and Ruhm and Black (2002) maintain that drinking decreases during economic downturns. Likewise, Ásgeirsdóttir *et al*. (2014) find that the 2008 economic crisis in Iceland led to reductions in all of the health-compromising

[19] However, unemployment results in an increase in leisure time, which could encourage social drinking.

behaviours that they examined (smoking, heavy drinking, consumption of sugared soft drinks, sweets and fast food, and indoor tanning). Alternatively, there is evidence that supports alcohol consumption is countercyclical, increasing it during periods of economic crisis. For instance, Dee (2001), Dávalos, Fang and French (2012) or Herzfeld, Huffman and Rizov (2014). Meanwhile, Bor *et al.* (2013) show for the U.S. case that during the Great Recession there was an increase in abstention from alcohol and a rise in frequent binging. Others, like Jiménez-Martín, Labeaga and Vilaplana-Prieto (2006) conclude that the business cycle does not affect drinking consumption.

Related to individual level condition, there is some evidence that individual-level job loss can lead to greater alcohol consumption and problems. Mossakowski (2008) considers the question of whether the duration of poverty and unemployment is a risk factor for heavy drinking and heavy drinking frequency. She finds that involuntary job loss results in heavy drinking and alcohol-related problems for those 27 to 35 years old. Luoto, Poikolainen and Uutela (1998), Popovici and French (2013), Mulia *et al.* (2014) also show a positive and significant effect of unemployment on drinking behaviours. However, again, there are also studies where the conclusions of which are ambiguous. Ettner (1997) shows that unemployment does not necessarily lead to alcohol abuse. In addition, in Khan, Murray and Barnes (2002) recent unemployment is related to a decrease in alcohol use, but long-term unemployment is correlated with an increase one.

Turning our attention to Spain, we find little evidence to support the hypothesis that a downturn in the economic cycle is directly correlated with a downturn in alcohol consumption —or, for that matter, with any other health benefits. However, Del Pozo *et al*. (2002) find no direct correlation between the duration of unemployment and the

extent of tobacco and alcohol use. Otherwise, Gili *et al.* (2013), evaluating the mental-health consequences of the economic crisis during 2006 and 2010, report not only that there was a significant increase in the number of patients seeking treatment at primary-care centres for mood, anxiety, somatoform, and alcohol-related disorders but also that one-third of these cases were associated with household-unemployment and mortgage-payment difficulties. In other words, evidence concerning the effect of cyclical economic downturns on alcohol consumption and alcohol abuse in Spain is inconclusive.

4.3.Methods and data variables

This section is devoted to the methods, the data variables, and the econometric strategy employed in this study. Various empirical contributions account for our application of the model discussed below.

4.3.1. Measuring alcohol consumption and specification

The distinction between drinking participation and conditional drinking is standard in the field of health economics. The formulation of the problem can be illustrated within the framework of Ruhm and Black (2002) and Mullahy (1998), in which the expected consumption by an individual *i* with characteristics *X* is determined by

$$E[Y_i|X_i] = Pr[Y_i > 0|X_i] \times E[Y_i \mid Y_i > 0, X_i], \qquad (4.1)$$

where *Y* is the number of drinks, *E*(·) and *Pr*(·) indicate conditional expectations and probabilities, and the first (second) term on the right-hand side refers to drinking participation (conditional drinking). We can then examine the effects of the individual on alcohol consumption from Equation (4.1). Drinking measure for person *Y*, is given by

$$Y_i = F\ (\alpha_i + \ \beta_u \text{Unemployed}_i + \ \beta_x X_i + \varepsilon_i), \qquad (4.2)$$

where *Unemployed* is individual labour status, *X* denotes a vector of other explanatory variables, and ε is the disturbance term.

The dependent variable *Y* represents the drinking measure for each individual. Its latent variable Y^* is a linear function of some explanatory variables (including socioeconomic measures, such as labour status, age, gender, educational level, marital status, and nationality). We observe *Y* as a result of comparing the utility of consuming a given (including zero) number of drinks with another number of drinks. Thus, the observability rule is $Y = 1\ (Y^* > 0)$ for the binary choice being a drinker or not, or $Y = max\ (Y^*, 0)$ for the number of drinks consumed (Jiménez-Martín, Labeaga and Vilaplana-Prieto, 2006). Equation (4.2) can then be rewritten as

$$\begin{aligned} \Pr(Y_i = 1) = \beta_0 + \beta_1 \text{Labour Status}_i + \ \beta_2\, \text{Age}_i + \beta_3\, \text{Gender}_i + \\ + \beta_4\, \text{Educational Level}_i + \ \beta_5 \text{Marital Status}_i + \\ + \beta_6 \text{Nationality}_i + \ \varepsilon_i \end{aligned} \qquad (4.3)$$

Next, we turn to specify the average treatment effect on the treated (ATT) for 2006 and 2011-2012 as

$$ATT = \ E[Y_1 \ - \ Y_0 | D = 1] \ = \ E[\ Y_1 | D = 1] - \ E[Y_0\ | D = 1], \qquad (4.4)$$

where subscripts 1 and 0 mean unemployed and employed, respectively, and D = 1 means unemployed. The second term on the right hand side in Equation (4.4) is the

counterfactual: what the drinking behaviour of an unemployed person would be if he/she were employed.

Finally, we capture the effect of business cycle on drinking behaviour through unemployment status as

$$Y_{idt} = \alpha + \gamma \text{Unemployed}_{\text{it}} + \delta \text{t} + \theta(\text{Unemployed}_{\text{it}} * \text{t}) + X'_{it}\beta_t + \epsilon_{idt}, \quad (4.5)$$

where *d* stands for the employment status. *t* is a dummy variable indicating time, crisis or not, at which the individual is observed (*t* = 1 if year is 2011-2012, or *t* = 0 if year is 2006). Thus, it represents the time difference between 2006 and 2011-2012: that is, the "period effect". Then *t* collects all the changes that have occurred during this period, such as prices, taxes or the reduction in health expenditure, not explained by the remaining independent variables. Therefore, the parameter δ represents the change in heavy drinking, whereas γ and θ provide information on the effects of unemployment on heavy drinking before (γ) and during the crisis $(\gamma + \theta)$. The effect of control variables *X* is assumed to be different in each of the two periods.

4.3.2. Data and variables

In this subsection we discuss the variables that will be used to assess the magnitude of estimated effects presented below. We use micro data from the Spanish National Health Survey (SNHS) for the two periods under consideration, 2006 and 2011-2012. The SNHS is a research operation carried out by the Spanish National Institute of Statistics in partnership with the Ministry of Public Health, Social Services and Equality. Comparable to other European health surveys, it focuses on families, and its main objective is to obtain data from citizens regarding various issues associated with health

(status, care, and determinants). Here, two points need to be made: (i) survey data for the intervening years, 2007-2010, are unavailable; and (ii) it is not a panel survey in which a sample of households had been interviewed year after year so we work with different individuals on each occasion. To be precise, it is not the typical periodical survey. The preceding one, was conducted in 2003.

The two survey samples consist of 31,300 and 24,000 dwellings distributed among 2,236 and 2,000 census sections, respectively. Since our purpose in this study is to determine whether alcohol abuse is related to unemployment status, and since the sale of alcohol is restricted to persons over the age of eighteen[20], we restricted our two samples to the adult working-age population (18-65 years old), both employed and unemployed. Our sample sizes are thus n = 14,696 for 2006, and n = 14,981 for 2011-2012. The surveys include various questions regarding alcohol consumption. First, respondents are asked whether they have consumed at least one drink of any alcohol beverage in the past two weeks, twelve months or at any previous time. Other questions concern the frequency of their consumption. The fact that these data were self-reported means that the results are tentative. Actually, despite the SNHS allows incorporating individual-specific characteristics, a data drawback is the lack of objectivity in the responses by the individuals. Also, the missing values there are.

Thus, following Mossakowski (2008), we are able to create two dependent variables as proxies for alcohol consumption: *heavy drinker* and *heavy-drinking frequency*. Since the questions concerning alcohol consumption vary considerably among the surveys, we build a dichotomous variable, coded 1 for those who consumed five or more drinks a week and 0 for those who did not. The second dependent variable

[20] Despite legal working-age population in Spain is from sixteen years old.

measures the frequency of drinking. This variable comprises four levels: 0 ("does not drink alcohol"), 1 ("drinks alcohol only on weekends"), 2 ("drinks alcohol only on weekdays"), and 3 ("drinks alcohol on weekdays and weekends alike"). Turning to the explanatory variables, *Unemployed* is a dichotomous variable: 1 indicates individual labour status if the respondent declares to be unemployed, 0 indicates that they responded otherwise. Additional controls for socioeconomic conditions included in the regression models are age, gender, educational level, marital status, and nationality. *Gender*, *Married*, and *Nationality* are also dichotomous variables. *Age* is a continuous variable ranging from 18 to 65 as we stated above. *Education* is categorized in terms of five levels of educational attainment, being the lower level of "Primary education or below" the reference category. Income could not be considered as a regressor because it is not available for the SNHS 2011-2012. Further details on the variables used in the estimates are described in Table 4.1, where the summary statistics of the series in the dataset are provided as well.

Table 4.1. Definitions of variables and descriptive statistics

Variables		**Definition**	**2006 (n= 14,696)**		**2011-2012 (n= 14,981)**	
			Mean	**S.D.**	**Mean**	**S.D.**
heavy drinker		1 if consumes five or more drinks a week	0.26	0.44	0.26	0.44
heavy-drinking frequency		0 if does not drink alcohol, 1 if drinks alcohol only on weekends, 2 if drinks alcohol only on weekdays, and 3 if drinks alcohol on weekends and weekdays alike	2.60	0.90	0.84	1.28
Labour status	*Unemployed*	1 if unemployed	0.12	0.33	0.18	0.38
	Unem_never	1 if unemployed and has never worked	0.01	0.08	0.01	0.09
	Unem_6	1 if unemployed for 6 months or less	0.05	0.22	0.05	0.22

	Unem_6_12	1 if unemployed for 6 months to 1 year	0.02	0.13	0.03	0.17
	Unem_12	1 if unemployed for 1 year or longer	0.04	0.20	0.09	0.28
Age	*Age*	Age (in years)	40.50	10.81	43.32	12.56
Gender	*Male*	1 if male	0.48	0.50	0.49	0.50
Education	*Educ1*	Primary education or below (reference category)	0.29	0.45	0.14	0.35
	Educ2	Compulsory secondary education	0.14	0.34	0.34	0.47
	Educ3	Non-compulsory and pre-university secondary education	0.25	0.43	0.59	0.49
	Educ4	Specific labour training	0.09	0.29	0.08	0.27
	Educ5	University graduate	0.23	0.42	0.19	0.39
Marital status	*Married*	1 if married	0.58	0.49	0.55	0.50
Nationality	*Nationality*	1 if foreigner	0.10	0.29	0.10	0.30

Notes: Sample of employed and unemployed respondents aged 18-65.

Related to the empirical strategy, first, we estimate the impact of unemployment and several covariates on the probability of heavy drinking as Equation (4.3) shows. It is now appropriate to consider the ways in which econometric methodology relies on discrete-choice models. Specifically, bivariate and multinomial models[21] are used to analyse the associations of the socioeconomic variables on the probability and frequency of drinking (Greene, 2012; Jones *et al*., 2013).

Next, through Equation (4.4) we estimate the impact of unemployment on alcohol consumption. Matching techniques applied to two groups: one comprising individuals who have received the treatment ("treated") and another comprising similar individuals who have not received the treatment ("controls"). Following Ayala and Rodríguez (2013) and more particularly Urbanos-Garrido and Lopez-Valcarcel (2015), matching methods based on propensity score (Rosenbaum and Rubin 1983) are applied, separately, to the 2006 and 2011-2012 data. Again, probit regressions are employed to

[21] As stated, $\Pr(Y_i = j)$ where j = 0, 1, 2, 3.

estimate the probability of being unemployed ("treated") as a function of the observable covariates vector *X* associated with unemployment for each of the two periods. The parameter of interest to estimate is the average treatment effect on the treated (ATT) of unemployment on the unemployed. Once we had calculated the propensity score, we applied different methods to make matching: nearest-neighbour, radius, and kernel[22]. Last, through Equation (4.5) we capture the effect of the business cycle on drinking through unemployment status by using the Difference-in-Difference (DiD) technique.

4.4. Empirical results

In this section we present the results from the determinants of drinking behaviour both before and during the recession. We estimate probit models that explain *heavy drinker*. We also test the variables that affect *heavy-drinking frequency*. The econometric model that we use to deal with that variable is a multinomial one[23]. Then, we present the results derived from the matching techniques and differences-in-differences estimations.

In regard to identification, four points need to be made. First, it is important that one does not commit the ecological fallacy in the interpretation of statistical data (Catalano and Dooley, 1983). In the present case, the fallacy would be to assume that aggregate unemployment correlations will translate into individual ones. Second, the

[22] Nearest-neighbour matching consists of matching individuals by the propensity score with the smaller difference. In the radius-matching method each individual is matched with one of more individuals in the control group whose propensity score is closer than a prefixed given number. Finally, with the kernel-matching method, the "treated" individuals are compared with a weighted average of the "control" individuals. These weights are inversely proportional to the distance between the propensity scores of the two groups.

[23] Heavy drinking frequency is not used as an ordered variable. Drinking on weekends versus weekdays is no really ordered, although drinking on both weekdays and weekends, or neither could be considered ordered.

2006-survey respondents are not the same as the 2011-2012 ones. Third, there may be a number of possible interpretations when one synthesizes multiple coefficients; we present what we consider the most plausible one. Fourth, in our models coefficients on explanatory variables have only a qualitative interpretation[24]. For instance, a positive coefficient on *unemployment* means that being unemployed is positively associated with being a heavy drinker. The negative sign reverses the meaning of the coefficient.

We first focus on *heavy drinker* estimates from Equation (4.3). Table 4.2 presents five categories of respondents (in the first section the 2006 set, in the second section the 2011-2012 set) who declared themselves to be unemployed according to the duration of their unemployment. The model yields negative and roughly significant coefficients on unemployment. The association is somewhat reduced for the long-term unemployed but remains highly significant for short periods. The fact that a positive sign is found for respondents in the 2011-2012 set who declared themselves to be unemployed for no more than six months is consistent with previous findings that attribute their heavy drinking to stress due to their being unaccustomed to being unemployed.

We now introduce control variables. It is worth noting that the coefficients on education are slightly consistent with those on unemployment. Therefore, the deterrent effect of education on *heavy drinker* occurs among the lower educational levels (compulsory education) in both periods. The reverse effect between periods is observed for the higher educational levels. It is known that there is a correlation between human capital and income (Bils and Klenow, 2000; Benhabib and Spiegel, 2005). The crisis is a significant factor not only in regard to heavy drinking but also in regard to an

[24] Determining the marginal effect of an explanatory variable makes sense when such variable is continuous.

individual's marital status. Therefore, the coefficient for *married* is negative and significant in 2011-2012 but not in 2006. In contrast, the estimates for *age*, *male*, and *nationality* are robust to specification changes, the first two being positive and the third being negative, both before and during the crisis. Afterwards, to give greater statistical reliability to the estimates, we pooled the surveys in Table A4.1 of Appendix. The period effect, *t*, has a negative and significant sign at all. Accordingly, in the crisis period it would be less drinking. The rest of control variables remains stable.

Table 4.2. Probit-model estimation. Dependent variable: *heavy drinker*

Variable/ specification	**Pre-crisis (2006)**				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Unemployed	-0.133 *** (-3.45)				
Unem_never		-0.197 (-1.05)			
Unem_6			-0.064 (-1.15)		
Unem_6_12				-0.356 *** (-3.34)	
Unem_12					-0.116 * (-1.89)
Age	0.021 *** (18.08)	0.021 *** (18.03)	0.021 *** (18.00)	0.021 *** (18.05)	0.022 *** (18.18)
Male	0.830 *** (34.56)	0.838 *** (35.02)	0.837 *** (35.01)	0.837 *** (35.00)	0.835 *** (34.84)
Educ2	-0.010 (-0.26)	-0.006 (-0.17)	-0.007 (-0.19)	-0.007 (-0.17)	-0.007 (-0.19)
Educ3	-0.057 * (-1.75)	-0.050 (-1.54)	-0.051 (-1.56)	-0.051 (-1.57)	-0.052 (-1.60)
Educ4	-0.007 (0.15)	0.002 (0.04)	0.001 (0.02)	0.002 (0.04)	-0.000 (-0.01)
Educ5	-0.086 *** (-2.58)	-0.074 ** (-2.22)	-0.075 ** (-2.27)	-0.077 ** (-2.31)	-0.078 ** (-2.33)
Married	-0.026 (-1.02)	-0.019 (-0.77)	-0.020 (-0.79)	-0.022 (-0.89)	-0.021 (-0.83)
Nationality	-0.241 *** (-5.53)	-0.240 *** (5.50)	-0.239 *** (5.48)	-0.241 *** (5.53)	-0.242 *** (-5.54)
Pseudo R^2	0.106	0.105	0.105	0.106	0.105

Variable/ specification	**Crisis (2011-2012)**				
Unemployed	0.007 (0.23)				
Unem_never		-0.263 (-1.60)			
Unem_6			0.140*** (2.69)		
Unem_6_12				0.017 (0.25)	
Unem_12					-0.073* (-1.74)
Age	0.015*** (14.49)	0.015*** (14.29)	0.015*** (14.70)	0.015*** (14.52)	0.015*** (14.54)
Male	0.870*** (36.50)	0.870*** (36.50)	0.868*** (36.44)	0.870*** (36.53)	0.871*** (36.55)
Educ2	-0.059* (-1.91)	-0.057* (-1.85)	-0.062** (-2.03)	-0.058* (-1.90)	-0.055* (-1.81)
Educ3	0.186*** (4.61)	0.183*** (4.52)	0.189*** (4.68)	0.186*** (4.61)	0.182*** (4.52)
Educ4	0.189*** (3.57)	0.184*** (3.49)	0.191*** (3.62)	0.188*** (3.56)	0.183*** (3.46)
Educ5	0.201*** (4.73)	0.197*** (4.67)	0.203*** (4.81)	0.200*** (4.73)	0.194*** (4.57)
Married	-0.119*** (-4.79)	-0.120*** (-4.85)	-0.119*** (-4.79)	-0.120*** (-4.81)	-0.122*** (-4.90)
Nationality	-0.170*** (-4.15)	-0.169*** (-4.13)	-0.174*** (-4.24)	-0.170*** (-4.15)	-0.167*** (-4.08)
Pseudo R^2	0.095	0.096	0.096	0.095	0.096

Notes: *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Observations: 14,696 for 2006 and 14,981 for 2011-2012.

Next, we explore the mechanisms through which *heavy-drinking frequency* operates, as Table 4.3 shows using "not drink alcohol" as reference category. Each column represent each heavy-drinking frequency category (1 to 3). The estimates for the subsample of heavy drinkers are in line with the trends observed for the full sample. Whereas before the crisis period it is always less likely to drink if it is unemployed, during the crisis this variable is no longer significant. Regarding control variables, it is more likely that men drink on weekends, weekdays or independently, than they do not.

Coefficients on *education* are positive for the higher levels. The inverse applies to *married* and *nationality*. Related to *age*, before the crisis it is more likely that aged people drink both, than not. The likelihood is inverse to drink the weekend. During the crisis, the same is applied to more age and drinking on weekdays. As done for *heavy drinker*, the robustness of the results are checked through Table A4.2 in the Appendix were both surveys are pooled. This Table shows that it is always less likely to drink in crisis.

Table 4.3. Multinomial Logit-model estimation. Dependent variable *heavy-drinker frequency*

Variable/ outcome	**Pre-crisis (2006)**		
	Base outcome = 0		
	(1)	**(2)**	**(3)**
Unemployed	-1.302 ***	-0.665 *	-0.596 ***
	(-4.46)	(-1.78)	(-3.52)
Age	-0.056 ***	0.015	0.026 ***
	(-6.33)	(1.31)	(4.07)
Male	1.267 ***	1.527 ***	1.353 ***
	(7.09)	(6.09)	(10.31)
Educ2	-0.075	-0.420	-0.153
	(-0.29)	(-1.11)	(-0.81)
Educ3	0.377	0.248	0.230
	(1.61)	(0.80)	(1.30)
Educ4	0.708 **	0.153	0.428 *
	(2.22)	(0.33)	(1.67)
Educ5	0.884 ***	0.973 ***	0.635 ***
	(3.43)	(3.08)	(3.15)
Married	-0.540 ***	-0.054	-0.033
	(-2.97)	(-0.22)	(-0.24)
Nationality	-0.388	-0.205	-0.053
	(-1.20)	(-0.44)	(-0.21)
Variable/ outcome	**Crisis (2011-2012)**		
	Base outcome = 0		
	(1)	**(2)**	**(3)**
Unemployed	-0.079	-0.695	-0.015
	(-0.85)	(-0.63)	(-0.23)
Age	-0.030 ***	0.058 *	0.044 ***
	(-9.16)	(1.72)	(19.62)

Male	1.557 ***	2.702 ***	1.821 ***
	(20.36)	(2.46)	(35.41)
Educ2	-0.418 ***	-0.303	-0.126 **
	(-4.57)	(-0.30)	(-1.96)
Educ3	1.032 **	0.405	0.445 ***
	(6.92)	(0.32)	(5.52)
Educ4	1.023 ***	1.805	0.495 ***
	(5.81)	(1.43)	(4.47)
Educ5	1.201 ***	-12.119	0.655 ***
	(7.81)	(-0.03)	(7.52)
Married	-0.376 ***	-1.425 *	-0.069
	(-4.80)	(-1.66)	(-1.34)
Nationality	-0.501 ***	2.735 ***	-0.346 ***
	(-4.05)	(3.37)	(-3.91)

Notes: *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Observations: 4,079 for 2006 and 11,321 for 2011-2012.

We now present the results of the matching techniques, which provide comparisons on different points in the transition along the business cycle. As we have previously observed, drinking behaviour during the period of acceleration (2006) differed significantly from drinking behaviour during the slowdown (2011-2012). To report the ATT estimates from Equation (4.4) we used alternative matching approaches for the categories "treated" (unemployed) and "untreated" (employed) (Table 4.4). Here we present the data corresponding to the category "unemployed", the estimated heavy drinking among the category "unemployed" if they had been working (counterfactual), and the difference between these two categories (Columns (1), (2), and (3), respectively). It is to be noted that the difference increases during the period under study from -0.033 to 0.013 ("nearest neighbour with replacement"). These results suggest that being unemployed prior to the recession did not increase the incidence or degree of heavy drinking, and the estimates are very robust to the matching method.

However, it seems to have a positive effect during the crisis, although less significant than it was during the pre-crisis period.

Table 4.4. Impact estimates of unemployment on heavy drinking. Dependent variable: *heavy drinker*

Pre-crisis (2006)	Unemployed $E(Y_1\|D = 1)$	Counterfactual $E(Y_0\|D = 1)$	ATT (Impact)
Nearest neighbour with replacement	0.197	0.228	-0.031 (-1.37)
Nearest neighbour without replacement	0.197	0.229	-0.033*** (-3.37)
Nearest neighbour with more than one neighbour (3)	0.197	0.217	-0.021 (-1.38)
Radius matching (0.02)	0.197	0.227	-0.030*** (-2.94)
Kernel	0.197	0.237	-0.047*** (-3.90)
Crisis (2011-2012)	Unemployed $E(Y_1\|D = 1)$	Counterfactual $E(Y_0\|D = 1)$	ATT (Impact)
Nearest neighbour with replacement	0.254	0.246	-0.008 (-0.37)
Nearest neighbour without replacement	0.254	0.241	0.013 (1.46)
Nearest neighbour with more than one neighbour (3)	0.254	0.242	0.012 (0.86)
Radius matching (0.02)	0.254	0.251	0.003 (0.26)
Kernel	0.254	0.252	0.002 (0.20)

Notes: Full model that adjusts for age, gender, education, marital status, and nationality in each year. Average treatment effect on the treated (ATT) is the difference between the two previous columns. *t*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10%, respectively.

The DiD estimates from Equation (4.5) confirm the aforementioned results (Table 4.5). γ measures the effect of unemployment on heavy drinking, and θ accounts for the change in the effect of unemployment on heavy drinking during the crisis period relative to its effect during the pre-crisis period. The effect of unemployment on heavy

drinking is negative (-0.121), so unemployed drink less. Besides, a decline (-0.085) in the incidence in this unhealthful habit is observed, i.e. lower levels of drinking in the crisis period[25]. The fact that the interaction term is positive and significant (0.132) suggests that being treated in the recession period increased drinking (compared to the previous one). In short, these results, like those reported above, indicate the unemployed drink (generally) less than the employed, but in the crisis period they drink (relatively) more. Along with the previous tables (specifically, Table 4.3), in the 2006 data there is a significant difference in drinking between the unemployed and the employed, but in the 2011-2012 data there is no significant difference at all. That is, the difference between unemployed and employed seems to has disappeared in the crisis period. In addition, as both the main outcome of interest and the main exposure of interest differ substantially by gender, in Table A4.3 of the Appendix the analysis has be done stratified by gender. The results are robust to the whole sample, and indicate that the unemployed would drink less.

Table 4.5. DiD estimates of the heavy drinking of unemployment changes before and during the economic crisis

Effect	Full model with controls	Pseudo R^2	*n*
Change in heavy drinking behaviour (δ)	-0.085 *** (-4.34)	0.098	29,677
Effect of unemployment on heavy drinking (γ)	-0.121 *** (-3.17)		
Change in the effect of unemployment on heavy drinking behaviour during the crisis (θ)	0.132 *** (2.70)		

Notes: Full model that adjusts for age, gender, education, marital status, and nationality. *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10%, respectively.

[25] As indicated, it may also reflect the moderating effects on alcohol consumption of increases in the price of alcoholic beverages and in the tax on them as well. In fact, there is considerable evidence that this is the case (Wagenaar, Salois and Komro, 2009).

4.5.Discussion

Recent literature offers conflicting and inconclusive evidence regarding the effect of economic cycles on health-related disorders. We provide new evidence regarding the impact of unemployment on drinking patterns in Spain, using data collected before and during the Great Recession. Alcohol use captures a very broad set of patterns: moderate/light use that might benefit health to heavy use (binging, drinking and driving, abuse/dependence) which might lead to social costs (health care use, reduced productivity in the labour market, increased crime, or traffic accidents). Focusing on heavy drinking behaviour we analysed alcohol-unemployment relationship. Our results along with Ettner (1997) indicate that the unemployed drink less than the employed, but in the crisis period they drink more, probably due to an income effect.

We hypothesize that heavy drinking is positively related with real disposable income. When the unemployed realize that hard times are here to stay, they tighten their belts accordingly. Alcoholic beverages are among the consumer goods that are not indispensable and that no longer find a place in the family budget. Then, this reduction could not occur if individuals can benefit for increasing disposable income due to family support or any resources by other insurance mechanism (Bentolila and Ichino, 2000). Thus, it confirms previous research indicating that heavy drinking is a pro-cyclical phenomenon (Ruhm and Black, 2002; Ruhm, 1995; Ásgeirsdóttir *et al*., 2014). For the Spanish case, these results support the ones of Del Pozo *et al.* (2002). Our evidence also confirm the hypothesis that drinking is largely a function of socioeconomic variables. For example, the double influence of educational variables through the awareness of the negative effects of alcohol abuse on physical and mental

health or via an income effect. Family responsibilities tend to limit their participation in festivities and the risk of their drinking to excess (Jiménez-Martín, Labeaga and Vilaplana-Prieto, 2006).

Besides, it is important to highlight the research limitations of the study. Despite the fact that the SNHS data allowed the incorporation of individual-specific characteristics, the fact that these data were self-reported means that the results are tentative. Moreover, certain values are missing, particularly in the case of the drinking variables. But instead of dampening researchers' spirits, these limitations should serve to spur further research into an issue of vital importance to Spain's citizens, employed and unemployed, drinkers and non-drinkers alike.

4.6. Conclusions

We assess if unemployment status, before and during the Spanish economic collapse of 2008, is related to heavy drinking behaviour. Results indicate that being unemployed reduce the probability of being a heavy drinker. Nonetheless, the difference between unemployed and employed seems to has disappeared in the crisis period. In light of the findings, when it comes to governmental reaction to alcohol-related risk factors, policymakers would do well to adopt a combination of prevention and control strategies. Even so, by focussing on alcohol related public health initiatives, we are not trying to divert attention away from these days more important challenges. That is, reducing unemployment, low income and social inequality.

Conclusiones

Esta tesis doctoral concluye con una última sección la cual contiene un resumen de algunas de las principales enseñanzas obtenidas en todos los capítulos anteriores. De igual forma, se establecen en este último apartado algunas de las posibles líneas de investigación futuras derivadas de esta tesis relativa al análisis económico aplicado a diversos aspectos concretos de la economía pública y de la salud.

El objetivo último de todas las líneas de investigación que aquí se plantean continúa siendo avanzar en el análisis de complementariedad existente entre la salud, la economía así como la participación del sector público en las mismas. Y es que dichos elementos son vitales para el diseño y evaluación de las políticas públicas. Esto es, dada la importancia de la sanidad en los Estados de Bienestar actuales, contribuir al estudio del papel de la misma en la economía y sus respectivas interrelaciones parece algo fundamental.

1. Resultados e implicaciones en términos de políticas públicas

La Economía de la Salud se ha convertido en una disciplina cuyo alto grado de especialización dentro de la economía viene justificado por su intensa producción científica en las últimas décadas, así como cuenta con la ventaja de que a menudo se nutre de otros enfoques disciplinarios. Y es que desde el trabajo seminal de Grossman (1972b), existe una amplia literatura académica que entiende la salud como una forma de capital. Así, la relación existente entre economía y salud es una de las más estudiadas a nivel internacional.

De este modo, dado que la sanidad es una de las bases fundamentales del Estado del Bienestar actual, en esta tesis doctoral, se han intentado abarcar el estudio de distintos elementos que relacionan la salud y la economía. En concreto, se han analizado cuestiones relacionadas con la financiación y el gasto sanitario en un marco internacional. Asimismo, se ha prestado especial interés a los efectos del capital salud sobre el crecimiento económico para el caso español, tanto desde una perspectiva directa como indirecta. De igual forma, se ha hecho referencia al estudio de la demanda sanitaria y a los estilos de vida de la población. A su vez, conscientes de los cambios que la crisis económica ha podido producir, los últimos capítulos, muestran un análisis empírico comparado de los efectos en salud antes y después de la "Gran Recesión". Cuestiones y resultados todos ellos vitales para el diseño y evaluación de estrategias de salud pública, tanto relativas a la promoción y prevención de la salud como a su financiación.

Como decíamos anteriormente, los resultados obtenidos en este ámbito aportan nueva evidencia empírica a los estudios sobre los determinantes del gasto sanitario, y

los efectos del mismo sobre la salud y la economía. Para ello, se han empleado diversas fuentes de datos tanto a nivel nacional como internacional. Se han considerado también los distintos niveles de gobierno actualmente existentes en cada país para la elección de las respectivas bases de datos a utilizar en el estudio. Las principales fuentes de datos han sido la *OECD Health Statistics* (antigua *OECD Health Data*), la BD.MORES, y la información proporcionada por el Instituto Nacional de Estadística y el Ministerio de Sanidad, Servicios Sociales e Igualdad.

Así, y en relación a la información disponible, es importante señalar las limitaciones de la investigación efectuada. El caso es, que a pesar de que los datos de las Encuestas Nacionales de Salud permiten la incorporación de características individuales al estudio, pensamos que debe tomarse siempre con cautela la interpretación de los resultados, al tratarse de información autoreportada por los individuos. Adicionalmente, algunas de las variables finalmente empleadas no son las mismas pues pueden cambiar según el tipo de encuestas y años considerados. Por otra parte, existen "valores perdidos" (información ausente o que simplemente falta), principalmente porque los individuos no contestan a una serie de preguntas o bien responden con la opción "*no sabe/no contesta*" incorporada en el cuestionario. Particularmente, esto último sucede en el caso de las variables relacionadas con el consumo de alcohol. En cuanto a la utilización sanitaria, se debe considerar el número de visitas a las que se hace referencia, pues tienen en cuenta únicamente el último mes. Especialmente si consideramos el caso de las Encuestas Nacionales de Salud.

En ese sentido, se resumen a continuación, para finalizar con esta tesis doctoral, las conclusiones más relevantes que se han obtenido en los cuatro capítulos previamente

expuestos en este trabajo. Asimismo, se establecen para cada uno las aportaciones más originales con respecto a la evidencia científica previamente existente.

En el Capítulo 1, se examinan empíricamente los efectos de la renta sobre el gasto sanitario para una muestra de 14 países de la OCDE, así como su dinámica durante el periodo 1971-2009. El contexto de análisis es poder contribuir al debate abierto en los últimos años en la Economía de la Salud acerca de si la elasticidad renta-gasto sanitario es mayor o menor que la unidad (Bac y Le Pen, 2002; Farag *et al.*, 2012). Los resultados encontrados en nuestro trabajo, son similares a los obtenidos en otros estudios recientes que utilizan técnicas de datos de panel. Son además compatibles con la hipótesis habitualmente empleada en la literatura en la que se plantea que el cuidado de la salud es una necesidad en el corto plazo, mientras que no se puede rechazar que sea un bien de lujo en el largo plazo. Se comprueba así la existencia tanto de un "efecto umbral" (siempre se observa que es un bien necesario para los países del "*clúster*" con menores niveles iniciales de renta y gasto) como de un "efecto anclaje" (los resultados muestran evidencia empírica suficiente de que los gastos sanitarios de un año están fuertemente condicionados por los gastos de ejercicios anteriores). Se testa, adicionalmente, la hipótesis de convergencia mediante "*clústeres*" de países. De hecho, este trabajo apoya la hipótesis de convergencia condicional en el gasto sanitario entre países desarrollados. Y es que, desde la perspectiva de la política económica, la tendencia creciente de los gastos sanitarios ha hecho que se cuestione la sostenibilidad financiera futura de los sistemas que los soportan. No obstante, nuestros resultados confirman que las mismas políticas de salud en la actualidad pueden tener efectos diferentes, dependiendo del marco final (país y periodo temporal) en el que se apliquen. Por ejemplo, la minoración de gastos públicos en salud podría aumentar a su vez el

relativo al sector privado en salud (relacionado con la renta) con un efecto indeterminado sobre el gasto sanitario total.

En el Capítulo 2, se han analizado los efectos de la relación existente entre salud y crecimiento económico para todas las regiones españolas en el período 1980-2007. Este fenómeno, ha sido considerado tradicionalmente como una relación de causalidad en una sola dirección. Esto es, la riqueza permite un mejor acceso a los alimentos, a inversiones en el cuidado de la salud o a la educación (Pritchett y Summers, 1996; Aghion, Howitt y Murtin, 2011). Sin embargo, en los últimos años aparece cada vez más evidencia empírica que explica la causalidad inversa, es decir, cómo la salud puede a su vez facilitar el crecimiento económico. Los resultados obtenidos en nuestro trabajo apoyan aquellos en la literatura académica que encuentran una relación negativa y directa entre mortalidad y crecimiento económico. De igual forma, se aporta evidencia acerca de los efectos indirectos de la salud sobre el crecimiento a través de distintos canales (inversión en capital físico y humano, así como el caso de la fertilidad). Estos resultados empíricos tienen una serie de importantes consecuencias desde la perspectiva de las políticas y estrategias de salud pública. Así, los principales objetivos para dichos responsables políticos deben dirigirse claramente a mejorar la salud de la población, especialmente a una edad temprana. Este supuesto es de vital importancia en los debates actuales sobre los costes y beneficios de los programas de atención sanitaria. Igualmente, siendo la protección de la salud uno de los indicadores más notables para cuantificar el grado de desarrollo económico, es importante ser conscientes de su papel al intentar prevenir e incluso evitar la aparición desigualdades sociales.

De este modo, en los dos últimos capítulos de la presente tesis doctoral, se ha reflexionado y analizado acerca de los efectos de los “shocks” (en la salud, su grado de

utilización así como los estilos de vida) causados por la crisis económica en España. Y es que, aunque en general se reconoce que el crecimiento a largo plazo mejora la salud (Newhouse, 1977 y 1992), el impacto de los cambios económicos a corto plazo en dicha salud sigue siendo objeto de debate (Catalano *et al*., 2011).

Examinar los determinantes de la utilización de los servicios sanitarios y las necesidades insatisfechas de asistencia sanitaria en España, durante la Gran Recesión y en el periodo anterior (con especial interés en el desempleo), son los objetivos que se plantearon alcanzar en el Capítulo 3. Nuestros hallazgos empíricos muestran que estar desempleado no ejerce un fuerte efecto en la probabilidad de experimentar necesidades de salud no satisfechas o en la utilización de los servicios sanitarios. Una posible explicación para ello es el hecho de que el sistema sanitario español tiene carácter universal y es financiado básicamente con impuestos por lo que la renta o el status laboral sólo quizás influiría sobre el acceso a servicios sanitarios bien mediante la modulación de la variable "tiempo de espera" bien a través del actual copago farmacéutico. También encontramos que los principales factores determinantes se concentran en personas de edad avanzada, mujeres, individuos con un alto nivel educativo o en aquellos con una "no muy buena salud" autopercibida. La "demanda inducida por la oferta" juega en este caso un papel importante, y más si se tiene en cuenta que la sanidad está descentralizada a las regiones españolas de manera completa (exceptuando Ceuta y Melilla) desde el año 2002. El factor regional puede ser así relevante para las autoridades públicas a este nivel ya que éstas pueden implementar políticas sociales destinadas a moderar los efectos económicos adversos que puedan a su vez afectar al derecho constitucional relativo a la protección de la salud. Es importante resaltar, que dichas políticas de salud deberían contribuir a reducir las desigualdades en

ese campo, promocionando la igualdad de acceso a los servicios de salud a las personas más desfavorecidas o con más en riesgo de exclusión social.

Finalmente, en el Capítulo 4, se han analizado los cambios experimentados en los últimos años en los estilos de vida de la población española. En concreto, son también estudiados los hábitos de salud asociados al consumo "excesivo" de alcohol, con especial interés en el posible efecto del desempleo. La principal razón para acometer este estudio es que la literatura académica reciente ofrece evidencia contradictoria y poco concluyente sobre el efecto final de los ciclos económicos en las perturbaciones relacionadas con la salud. Nuestro análisis muestra que estar desempleado reduce la probabilidad de beber de manera "excesiva". Este consumo se asociaría positivamente con la renta disponible, siendo entonces un fenómeno procíclico. Sin embargo, la diferencia explicativa entre "parados" y "ocupados" parece desaparecer en el período de crisis con respecto al periodo anterior objeto de estudio. Así, cuando se trata de la reacción gubernamental a los factores de riesgo relacionados con el alcohol (en particular) y los estilos de vida (en general), las autoridades sanitarias harían bien en adoptar una combinación de estrategias públicas de prevención y control. De todos modos, no deberían desviar la atención de otros desafíos más importantes en la actualidad como son conseguir mayores reducciones tanto de las tasas de desempleo así como de las desigualdades sociales (Marmot y Bell, 2012; Cortès-Franch y López-Valcárcel, 2014).

En síntesis, las aportaciones originales de la presente tesis doctoral para cada uno de los capítulos han sido las siguientes:

- El Capítulo 1, se distingue de los anteriores estudios publicados sobre la temática objeto de análisis en este caso por tres vías: (i) dentro de la

literatura académica que trata de analizar los determinantes del gasto sanitario, los estudios previos prácticamente no distinguen entre el corto y el largo plazo; (ii) el modelo especificado, basándose en la teoría neoclásica del crecimiento (Barro y Sala-i-Martín, 1995) considera la hipótesis de convergencia del gasto sanitario entre países; (iii) se llevan a cabo distintos test de sensibilidad de los resultados empíricos, atendiendo a diferencias por subgrupos de países y subperiodos de tiempo.

- Para el Capítulo 2, las características distintivas serían las siguientes: (i) hasta donde llega el conocimiento de la doctoranda y supervisores, es uno de los primeros trabajos que analiza para el caso español el efecto del capital-salud sobre el crecimiento económico, considerando como *proxy* del capital salud a la mortalidad infantil, (ii) se utiliza para el análisis un modelo estructural, basado en el planteamiento propuesto por Lorentzen, McMillan y Wacziarg (2008) que analiza los distintos canales que afectan al crecimiento (capital físico, capital humano y fertilidad), mientras que adicionalmente se emplean otras técnicas de datos de panel; (iii) por tanto se estudian, de manera conjunta e independiente los efectos directos e indirectos de la salud sobre el crecimiento económico.
- Las novedades del Capítulo 3, radican en ser uno de los primeros trabajos que analizan las necesidades de salud no satisfechas para España, atendiendo a las diferencias existentes basadas en el ciclo económico. Otros elementos de la demanda del mercado sanitario, como son la utilización y sus determinantes, son estudiados también en este capítulo.

- El Capítulo 4, al igual que el anterior, propone un análisis empírico para dos fases opuestas del ciclo económico. (i) Hasta donde llega nuestro conocimiento, es de los pocos trabajos para España que se centran de manera actual en estudiar la relación entre desempleo y estilos de vida, haciéndolo en concreto para el caso del consumo "excesivo" de alcohol, (ii) la metodología utilizada en este capítulo, es de las más recientemente empleadas en nuestro país en la evaluación económica e incluye las técnicas de "emparejamiento" (matching).

2. Futuras líneas de investigación

Los cuatro capítulos de esta tesis doctoral, si bien han dado respuesta a algunas preguntas científicas relevantes en el campo de la economía de la salud, sugieren ciertas cuestiones que pueden abordarse en futuras investigaciones. Así, a partir del trabajo desarrollado en la presente tesis doctoral, resulta relativamente fácil encontrar líneas de estudio a considerar a partir de la misma, ya sea bien en la profundización tanto teórica como empírica de los temas o enfoques tratados, bien en cuestiones derivadas de dicha temática. Si bien, todas las líneas de avance estarán restringidas en cada momento a la calidad y disponibilidad de datos.

Relacionado con la evolución de los gastos sanitarios, y los debates actuales acerca de la sostenibilidad futura de los sistemas sanitarios, así como de los costes y beneficios de distintos programas de salud pública, resulta imprescindible realizar un seguimiento y un análisis coste-efectividad de los mismos. En este campo, tener en cuenta el contexto de trabajos de "segunda generación" una vez completada la

descentralización de competencias sanitarias, es clave para el caso español (Lopez-Casasnovas y Rico, 2003). Por consiguiente, atender a las variaciones en los grados de acceso y equidad son cuestiones de vital importancia, y más en un contexto económico como el actual, donde la salud, tiene un papel prioritario en la cohesión y desarrollo económico de regiones y países.

Así, y dado que la relación entre crecimiento económico y salud es un área fértil de investigación en la que se debe hacer un mayor esfuerzo para generar más información empírica para las autoridades competentes, el segundo capítulo podría extenderse aún más en el futuro en cuanto a sus líneas de estudio. Sería pues interesante comprobar los resultados mediante el uso de otras *proxies* del capital salud, distintas a la mortalidad infantil, así como considerar causas específicas de mortalidad (por ejemplo, distintos tipos de cáncer o de enfermedades cardiovasculares, u otro tipo de enfermedades crónicas o infecciosas). De igual forma, pensamos que es fundamental avanzar en la comprensión de cómo las medidas de calidad relacionada con la salud se relacionan con el bienestar subjetivo, y la importancia de las mismas en la asignación de recursos (Cubí-Mollá, De Vries y Devlin, 2014; García-Gómez *et al*., 2015). Y seguir trabajando desde una perspectiva multidisciplinar resulta también algo básico en estos tiempos en los que vivimos.

Adicionalmente, debido a que en el campo de las desigualdades en salud es un área de análisis en la que se debe hacer un mayor esfuerzo para generar información empírica para los decisores de políticas públicas, los últimos capítulos podrían ampliarse en cuanto a sus líneas de trabajo. Sería pues valioso comprobar si los resultados varían o no considerablemente en otros escenarios mediante el uso de otras encuestas, métodos y variables de control, o bien realizar el mismo estudio para varios

países europeos o de la OCDE o en vías de desarrollo. Para ello, podremos acudir a la información facilitada por los distintos Ministerios del Gobierno de España, el INE o Eurostat o fuentes de información similares, y acceder a otras encuestas como son: la Encuesta Europea de Salud, la Encuesta de Condiciones de Vida, la Encuesta sobre Discapacidades o Encuestas sobre el consumo de drogas, etc. Asimismo, la Encuesta de Salud, Envejecimiento y Jubilación en Europa (*The Survey of Health, Ageing and Retirement in Europe*, SHARE) también puede ser un elemento de análisis importante a tener en cuenta para futuros trabajos de investigación.

De igual forma, atender al efecto económico de la inmigración y la existencia de otros cambios asociados a los estilos de vida es fundamental. Será pues prioritario tanto en España, como en países de su entorno, adoptar estrategias aún más ambiciosas que las actuales frente al sedentarismo, la obesidad o los desórdenes alimenticios (Costa-Font y Jofre-Bonet, 2013). También es vital estudiar el impacto de las enfermedades crónicas, mentales o raras, las cuales afectan a la salud y a su gasto relacionado en los países, así como la relación coste-efectividad de las innovaciones sanitarias. Igualmente, resulta interesante dado su impacto en el gasto sanitario, entre otras cuestiones, el análisis de la información y difusión de los nuevos medicamentos así como los hipotéticos incrementos en costes que supondrá la innovación sanitaria (por ejemplo, el actual debate entre fármacos biológicos y biosimilares) versus los posibles beneficios en salud que ello supondrá (Serra-Sastre y McGuire, 2013). Todo ello resulta pues prioritario y se configura como una auténtica agenda de investigación aún pendiente de abordar para estas próximas décadas.

Conclusions

This thesis concludes with a final section which contains a summary of some key lessons learned through the previous chapters. In the same way, some possible future lines of research derived from this thesis, on the applied economic analysis to various specific aspects of the area of public economics and health, are established.

The final aim of all these future lines of research presented here, would be still advance more in the analysis of complementarity between health, the economy and public sector participation. These elements are vital in the designing and evaluation of public policies. That is, given the importance of health on Welfare States, contribute to the study of the role of health in the economy and their interrelationships seems essential.

1. Results and implications for public policy

Health Economics has become a highly specialized discipline within the economy and often draws on other disciplinary approaches. Since the seminal paper of Grossman (1972b), there is vast academic literature linking health as a form of capital. Thus, the correlation between health and the economy is one of the best known in the international economic development.

Therefore, given that health is one of Welfare States' basic pillars, in this thesis, we have tried to include the study of different elements that connect health and the economy. Precisely, issues related to financing and health expenditure in an international context have been analysed; or it has paid special attention to the effects of health capital on economic growth, both direct and indirect, for the Spanish case. Similarly, reference is made to the study of demand for health care and population's lifestyles. Aware in turn on changes the economic crisis could has produced, the last chapters show an empirical comparative analysis before and through the "Great Recession". Issues and outcomes all them vital to the design and evaluation of public health strategies, both concerning health promotion and prevention, or its funding.

The results obtained in this field, provide new empirical evidence on the determinants of health expenditure, and its effects on health and the economy. In doing so, national and international data have been used. We have also considered the various existing levels of government in each country for the elaboration of the respective databases used in the study. The main sources of data were the OECD Health Statistics (formerly OECD Health Data), BD.MORES, and information provided by the Spanish

National Statistics Institute (INE) and the Ministry of Public Health, Social Services and Equality.

Thus, in relation to the available information, it is important to highlight the limitations of the research carried out. The fact is that although data from National Health Surveys allow the incorporation of individual characteristics to the study, it should be taken with caution when interpreting the results, because these information are self-reported by individuals. In addition, some of the variables are not the same between surveys as they may change according to surveys and years considered. Moreover, there are "missing values" (missing information), mainly because individuals do not answer some questions or respond with the option do not know/no answer incorporated into the questionnaires. Particularly, the latter happens in the case of alcohol-related variables. Regarding utilization, it should be noted the number of visits asked for are related only with the last month.

Consequently, to conclude this study, the most relevant conclusions that have been obtained in the four chapters previously exposed, are summarized below. It is also established, for each one, the most original contributions in regard to previous empirical evidence.

Chapter 1, empirically examines the impact of income on health care expenditure and its dynamics over time, in a sample of 14 OECD countries for the period 1971 to 2009. The context of analysis is the opened debate, in recent years, in the field of health economics of whether the income elasticity of health expenditure is greater or less than unit (Bac and Le Pen, 2002; Farag *et al.*, 2012.). The results are similar to those obtained in recent studies using panel data techniques. They are also compatible with the hypothesis that health care is a necessity in the short-run but it

cannot be rejected to be a luxury good in the long-run. The existence of a "threshold effect" (it is always observed that it is a necessary good for countries of the cluster with lower initial levels of income and expenditure) and "anchorage effect" (the results show strong empirical evidence that health expenditure on a year is strongly influenced by the one from the previous) are also checked. The convergence hypothesis is additionally tested by clusters of countries. In fact, this study supports the hypothesis of conditional convergence in health expenditure across countries. From a policy economic perspective, rising trends in health expenditure had concerned about the sustainability of national health care systems. However, our results confirm that nowadays same health policies can have different effects, depending on the framework in which it is implemented. For example, public health expenditure cuts could increase private health expenditure (related with income) with an indeterminate effect on total health expenditure.

Chapter 2, has analysed the effects of the relationship between health and economic growth across all the Spanish regions over the period of 1980 to 2007. This correlation has been traditionally seen as a causal link in only one direction. That is, wealth allows better access to food, investments in health care or education (Pritchett and Summers 1996; Aghion, Howitt and Murtin, 2011). However, in recent years a sizeable body of research has addressed the reverse causation, i.e. how health capital facilitate economic growth. Similarly, evidence of indirect health effects on growth through different channels (investment in physical and human capital, and fertility) is shown. Our results have a number of consequences from a policy economic perspective and public health strategies. Thus, one of the main objectives for policymakers should be clearly directed to improve population health, especially at an early age. This

assumption is on primary importance in current debates on the cost and benefits of health care programs. Instead, being health one of the most sensitive indicators to reflect development, it is important to aware its significance in order to prevent, and even to avoid, social inequalities.

Hence, in the last two chapters, it has been reflected and discussed about the effects of "shocks" caused by the economic crisis in Spain. It is generally recognized that in the long term economic growth improves health (Newhouse, 1977 and 1992), however, the impact of economic short-term changes on health is still an opened debate (Catalano *et al*., 2011).

Examine the determinants of the use of health services and unmet health care needs in Spain, through the Great Recession and the previous period (with special emphasis on unemployment) were the objectives of Chapter 3. Our findings show that being unemployed does not exert a strong effect on the probability of experiencing unmet health care needs or using health care services. Here, it may have an important role the fact, Spanish National Health System is characterised by universal coverage and tax funding. Furthermore, we find these effects are concentrated on elderly, female, highly educated and not very good self-assessed health individuals. Our findings support that demand-induced supply plays a major role, and even more, if considering health care is completely decentralized to regions since 2002. The regional factor may be relevant as regional public authorities can implement social policies aimed at moderating adverse effects that could affect health protection. It is important to highlight that health policies should help to reduce inequalities and promote equal access to health services to those most disadvantaged.

Finally, in Chapter 4, it have been analysed the changes there have occurred in recent years in the lifestyles of the Spanish population. Specifically, health habits associated with excessive alcohol consumption, with special emphasis on unemployment, are also studied. In the academic literature there is not a consensus on how the effect of the business cycle affects health behaviours. Results indicate that being unemployed reduce the probability of being a heavy drinker. Thus, heavy drinking would be positively associated with disposable income and it would be a pro-cyclical phenomenon. Nonetheless, the difference between unemployed and employed seems to has disappeared in the crisis period. Therefore, when it comes to governmental reaction to alcohol-related risk factors (in general) and lifestyles (in particular), policymakers would do well to adopt a combination of prevention and control strategies. Even so, by focussing on alcohol related public health initiatives, we are not trying to divert attention away from these days more important challenges. That is, reducing unemployment and social inequalities (Marmot and Bell, 2012; Cortès-Franch and López-Valcárcel, 2014).

The original contributions of the thesis for each of the chapters are the following ones:

- Chapter 1, differs from it processors by three ways: (i) within the academic literature that attempts to analyse the determinants of health expenditure, the abovementioned studies hardly distinguish between short- and long-term; (ii) the specified model based on the neoclassical growth theory (Barro and Sala-i-Martin, 1995) considers health expenditure convergence hypothesis across countries; (iii) it carries out

diverse sensibility tests, looking at differences between subgroups of countries and subperiods of time.

- For Chapter 2, the distinctive features are the following: (i) as far as we are concerned it is among the first to disentangle health-related growth for the Spanish regions, when using infant mortality as a proxy for health status; (ii) to this examination it is used a structural model based on Lorentzen, McMillan and Wacziarg (2008) which analyses the different channels that affect growth (physical capital, human capital and fertility), additionally other panel data techniques are applied; (iii) the direct and indirect effects of health on economic growth are both, jointly and independently, studied.
- The innovative approaches of Chapter 3, lie in being one of the first studies analysing unmet health care needs for Spain, while in addition attending to differences based on the economic cycle. Other elements of the health care market demand, such as the utilization and its determinants, are also discussed in this chapter.
- Chapter 4, as its predecessor, empiricaly analyses two opposite phases of the economic cycle. (i) To our knowledge, this is one of the few studies which for Spain, is focused on the study of the relationship between unemployment and lifestyles, in particular, excessive alcohol consumption; (ii) the methodology used in this chapter, is the most recently used in our country for economic evaluation, and it includes matching techniques.

2. Future lines of research

The four chapters of this thesis, while having answered some important scientific questions in the field of health economics, suggest certain issues that can be addressed in future research. Thus, from the research developed in this thesis, it is relatively easy to find lines of research to look after it, either deepening in topics or treated approaches, as well as in matters arising from this issue. All future research lines will be restricted to the quality and availability of data.

Related to the evolution of health care expenditure, and current debates about the future sustainability of health care systems and the costs and benefits of different public health programs, both making a track and a cost-effectiveness analysis are essential. In this field, taking into account the context of "second generation" studies, once the decentralization of health care is completed, is key to the Spanish case (Lopez-Casasnovas and Rico, 2003). Addressing the variations in the degrees of access and equity are matters of vital importance, and even more in an economic context like this, where health has a very important role in the cohesion and economic development of regions and countries.

Accordingly, because health-related growth is an area in which greater effort must be made to generate empirical information for policymakers, Chapter 2 could be extended even more in its future lines of research. It would be valuable to test the results by using other health proxies than infant mortality, and also to focus on specific causes of death (i.e.: different types of cancer or cardiovascular diseases, or other chronic or infectious diseases). Similarly, to advance in the understanding of how quality measures related to health are related to subjective well-being, and the importance of them in the

allocation of resources (Cubí-Molla, De Vries and Devlin, 2014; García-Gómez *et al*., 2015). Besides, to keep on working from a multidisciplinary perspective.

In addition, due to health inequalities is an area of analysis in which it be should make a greater effort to generate empirical information for public policymakers, the last chapters could be extended in their lines of research. Therefore, it would be valuable to test whether the results vary in other scenarios by using other surveys, other methods and control variables, or doing the same study for several European or OECD countries. For that, we turn to the information provided by the various Ministries of the Government of Spain, INE or by Eurostat, and access other surveys such as: the European Health Survey, the Living Conditions Survey, Survey on Disability and Surveys about drug use. Also, the Survey of Health, Ageing and Retirement in Europe (SHARE) could be considered in our future research.

In the same way, addressing the economic impact of immigration and the existence of other changes associated with lifestyles, in which adopting strategies against sedentarism, obesity or eating disorders (Costa-Font and Jofre-Bonet, 2013) will be a priority both in Spain and in neighbouring countries. Also, to study the impact of chronic, mental or rare diseases, which may affect health and its related expenditure, as well as cost-effectiveness of health innovations. Similarly, it is interesting, given their impact on health expenditure, among other things, the analysis of information and diffusion of new prescription drugs (Serra-Sastre and McGuire, 2013). All that is therefore a priority and is configured as an authentic pending research agenda for these next few decades.

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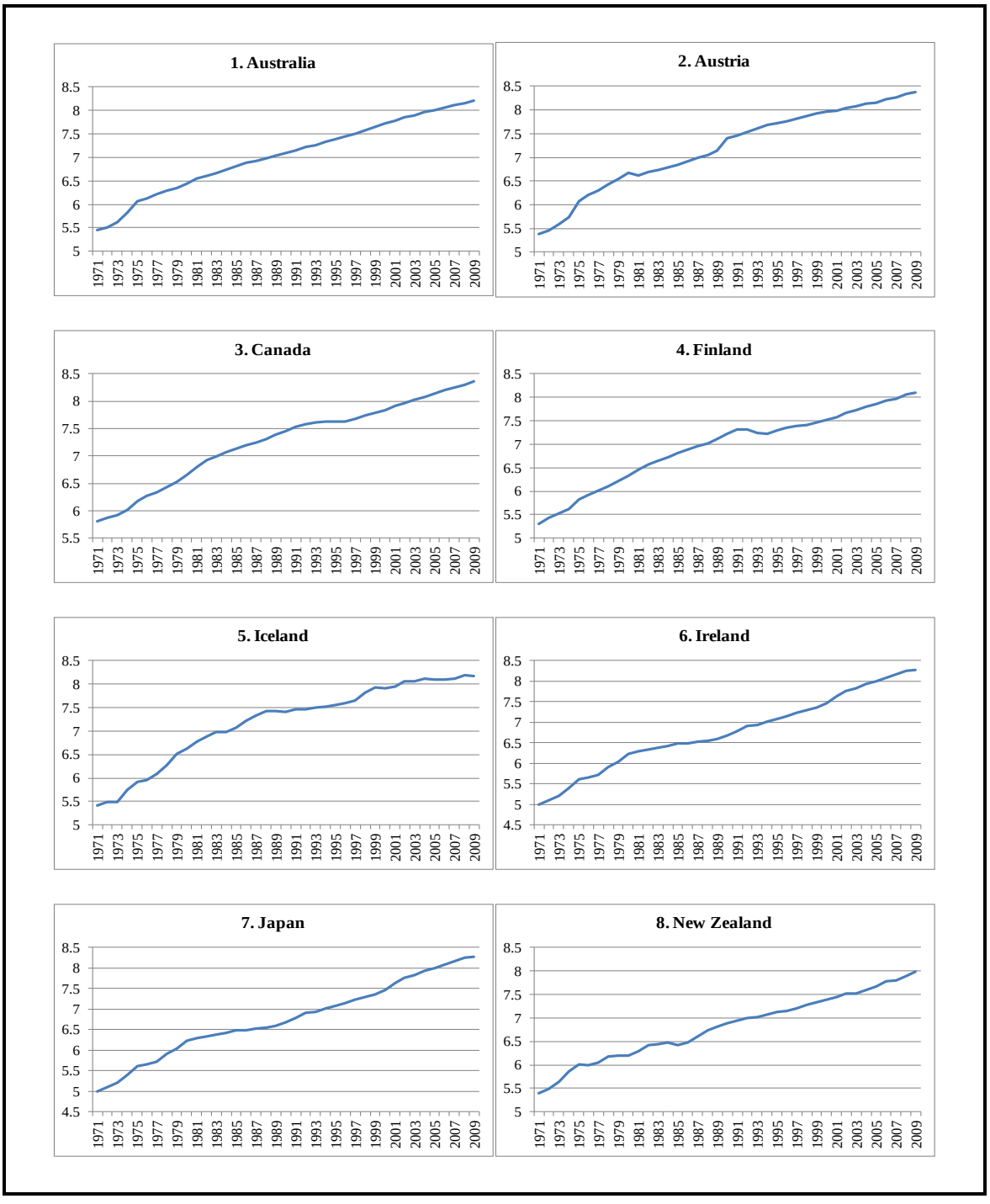
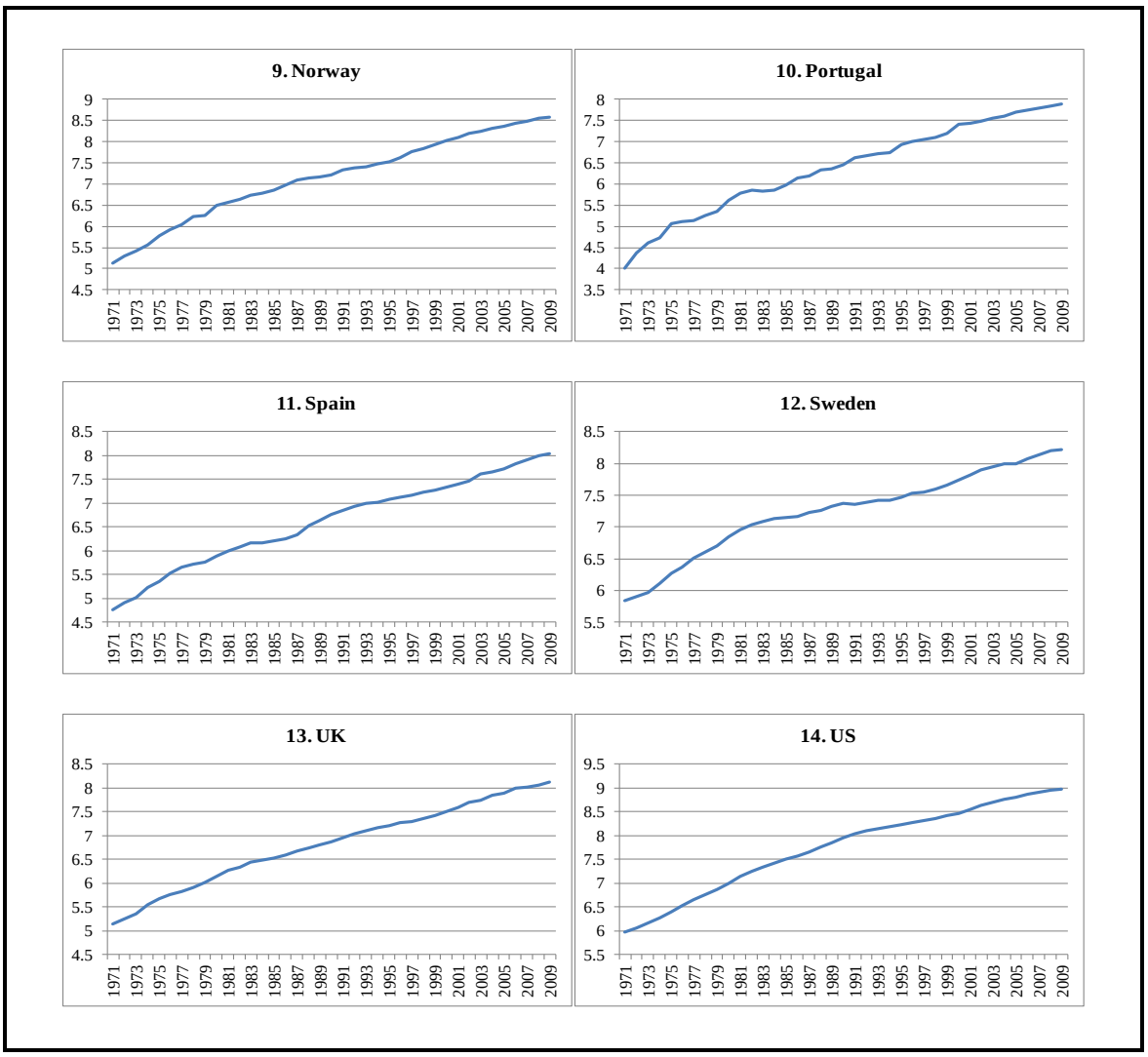
Appendix

Figure A1.1. Per capita health expenditure by country ($US PPP)





Source: Authors' elaboration based in OECD Health Data (2012).

Table A1.1. Determinants of health care expenditure: Econometric estimates of subperiods for specification (iii). Dependent variable: *expenditure*

		Short-run elasticity			**Long-run elasticity[a]**	
		Linear	*PANEL A*	*PANEL B*	*PANEL A*	*PANEL B*
Full set of observations	1971-2009	0.94 ***	0.20 ***	0.18 ***	1.12 ***	0.87 ***
		(0.06)	(0.03)	(0.05)	(0.05)	(0.14)
Subperiod of time	1971-1975	1.64 ***	0.58 ***	0.44	2.46 ***	1.95
		(0.11)	(0.16)	(0.28)	(0.61)	(0.52)
	1976-1991	1.12 ***	0.29 ***	0.33 ***	1.09 ***	1.22
		(0.09)	(0.06)	(0.09)	(0.12)	(0.23)
	1992-2001	1.30 ***	0.46 ***	0.46 ***	1.39 ***	1.43
		(0.08)	(0.14)	(0.12)	(0.07)	(0.27)
	2002-2009	1.06 ***	0.20 ***	0.19 ***	1.18 ***	1.05
		(0.07)	(0.06)	(0.06)	(0.12)	(0.38)

Notes: Panel A, when the technology variable is omitted, whereas it is included in Panel B. Robust standard errors are reported in brackets. [a]Standard errors calculated from Equation (1.4) using the delta method. ***, **, and * denote significant at 1%, 5%, and 10% respectively.

Table A4.1. Probit-model estimation pooled surveys. Dependent variable: *heavy drinker*

Variable/ specification	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Unemployed	-0.041 * (-1.72)				
Unem_never		-0.220 * (-1.78)			
Unem_6			0.047 (1.23)		
Unem_6_12				-0.094 (-1.61)	
Unem_12					-0.080 ** (-2.35)
t	-0.068 *** (-3.68)	-0.070 *** (-3.79)	-0.072 *** (-3.85)	-0.070 *** (-3.78)	-0.068 *** (-3.63)
Age	0.017 *** (22.14)	0.017 *** (22.05)	0.017 *** (22.27)	0.017 *** (22.18)	0.017 *** (22.32)
Male	0.853 *** (50.66)	0.853 *** (50.65)	0.854 *** (50.72)	0.854 *** (50.71)	0.853 *** (50.67)
Educ2	-0.007 (-0.28)	-0.007 (-0.34)	-0.008 (-0.38)	-0.007 (-0.33)	-0.007 (-0.29)
Educ3		0.009 (0.41)	0.011 (0.49)	0.010 (0.46)	0.009 (0.40)
Educ4	0.041 (1.25)	0.043 (1.29)	0.045 (1.38)	0.044 (1.34)	0.042 (1.26)
Educ5	0.007 (0.29)	0.010 (0.41)	0.013 (0.50)	0.010 (0.41)	0.007 (0.30)
Married	-0.067 *** (-3.83)	-0.066 *** (-3.73)	-0.065 *** (-3.69)	-0.066 *** (-3.76)	-0.067 *** (-3.83)
Nationality	-0.204 *** (-6.87)	-0.206 *** (-6.92)	-0.207 *** (-6.95)	-0.206 *** (-6.90)	-0.206 *** (-6.90)
Pseudo R^2	0.010	0.010	0.010	0.010	0.010

Notes: *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Observations: 29,677.

Table A4.2. Multinomial Probit-model estimation pooled surveys. Dependent variable *heavy-drinker frequency*

Variable/ outcome	Base outcome = 0		
	(1)	**(2)**	**(3)**
Unemployed	-0.146 **	-0.121	-0.051
	(-2.44)	(-0.72)	(-1.08)
t	-1.740 ***	-3.440 ***	-2.879 ***
	(-27.40)	(-20.99)	(-55.23)
Age	-0.020 ***	0.019 ***	0.033 ***
	(-10.02)	(3.76)	(20.54)
Male	1.172 ***	1.252 ***	1.382 ***
	(25.78)	(11.02)	(38.95)
Educ2	-0.193 ***	-0.237	-0.093 **
	(-3.49)	(-1.51)	(-2.11)
Educ3	0.524 ***	0.316 **	0.344 **
	(7.57)	(2.33)	(6.64)
Educ4	0.058 ***	0.371 *	0.406 ***
	(6.25)	(1.89)	(5.40)
Educ5	0.708 ***	0.605 ***	0.528 ***
	(9.24)	(4.23)	(8.99)
Married	-0.269 ***	-0.109	-0.046
	(-5.71)	(-1.02)	(-1.25)
Nationality	-0.361 ***	0.043	-0.222 ***
	(-4.74)	(0.24)	(-3.60)

Notes: *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10% respectively. Observations: 15,400.

Table A4.3. DiD estimates of the heavy drinking of unemployment changes before and during the economic crisis by gender

Effect (males)	Full model with controls	Pseudo R^2	*n*
Change in heavy drinking behaviour (δ)	-0.063 ** (-2.46)	0.027	14,335
Effect of unemployment on heavy drinking (γ)	-0.149 *** (-2.68)		
Change in the effect of unemployment on heavy drinking behaviour during the crisis (θ)	0.146 ** (2.16)		
Effect (females)	**Full model with controls**	**Pseudo R^2**	***n***
Change in heavy drinking behaviour (δ)	-0.107 *** (-3.52)	0.017	15,342
Effect of unemployment on heavy drinking (γ)	-0.094 * (-1.79)		
Change in the effect of unemployment on heavy drinking behaviour during the crisis (θ)	0.107 (1.47)		

Notes: Full models that adjusts for age, education, marital status, and nationality. *z*-statistics in parentheses. ***, **, and * denote significant at 1%, 5%, and 10%, respectively.