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ENSAYOS EN ECONOMÍA DE LA SALUD Y BIENESTAR: ESPECIAL REFERENCIA AL RETO DE LA CRONICIDAD

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DOCTORAL THESIS

Essays in Health and Welfare Economics: Special Reference to the Challenge of Chronic Diseases

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Contents

List of Tables

Introducción

1. Objetivos generales de la investigación y motivación: Economía de la Salud, del Bienestar y de las Enfermedades Crónicas

La mayoría de países de la Organización para la Cooperación y el Desarrollo Económico (OCDE) han descentralizado la gestión y financiación de sistemas de protección de la salud y bienestar que están fuertemente vinculados a sus distintas restricciones políticas y presupuestarias. Además, la cobertura social del Estado de bienestar alcanzada por cada país está determinada por su renta o factores de oferta y demanda.

De hecho, la OCDE, en sus informes periódicos denominados "*Health at a Glance*" muestra que la utilización de los servicios de salud para las personas mayores es mucho mayor que la de otros grupos de edad, lo que puede poner demasiado presión a las perspectivas que tienen los diferentes Estados de Bienestar en gastos sociales como Educación, Salud, Pensiones y Servicios Sociales.

Por tanto, esta tesis tiene como objetivo profundizar en el análisis del gasto social y atención sanitaria (o indicadores como el capital humano o la mortalidad infantil), el Producto Interno Bruto (PIB) y las distintas características sociodemográficas (edad avanzada, enfermedades crónicas, inmigración, etc.). De este modo, el estudio de estos determinantes se hace tomando como punto de partida una perspectiva macroeconómica, aunque finalmente se consideran algunas implicaciones microeconómicas. Realmente pensamos que esto es básico para poder diseñar y evaluar las distintas políticas y estrategias públicas implementadas por los gobiernos.

2. Metodología y fuentes de información

En esta tesis, los distintos métodos cuantitativos se combinan con un marco teórico limitado, tanto por la disponibilidad como por la calidad de los datos. Trabajamos así con diferentes técnicas econométricas como son modelos de datos de panel dinámico, de elección discreta o de conteo, entre otros.

Para ello, se utilizarán diferentes fuentes de datos. Por otra parte, también se emplean encuestas de salud (microdatos) y otro tipo de información relacionada con los objetivos de esta Tesis. Las principales fuentes de datos utilizadas son las estadísticas de la OCDE (OECD Health Statistics) para la Salud, las del Banco Mundial y la información proporcionada por el Instituto Español Nacional de Estadística (INE), tales como el Panel de Hogares de la Unión Europea (PHOGUE), la Encuesta Nacional de Salud española, la Encuesta de Condiciones de Vida (EU-SILC) o las del Ministerio de Salud, Servicios Sociales e Igualdad. Los softwares utilizados principalmente son Stata 10.0 y EVIEWS.

De este modo, en primer lugar cabe señalar que las estadísticas de salud de la OCDE (OECD Health Statistics) son, desde nuestro punto de vista la fuente más importante de información para comparar tanto los recursos como los resultados en términos de salud entre los diferentes sistemas nacionales de atención sanitaria. Esta fuente informativa es renovable anualmente y proporciona información sobre el estado de salud y sus recursos así como su utilización o financiación. Además, en la última sección de esta Tesis trabajamos con microdatos del PHOGUE, la Encuesta Nacional de Salud española o la más reciente que es la Encuesta de Condiciones de Vida (EU-SILC) realizada por el INE en colaboración con Eurostat. Es importante señalar que este tipo de encuestas están dirigidas a familias / hogares a fin de obtener datos sobre sus ingresos, estado de salud o condiciones de vida y sus factores determinantes desde un punto de vista tanto nacional como regional.

3. Contribuciones de la Tesis: Grado de innovación

El objetivo específico de esta tesis es analizar las implicaciones a nivel macro y microeconómico del gasto social y sanitario (e incluso determinados indicadores como el capital humano o la mortalidad infantil), el Producto Interno Bruto (PIB) y las características sociodemográficas (condiciones crónicas, envejecimiento, inmigración, etc.). Así que, con la información actualizada sobre dichas temáticas, pretendemos realizar una contribución original a los actuales estudios académicos en el campo de la economía de la salud y el bienestar.

La tesis se divide en cinco capítulos. Esos capítulos aunque independientes, están vinculados. Todos ellos tratan de analizar diferentes temas relacionados con la economía de la salud y el bienestar utilizando para ello distintas metodologías y contando para ello con todos los datos disponibles hasta la fecha. Por lo tanto, en los primeros cuatro capítulos, trabajamos con datos agregados, mientras que en el último capítulo se utilizan básicamente microdatos. Por lo tanto, la estructura es la siguiente:

- Capítulo 1: Gasto público y gasto social y su relación con el crecimiento económico en los países de la Unión Europea.
- Capítulo 2: Gastos sanitarios, Producto Interno Bruto y personas mayores en España: un estudio comparativo basado en los test de raíz unitaria.
- Capítulo 3: El capital humano y Producto Interno Bruto: un análisis empírico basado en técnicas de cointegración.
- Capítulo 4: Explicando las diferencias de mortalidad infantil en la Unión Europea.
- Capítulo 5: Impacto de la inmigración sobre los servicios de salud españoles a nivel regional: una aproximación empírica.

Según todo ello, el primer capítulo de la tesis se centra en la relación entre el gasto público y el social con la renta. A partir de esto, los tres capítulos siguientes continúan profundizando en el análisis de los efectos de los gastos sanitarios en el envejecimiento, el capital humano o incluso sobre la mortalidad infantil. Además, se consideran los efectos de la inmigración sobre los servicios regionales de salud.

El Capítulo 1 analiza la relación entre el gasto público y el social y el crecimiento económico en los países de la Unión Europea (UE) en el período 1994-2012. En particular, ponemos a prueba la hipótesis de que los países con un gran sector público crecen más rápido que los demás. El análisis se basa en la propia serie histórica de dichas variables para los países de la UE. Nuestros resultados obtenidos en base a distintas regresiones y técnicas de panel sugieren que el gasto público no está claramente relacionado con el crecimiento económico de estos países.

El Capítulo 2 estudia el papel del envejecimiento en la sociedad y su efecto en el aumento de los gastos sanitarios en las distintas regiones españolas para el período 2002-2013, identificando sus diferencias geográficas y explicando dichas implicaciones en base a las diferencias del PIB. Los resultados obtenidos en este estudio son similares a los ya encontrados en algunos trabajos recientes que utilizan estas mismas técnicas econométricas.

En particular, nos encontramos con que el porcentaje de personas mayores (afectadas principalmente por enfermedades crónicas como la Organización Mundial de la Salud ya ha demostrado) sobre el total poblacional afecta positivamente al gasto sanitario per cápita. Sin embargo, los resultados empíricos que obtenemos son diferentes por regiones españolas.

A continuación, en el siguiente capítulo de la tesis se analiza la relación entre el gasto en educación y el PIB a partir de datos europeos y diferentes modelos de regresión.

Los resultados empíricos son diferentes según el país que consideremos, lo que sugiere que no es posible aplicar técnicas de cointegración. De hecho, que exista una relación de largo plazo no está siempre garantizada. Utilizando así datos de la OCDE y el Banco Mundial, podemos confirmar que las variables (gastos de educación y PIB) no están integradas con el mismo orden. Por esta razón, la causalidad, desde un punto de vista estadístico, no resulta tan clara.

En el Capítulo 4 se explican las diferencias en indicadores de salud en los distintos países de la Unión Europea. En particular, las diferentes especificaciones del modelo se prueban utilizando técnicas de datos de panel y a la mortalidad infantil como variable dependiente. Además, se analizan los problemas de agregación en estudios de este tipo que afectan a la relación entre la salud poblacional y la desigualdad de ingresos. Nuestros resultados empíricos sugieren que la mortalidad infantil se relaciona negativamente con el número relativo de camas, médicos generales y el PIB per cápita. Así, la mortalidad infantil se relaciona positivamente con la pobreza, el tabaco y el consumo de alcohol, y "los ingresos de los ricos", medidos a través de la relación entre el percentil 95/percentil 5 de la distribución del ingreso. De esta forma, los mayores ingresos para los ricos se relacionan positivamente con la mortalidad infantil. Además, la tecnología médica mejora la eficiencia sanitaria y, teniendo en cuenta la desigualdad (medida a través del índice de Gini y la mortalidad infantil) se puede observar que un incremento de la misma se asocia con una mayor mortalidad infantil. Nuestros resultados dan así apoyo a las tesis que destacan la influencia de los recursos sanitarios, estilos de vida, desigualdad y pobreza sobre la mortalidad infantil en los países europeos.

En el capítulo final, se ha puesto a prueba la utilización de los servicios sanitarios por los inmigrantes medida como visitas a dichos servicios y utilizando para ello la información contenida en el Panel de Hogares de la Unión Europea, la Encuesta Nacional de Salud y las Encuesta de Condiciones de Vida. Utilizamos así un marco econométrico tradicional y seguimos este tipo de enfoques teóricos y metodológicos, para que así la utilización de servicios de salud por los inmigrantes sea analizada en todos los grupos socioeconómicos así como su nivel educativo y grupo de clase social. Nuestros resultados son consistentes con la investigación centrada en las relaciones entre inmigrantes, características socioeconómicas (como mayores necesidades de una población inmigrante más joven) y utilización de servicios sanitarios. Además, se espera que el estado de salud y utilización de servicios de salud de la población inmigrante se acerque a los niveles de salud de la población general confirmando así la existencia de "un efecto inmigrante sano".

En otro orden de cosas, cabe destacar que en los últimos años diferentes versiones de los cinco capítulos de esta tesis se han presentado en varios seminarios, conferencias y reuniones, tanto nacionales como internacionales. Por otra parte, algunos de los resultados empíricos contenidos en la tesis han pasado la primera fase del proceso de revisión en diferentes revistas o se encuentran ya publicados en "*Empirical Economics Letters*" en el año 2014 y en "*Journal of Knowledge Management, Economic and Information Technology*", siendo las correspondientes referencias:

- Álvarez-García, S.; Pascual, M.; Castañeda, D. (2015). "Is Social Protection Expenditure or an Investment? A Cross-Country Comparison in the European Union", *Journal of Knowledge Management, Economic and Information Technology*, 5(6), 1-10.
- Pascual, M.; González, N., Castañeda, D. (2014). "Human Capital and GDP: An Empirical Analysis based on Cointegration Techniques", *The Empirical Economics Letters*, 13(2), 1-10.

Por último, es importante destacar los diversos cursos a los que también he asistido (cursos de capacitación y formación de profesores de la Universidad de Cantabria, así como varios cursos de especialización), e igualmente he participado en varias conferencias y seminarios. Además, para mejorar y completar mi educación asistí a algunos cursos incluidos en el Máster en Dirección y Gestión de Servicios Sanitarios y Sociales (Universidad de Cantabria y Consejería de Sanidad del Gobierno de Cantabria) estrechamente a su vez relacionados con el área de investigación (economía de la salud y bienestar) de esta tesis.

Introduction

1. Purpose of Research and General Motivation: Health Economics, Welfare and the Chronic Diseases

Most of the Organization for Economic Cooperation and Development (OECD) countries members have decentralized the management and financing of their health care and welfare systems that are linked to political and budget constraints. Besides, the level of Welfare State achieved by each country is determined by its income or demand and supply factors.

In fact, the OECD, in its periodic reports "*Health at a Glance*" shows that the utilization of health care for elderly people is higher than the one the other age`s groups made and this fact can put over-pressured to Welfare States' perspectives in social expenditures as Education, Health, Pensions and Social Services.

Therefore, this thesis aims to deepen in the analysis of the social and health care expenditure (or indicators as human capital or child mortality), Gross Domestic Product (GDP) and sociodemographic characteristics (elderly, chronic conditions, immigration, etc.). In doing so, the study of these main determinants is taken from a macroeconomic point view as starting point but finally we also consider some microeconomic implications. We really think that it is basic for the design and evaluation of public policies and strategies performed by governments.

2. Methodology and Data

In this thesis, quantitative methods are combined with a theoretical framework restricted both by the availability and the quality of data. We work with different econometric techniques such as dynamic panel data models, discrete choice models and counting ones, among others.

To do so, different sources of data will be used. Moreover, health surveys (microdata) and other kind of information related with the aims of this Thesis are also applied. The main data sources utilized are the OECD Health Statistics, World Bank and information provided by the Spanish National Institute of Statistics (INE) such as the European Community Household Panel (ECHP), the Spanish National Health Survey, the European Statistics on Income and Living Conditions (EU-SILC), the Ministry of Public Health, Social Services and Equality. The software primarily used are Stata 10.0 and EVIEWS.

Firstly, it should be noted that the OECD Health Statistics is from our point of view the most important source of information to compare health inputs and outputs between different international health care systems. It is annually renewable and provides information on health status, health resources, utilization, or financing. Besides, on the final section of this Thesis we work with microdata from the ECHP, Spanish National Health Survey, the latest EU-SILC performed by INE in collaboration with Eurostat. It is important to point out that these surveys are directed at families/households in order to obtain data on income, life status health and determinants from citizens' viewpoint at .national and regional level.

3. Contributions of the Thesis: Degree of Innovation

The specific objective of this thesis is to analyze the macro and microeconomic implications of the social and health expenditure (and even indicators as human capital or child mortality), Gross Domestic Product (GDP) and sociodemographic characteristics (elderly, chronic conditions, immigration, etc.). So, with the updated information on this issue we intend to make an original contribution to the academic studies in the field of health and welfare economics.

The thesis is divided into five chapters. The chapters though independent, are linked. All of them deal with the analysis of different issues of health and welfare economics using different methodologies and all available data. Therefore, in the first four chapters

we work with aggregate data, while in the latest chapter microdata will be used. Thus, the structure is the following one:

- Chapter 1: Government and social expenditure and its relationship with economic growth in the European Union Countries.
- Chapter 2: Health care expenditure, Gross Domestic Product and the elderly in Spain: a comparative study based on unit root test.
- Chapter 3: Human capital and Gross Domestic Product: an empirical analysis based on cointegration techniques.
- Chapter 4: Explaining child mortality differences in the European Union.
- Chapter 5: Impact of immigration on Spanish regional health services: an empirical approach.

According to it, the first chapter of the thesis will be focused on the relationship between government and social expenditure with income. From this, the following three chapters will continue to deepen in the analysis of health care expenditure effects on elderly, human capital or even on child mortality. Also, the effects of immigration on regional health services are considered.

Chapter 1 discusses the relationship between government and social expenditure and economic growth in the European Union (EU) countries over the period 1994-2012. In particular, we test the hypothesis that countries with a large public sector grow faster than the other ones. The analysis is based on historical series for the EU countries. Our results obtained based on regressions and panel techniques suggest that government spending is not clearly related with economic growth in these countries.

Chapter 2 studies the role of ageing society to curb rising health care expenditures along the Spanish regions over the period 2002-2013, identifying their geographic differences and explain them based on GDP differences. The results found in this study are similar to some obtained in recent papers which use these econometric techniques.

In particular, we find that the elderly (mainly affected by chronic conditions as World Health Organization demonstrated) positively affects health care expenditure per capita. However, the empirical results are different by Spanish regions.

In the following chapter of the thesis, we analyse the relationship between education expenditure and GDP using European data and different regression models.

The empirical results are different by country, which suggests that it is not possible to use cointegration techniques. In fact, a long run relationship is not always guaranteed. Using data from the OECD and the World Bank, we can confirm that the variables (education expenditure and GDP) are not integrated with the same order. For this reason, the causality, from a statistical point of view, is not so clear.

In Chapter 4 we explain differences on health indicators in the European Union countries. In particular, different model specifications were tried using panel data techniques and child mortality as dependent variable. Also, the aggregation problem afflicting cross-sectional studies of the relationship between population health and income inequality is analysed. Our empirical results suggest that child mortality is negatively related to the relative number of acute care beds, general practitioners and GDP per capita. So, child mortality is positively related to poverty, tobacco and alcohol consumption, and "the income of the rich" measured through the ratio 95th percentile/5th percentile of the income distribution. In this way, higher incomes for the rich are related positively to child mortality. Besides, medical technology enhance the efficiency of health care and, considering the relationship between income inequality (measured through Gini index and child mortality) we can observe that greater inequality is associated with higher child mortality. Our results give support to the influence of health care resources, lifestyles, income inequality and poverty on child mortality in the European countries.

In the final Chapter, it is tested the utilization of health care services by immigrant population measured as counts of utilization using the information contained in the European Community Household Panel, National Health Surveys and the European

Statistics on Income and Living Conditions. We use an econometric framework and following these theoretical and methodological approaches, health care utilization by immigrants are analysed across socio-economic groups, educational attainment and social class group. Our findings are consistent with research focused on links between immigrant, socio-economic characteristics (like greater needs of a younger immigrant population) and health care utilization. Also, it is expected that health status and utilization of health services of immigrant population will converge with the levels of general population which will confirm the existence of "a *healthy immigrant effect*".

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

Furthermore, some of the empirical results have been published, or have passed the first stage of the review process in different journals, most of them with impact factor. Also, the papers published are the following ones:

- Álvarez-García, S.; Pascual, M.; Castañeda, D. (2015). "Is Social Protection Expenditure or an Investment? A Cross-Country Comparison in the European Union", *Journal of Knowledge Management, Economic and Information Technology*, 5(6), 1-10.
- Pascual, M.; González, N., Castañeda, D. (2014). "Human Capital and GDP: An Empirical Analysis based on Cointegration Techniques", *The Empirical Economics Letters*, 13(2), 1-10.

Finally, note I have also attended various courses (training courses and teacher training at the University of Cantabria, as well as several specialized courses), conferences and seminars. Additionally, to improve and complete my education I attended some courses included in the Master in Management of Health Services (University of Cantabria and Department of Health, Government of Cantabria) closely related to the area of research (public economics-health and welfare) of this thesis.

CHAPTER 1

GOVERNMENT AND SOCIAL EXPENDITURE AND ITS RELATIONSHIP TO ECONOMIC GROWTH IN THE EUROPEAN UNION COUNTRIES

1.1. INTRODUCTION

Since the seminal papers of Solow (1956) and Romer (1986), economists have become progressively more interested in cross-country comparisons of short-term and long-term general growth (Lucas, 1988) and in those factors which are correlated with growth (Katz et al., 1983; Saunders, 1985; Barro, 1991; Agell et al., 1997; Bergh and Henrekson, 2011). Thus, the study of government expenditure, globalization and economic growth has experienced a remarkable interest since the last years. In this sense, some authors have found a strong negative statistical relationship between economic growth and different measures such as public expenditures and tax burdens (Marlow, 1986).

However, other studies support the opposite hypothesis (Katz et al., 1983; Ram, 1986). Then, Agell et al. (1997) review the theoretical and empirical evidence on the relationship between growth and public sector in the Organization for Economic Cooperation and Development (OECD). These authors conclude that it is not possible to prove that there is a clear-cut causal connection from observations of public sector size to economic growth. Hsieh and Kon (1994) do not find that government expenditure can increase per capita output growth. However, Lin (1994) concludes that government size is estimated to have positive impact on economic growth in the short-term but not in the intermediate-term (25 years in the study). Barro (1990) found that the ratio of real government consumption expenditure to real Gross Domestic Product (GDP) had a negative association with growth and investment. The argument used was that government consumption had no direct effect on private productivity but lowered saving and growth through the distorting effects from taxation or government-expenditure programs. The major controversy has been on whether or not the public sector increases economic growth. In fact, many people think that any increase in social expenditure must be financed through higher taxes or cutting other relevant spending.

Therefore, the effects of government spending on economic growth continue being an active field of awareness. Theoretically, a larger government size is more likely to reduce economic growth (Ram, 1986). Firstly, because government activity is carried

out inefficiently. Secondly, due to excessive burdens and thirdly because it can reduce the productivity system. On the other hand, government spending could upgrade the relationship between private and social interests and improve commercial openness. Also, public investment can enhance economic growth[1].

As a result, the relationship between government size and economic growth is not clear (see Table 1.1.). Lin (1994) points out different ways in which government can increase public growth (through provision of public goods and infrastructure, social services and targeted intervention). Besides, government taxation can lead to misallocation of resources or unproductive and inefficient expenditures. Fölster and Henrekson (1997) support the theory that at low levels of government spending and taxation, the productive effects of public goods are likely to exceed the social cost of raising funds. However, economic growth is likely to be negatively affected after a certain point by further increases in public expenditure (Tanzi and Zee 1997). Also, Sheehey (1993) finds that while government size (government consumption expenditure/GDP) is smaller than 15%, government size and economic growth have a positive relationship. Nevertheless, when government size is larger than 15%, the relationship is negative.

In this sense, Cheng and Lee (2005) find that in Taiwan over-expanding government expenditure does not promote economic growth, but may cause damage to an economy, because of crowding out effects or tax increase. Obviously, if changes in the share of government spending could modify the output growth rate, the size of government could be a potentially important factor explaining long-term growth rates (Hsieh and Kon, 1994).

[1] The impact of public investment on regional performance depends on region-specific characteristics such as technical efficiency, organizational capacity and productive specialization (Gonzalez-Paramo and Martinez, 2003).

Table 1.1.

Literature Review: Empirical papers discussing the relationship between growth and public sector size.

Authors	**Data**	**Conclusion**
Rubinson (1977)	Cross country sample.	A larger government size promotes economic growth by reducing the "dependence" especially in the poorer, less developed contexts.
Landau (1983)	Cross-sectional study of over 100 countries in the period 1961-1976.	Negative relationship between the growth rate of real per capita GDP and the share of government consumption expenditure in GDP.
Kormendi and Meguire (1985)	Study based on post-war data from 47 countries.	No significant cross-sectional relationship between the growth rate of real GDP or the level of the share of government consumption spending.
Grier and Tullock (1987)	Study of 115 countries.	Negative relationship between the growth rate of real GDP and the growth rate of the government share in GDP.
Ram (1986)	Study based on information of 115 countries from 1960 through 1980.	The overall impact of government size on growth is positive in almost all cases.
Barro (1991)	Study of 98 countries for the period 1970-1985.	Negative relationship between the output growth rate and the share of government consumption expenditure.
Hsieh and Kon (1994)	Study based on historical data for the G-7 countries.	The relationship between government spending and growth can vary significantly across time and major industrialized countries that presumably belong to the same growth club.
Lin (1994)	Cross-country study over 25 years.	Government size has a positive impact on economic growth in the short-term but not in the intermediate term.

Source: Author's elaboration.

Besides, in 2013 in the European Unión (EU) countries, government social expenditure accounted for 40.2% over total general government expenditure followed by health (14.8%), general public services (14.1%), education (10.3%) and economic affairs (8.8%). However, these weights varied across EU member states (Eurostat, 2015) taking special attention to those countries that have more social expenditure and with more percentage of older, sickness and disability people.

In this framework, over the last decade most of the EU countries have seen steady gains in employment, GDP per capita and cohesion (European Commission, 2010). In particular, in the last decade, social protection expenditure in the European Union increased in most of the countries as percentage of GDP. Thus, the largest share of social protection expenditure was assigned in the old age followed by the sickness function.

Government activity affects private sector, labour force productivity, trade balance, population health, etc. However, their relationship with economic growth is always controversial. Economic theory provides different arguments to justify why the public sectors size can be expected to vary over time and across countries (Barrios and Schaechter, 2008). In fact, wealthier nations expand the demand for public goods as well as increase public sector wages. Thus, from a political point of view, the public sector size can reflect political choices and different social models related with income distribution, education grants, health care services, etc.
Nevertheless, the public sector has to guarantee a minimum level of life for all the individuals. In this framework, the coverage of social protection systems have been generalized during the last fifty years (Gonzalez Páramo, 1994).

Spite of the importance of social protection expenditures, the viability of these programs has been questioned (Castles, 2003). However, there are enough arguments for public intervention in the economy, ranging from distributional concerns to market failures. So, it raises doubts about the globalisation process due to the negative effects on the welfare states (Rhodes, 1996). The reason for it is because the term “globalisation” includes an important controversy. Although some people consider it means abuse,

inequality and human explotation, for other ones, it represents a completely integrated world and generalized prosperity (Toribio, 2003). In fact, the globalisation can be understood as a process of international economic integration influenced by costs decrease in transport and communications with important flows of trade and capital among nations (Albi, 2003).

At this regard, Atkinson (1995) showed the extended idea that the Welfare State is one of the factors which leads to lower levels of economic growth and it is necessary to cut down social protection expenditure to reactive growth in European Union countries. Following Dreze and Malinvaud (1994), the main critical to the Welfare State can be synthesized as follows:

- The social protection programs have generated important deficit levels and public debt.
- The social protection programs have led to an increase of the public sector size until inefficient levels.
- The Public Health and redistribution programs have introduced undesirable rigidities in labour markets.

However, contradictory arguments exist, that is, other authors defend the contribution of social expenditure to economic growth. If we classify the social expenditures in those dedicated to income transfers and those that have for object the provision of preferable goods, it seems obvious that these last ones, particularly those dedicated to education and health will increase the capacity of economic growth. Sala-I-Martin (1992) considers that the programs of reduction of the poverty and income redistribution pensions can contribute to increase economic growth.

Thus, in our research we want to disentangle if social protection is an expenditure or an investment. At this regard, the term "government expenditures" refers to spending of the government sector including both the purchase of final goods and services, or GDP, and transfer payments. Government expenditures are used to face education, health, national defence, etc. and financed by a combination of taxes and borrowing. However, in

finance, investment is buying or creating an asset with the expectation of capital appreciation, profit, interest earnings, rents or some combination of these returns.

Also, it is important to note that social protection includes twelve main areas of social protection: financing, health care, sickness, maternity, invalidity, old-age, survivors, employment injuries and occupational diseases, family, unemployment, guaranteed minimum resources and long-term care (European Commission, 2004). On the other hand, a new beginning for Europe started with the Europe 2020 Strategy that puts forward three priorities:

– Smart growth: developing an economy based on knowledge and innovation.

– Sustainable growth: promoting a more resource efficient, greener and more competitive economy.

– Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion.

Hence, the relationship between government social spending and economic growth continues being an important field of interest.

In summary, the objective of this paper is to study the relationship between government and social expenditure and economic growth in the EU countries over the period 1994-2012. In particular, we will test the hypothesis that countries with a large public sector grow faster than the other ones. The analysis is based on historical series for the EU countries which its data are available in this period.

This chapter is organized as follows. Section 1.2. describes data sources we have used and characteristics of the variables involved in our analysis. In Section 1.3, we examine the empirical evidence based on the relationship between economic growth and government expenditure. Finally, section 1.4. gives a summary and conclusion.

1.2. DATA AND METHODOLOGICAL DECISIONS

This paper is focused on cross-country comparisons, in particular, on European Union countries which politically are stable democracies. So, international comparability of the data is very important. We have used economic indicators taken from the OECD and the European Commission (Economic databases).

Following the theoretical framework proposed by Ram (1986), we assume that the economy is composed of just two broad sectors: one is the government sector (*G*) and the other one is the non-government sector (*C*). Production functions for the two sectors could be written as:

$$C = C(L_C, K_C, G) \tag{1}$$

$$G = G(L_G, K_G) \tag{2}$$

Thus, output in each sector depends on the inputs of labour (*L*) and capital (*K*) and also, output of the government sector (*G*) exercises an externality effect on output of non-government sector (*C*). The total inputs are given by,

$$L_C + L_G = L \tag{3}$$

$$K_C + K_G = K$$

and the total output (*Y*) is the sum of the outputs in the two sectors:

$$Y = C + G \tag{4}$$

Let us suppose the relative factor productivity in the two sectors differ. In particular:

$$\frac{G_L}{C_L} = \frac{G_K}{C_K} = 1 + \delta, \tag{5}$$

where $G_L = \partial G / \partial L$ denotes the marginal production of labour input in the government sector (or its discrete $\Delta G / \Delta L$), $C_L = \partial C / \partial L$ is the marginal production of labour input to the non-government sector, $G_K = \partial G / \partial K$ is the marginal productivity of capital input in the government sector and $C_K = \partial C / \partial K$ is the marginal productivity of capital input in the non-government sector.

Therefore, the sign of δ indicates which sector has higher marginal factor productivity. A positive δ implies higher input productivity in the government sector and a negative δ indicates the opposite result.

By totally differentiating and manipulating production functions, and using (3) and (5), we can conclude that:

$$dY = C_L dL + C_K dK + C_G dG + \frac{\delta}{1+\delta} dG . \tag{6}$$

Dividing by *Y*, we obtain:

$$\dot{Y} = \alpha(I/Y) + \beta\dot{L} + \left[(\delta/(1+\delta)) - \theta\right]\dot{G}(G/Y) + \theta\,\dot{G}, \tag{7}$$

where the variable *I* is investment which is assumed to equal *dK*, α is the marginal product of *K* in the *C* sector, β is the elasticity of non-government output *C* with respect to *L* and θ equals $C_G(G/C)$ [2].

Consequently, Equation (7) shows that the variables which affect economic growth $(\dot{Y})$ include the investment rate (I/Y), labour force growth $(\dot{L})$, government expenditure growth $(\dot{G})$ and government size (G/Y).

[2] See Feder (1983) for further information about the parameters and the models.

1.3. RESULTS

In our empirical analysis, rate of increase of GDP is considered as a proxy for economic growth and GDP per capita in US$ Purchasing Power Parity (PPP) is used to measure the aggregate output *Y*. So, we will focus on time series analysis in order to show different relationships between variables. Thus, in order to explain cross-country growth rates, regression analysis has been carried out.

In particular, GDP per capita in the European Union countries has increased since 1990 (see Figure 1.1.). Note that Luxembourg is the European Union country with the largest GDP per capita since 1990 (in U.S. $) because these country benefits from a particular concatenation of circumstances (a huge iron and steel industry, a mayor worldwide banking and financial center, one of the most important technology and e-commerce hubs in Europe) that make Luxembourg so economically successful and a business-friendly country. As usual, GDP per capita is based on PPP. GDP that we use is Gross Domestic Product converted to international dollars using PPP rates. Besides, it is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. It is important to point out that data are in constant 2011 international dollars too.

So, we have considered an easy approximation for the growth equation:

$$\dot{Y} = \alpha + \beta\, \dot{G}(G/Y), \tag{8}$$

where a dot over the variable denotes its rate of growth, $\dot{Y}$ denotes dY/Y or its discrete equivalent $\Delta Y/Y$, G represents government spending and $\dot{G}(G/Y)$ equals $\Delta G/Y$. A constant term and a random stochastic disturbance term with the usual properties have been included.

Figure 1.1.

Evolution of GDP per capita (US$ Purchasing Power Parity).
European Union countries (1990-2013)

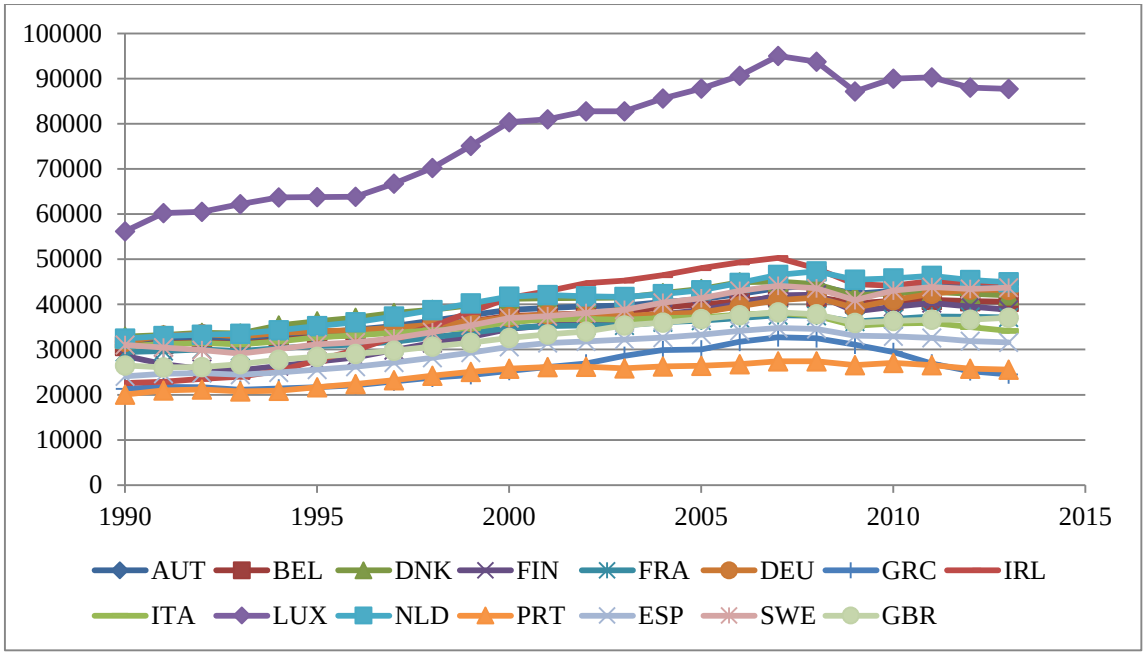


Table 1.2.

Estimated linear relationships between per capita growth rate $(\dot{Y})$ and government spending $(\dot{G})$. European Union countries (1994-2012).

Dependent variable: Economic Growth

Country	***Coef.***	***Std. Err.***	***t***	***P>t***	***R-square***
Austria	-2.9469	0.5896	-5.0000	0.0000	0.6248
Belgium	-0.3181	0.9967	-0.3200	0.7540	0.0060
Denmark	-1.6475	0.3824	-4.3100	0.0000	0.5219
Finland	-1.8332	0.4704	-3.9000	0.0010	0.4870
France	0.2644	1.0438	0.2500	0.8030	0.0043
Germany	-1.9337	0.5149	-3.7600	0.0020	0.4685
Greece	0.5019	0.8182	0.6100	0.5530	0.0363
Ireland	-0.1078	0.4827	-0.2200	0.8260	0.0031
Italy	-1.8498	0.3529	-5.2400	0.0000	0.6319
Luxembourg	0.4469	1.3449	0.3300	0.7440	0.0069
Netherlands	-0.7665	0.6714	-1.1400	0.2710	0.0800
Portugal	1.4363	0.4997	2.8700	0.0110	0.3405
Spain	-0.6378	0.7427	-0.8600	0.4040	0.0469
Sweden	-2.5757	0.1947	-13.2300	0.0000	0.9162
United Kingdom	1.2562	0.4036	3.1100	0.0080	0.4089

Source: Author's elaboration.

Except for France, Greece, Luxemburg, Portugal and United Kingdom, the relationship between both variables is negative (Table 1.2). However, in these countries R-square is not acceptable. The best result is found for Sweden where the estimated coefficient is -2.57, the variable is significant at 1% and R-square is acceptable and equal to 0.9162.

In order to deep in these relationships, the standard panel techniques for the econometric estimation have also been used (Greene, 2011). The fundamental advantage of this

panel data set over a cross section is that it allows us great flexibility in modelling differences across European Union countries. The basic framework is a regression model of the form:

$$\dot{Y}_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it} \quad (9)$$

where *i* refers to the country (*i*=1,..., 15 member states), *t* is the year, $\dot{Y}$ denotes economic growth for each country and *X* is a vector of variables. As explanatory variables we have included the size of the public sector (growth rate). The empirical results of the estimation are shown in Table 1.3.

First of all, we test the significance of the group effects with an *F*-test. In our models we reject the hypothesis that the country effects are the same. Secondly, we can use the fixed-effects approach or the random-effects ones. The Hausman test value shows that fixed effects should be used. We can appreciate that total government spending (growth rate) is significant. Also, the sign of this variable indicates that government spending is negatively related with economic growth in the European Union countries.

Table 1.3.
Estimates of the determinants of Economic Growth in the European Union countries (1994-2012). Dependent variable: Economic Growth

	Random Effects			
Random Effects	***Coef.***	***Std. Err.***	***t***	***P>t***
Total Government Spending	-0.1441	0.1117	-1.2900	0.1970
Fixed Effects	***Coef.***	***Std. Err.***	***t***	***P>t***
Total Government Spending	-0.6061	0.1602	-3.7800	0.0000
R-square	0.0554			
Wald Statist. and Prob (Wald)	1.66 (0.1970)			
Hausman Statistic and Prob (Hausman)	16.18 (0.0001)			
F Statistic and Prob (F)	35.34 (0.000)			

Source: Author's elaboration.

Also, we have considered the same previous approximation for the growth equation but for government social spending including a constant term and a random stochastic disturbance term with the usual properties have been included.
Therefore, Table 1.4. shows the results from cross-section data. The estimates are given for each country from 1994 to 2012. The relationship is negative and significant for Austria, Denmark, Finland, Germany, Netherlands and Sweden, at least at the 7 percent level. The best result is found for Sweden where the estimated coefficient is -6.3517, the variable is significant at 1% and *R*-square is equal to 0.8140. In contrast, it is positive and significant for Portugal and France. However, the relationship is not significant for Belgium, Greece, Ireland, Italy, Luxembourg and Spain.

In order to deep in these relationships, the standard panel techniques for the econometric estimation have also been used. Firstly, we have only considered social government spending as explanatory variable and later we have included other variables as population over 65 years (a proxy of elderly people) and Gini coefficient (see Table 1.5.).

The results of the estimation are given in Table 1.6. Also, we have used Hausman's specification test for the random effects model in order to test orthogonality of the random effects and the regressors. Besides, a Wald test is included to evaluate the joint significance of the variables.

First of all, we test the significance of the group effects with an *F*-test. In our models, we reject the hypothesis that the country effects are the same. Secondly, we can use the fixed-effects approach or the random-effects approach. The Hausman test value shows that fixed effects should be used. Total government spending (growth rate) is significant and level of explanation, as measured by R^2, is acceptable ($R^2 = 0.3042$). Also, the sign of variable points out that social government expenditure is negatively related with economic growth.

Table 1.4.

Estimated linear relationships between per capita growth rate $(\dot{Y})$ and government social expenditure $(S\dot{G})$. European Union countries (1994-2012).Dependent variable: Economic Growth

Country	***Coef.***	***Std. Err.***	***t***	***P>t***	***R-square***
Austria	-7.4088	2.7747	-2.6700	0.0170	0.3222
Belgium	1.9539	2.1105	0.9300	0.3680	0.0480
Denmark	-3.2697	0.9475	-3.4500	0.0030	0.4119
Finland	-3.7507	0.9847	-3.8100	0.0020	0.4751
France	2.6301	1.3376	1.9700	0.0680	0.2049
Germany	-5.5094	1.6657	-3.3100	0.0040	0.4061
Greece	-1.4758	1.4548	-1.0100	0.3340	0.0933
Ireland	-0.6720	1.4221	-0.4700	0.6430	0.0138
Italy	-0.0236	1.1563	-0.0200	0.9840	0.0000
Luxembourg	2.8979	2.7025	1.0700	0.2990	0.0670
Netherlands	-4.5796	1.3650	-3.3600	0.0040	0.4287
Portugal	2.2542	0.5885	3.8300	0.0010	0.4784
Spain	-0.2075	1.5240	-0.1400	0.8940	0.0012
Sweden	-6.3517	0.7591	-8.3700	0.0000	0.8140
United Kingdom	1.8726	2.0387	0.9200	0.3740	0.0568

Source: Author´s calculations from OECD Data.

Table 1.5.
Variables and definitions

Variable	Definition	Source
GDP	Economic Growth: GDP per capita, constant prices.	OECD Data.
SGS	Social government spending: Total, % of GDP	OECD Data.
POP65	Population over 65 years: Total, % of population.	OECD Data
GINI	Gini coefficient (scale from 0 to 100)	Eurostat

Source: Author's elaboration.

Table 1.6.
Estimates of the determinants of Economic Growth in the European Union countries (1994-2012). Dependent variable: Economic Growth

	Random Effects			
	Coef.	***Std. Err.***	***t***	***P>t***
Social Government Spending	-0.5496	0.2511	-2.1900	0.0290
Population over 65	2.3225	0.3256	7.1300	0.0000
Gini	-0.5675	0.2259	-2.5100	0.0120
R-square	0.2786			
	Fixed Effects			
	Coef.	**Std. Err.**	**t**	**P>t**
Social Government Spending	-1.1878	0.3516	-3.3800	0.0010
Population over 65	5.6680	0.6117	9.2700	0.0000
Gini	-0.4075	0.3696	-1.1000	0.2720
R-square	0.3042			
Wald Statist. and Prob (Wald)	58.51 (0.000)			
Hausman Statistic and Prob (Hausman)	49.97 (0.000)			
F Statistic and Prob (F)	30.61 (0.000)			

Source: Author's elaboration.

Therefore, it can be observed that there does not exist a clear relationship between economic growth and government spending (social expenditure) in EU countries. However, we can not conclude anything about income inequality (measured by Gini index) because the relationship is not significant although the signs are those expected. This fact can be justified because of data limitation (we have only homogenous information for a reduced number of years) or even because of unobserved heterogeneity, issues that are different when we study less developed countries.

1.4. CONCLUSIONS

Governments can handle their level of expenditure in order to influence the economy. However, the relationship between economic growth and government spending continues being controversial and in some cases are very ambiguous. However, the relationship between government spending and economic growth can be positive or negative depending on the countries included in the sample, the time period of analysis and the variables which reflect the public sector size. Thus, some of the problems are based on the measurement of the public sector size and the available statistics.

This paper provides new empirical evidence of the impact of government spending on economic growth in the European countries. At this regard, for some of them we have found a positive relationship whereas it is negative for others or even not significant. Our empirical results obtained based on regressions and panel techniques suggest that government spending is not always related with economic growth in the European countries.

Nevertheless, it is very difficult to identify clear relationships between growth and social protection expenditure in the European Union countries although certain similarities are observed among some countries. In this way, the Scandinavian countries are characterized by greater public sectors than those in Southern European ones and those in Ireland and United Kingdom. If we observe the changes in total expenditures from 1992 to 2012, it exists a descending trend.

Obviously, the social protection systems success is based on economic growth. However, the demographic evolution forces to limit the reach of these benefits. In fact, the empirical results obtained in this paper show that social government size is estimated to have negative impact on economic growth in most of the EU countries over the period studied (in Austria, Denmark, Finland, Germany, Netherlands and Sweden).

Lastly, keeping in mind that one of the fundamental objectives of the Welfare State is the decrease of income inequality, we should consider the relationship between growth

and inequality taking into account that higher inequality tends to hurt economic growth. So, governments can improve income distribution although the redistributional effects over economic growth will depend on the impact of grants and taxes for their financing.

Although a lower income inequality (corresponding a smaller value of Gini index European) can be related with a greater economic dynamism, the reduced number of countries (15) with available data for this period, the atypical situation of Ireland (even could be considered as a outlier case) and the number of years considered make that the obtained empirical results should be interpreted very careful. Obviously, besides recent studies as Ostry et. al. (2014) for International Monetary Fund. or Brueckner & Lederman (2015) for World Bank, further research about this topic is required to provide new evidence.

CHAPTER 2

PUBLIC HEALTH CARE EXPENDITURE, GDP AND THE ELDERLY IN SPAIN: A COMPARATIVE STUDY BASED ON UNIT ROOT TEST

2.1. INTRODUCTION

One interesting question in health economics is the correlation between health care expenditure, Gross Domestic Product (GDP) and population over 65 years (that is related with the incidence of chronic diseases as World Health Organization suggested in 2011) understood as share of the elderly (Tamakos and Hamori, 2015).

In this sense, since Grossman (1972), this issue had become intriguing to economists, and a growing literature has developed (Kumar, 2013) in other countries but not too much in Spain. Thus, Spanish National Health System (NHS) has been involved in important organizational changes that have derived in a federalism model of regional health services because is divided in 15 Regional Health Authorities since its last reform in 2002 (Basque Country and Navarra are in a different system inside Spain called *Foral model*). A minimum level of health care must be guaranteed everywhere, but the current system of regional funding means that the quality and quantity of health care might vary across Spain (Blazquez-Fermandez et al., 2014). As a result, huge interregional differences have appeared in health care expenditure and its financing that could even increase inequalities between the Spanish regions.

Also, the robustness of the Spanish NHS can be analyzed taking into account the evolution of the share of the health care expenditure on national income. Therefore, health care expenditure has increased over time, from 3.1% of GDP in 1970 to 8.8% in 2013 (OECD Health Statistics, 2015). This notably growth is because of Spanish NHS has achieved a wide public coverage in previous decades, and most of the population is covered now.

Thus, the objective of this paper is to analyze the role of an ageing society to curb rising health care expenditures along the Spanish regions over the period 2002-2013, identifying their geographic differences and explain them based on GDP differences. The remainder of this paper is divided into three sections. The following section outlines the theoretical model and defines the empirical specification in order to be

estimated. Data description and empirical results are described in next section. Discussion and concluding remarks are shown in last section.

2.2. THEORETICAL FRAMEWORK

During the last decades, three major developments in statistics have been widely discussed: vector autoregressions (VARs), unit roots and cointegration. Thus, one of the most important points when dealing with several time series is to consider the possible interdependence between them. In this sense, we can consider a time series as a collection of random variables ordered in time. Therefore, a time series is said to be stationary if statistical properties do not change over time. More formally, from a theoretical point of view, a time series is a collection of random variables X_t ordered in time. A time series is understood to be strictly stationarity (Maddala, 1992) if the joint distribution of any set of n observations $X(t_1)$, $X(t_2)$,…, $X(t_n)$ is the same as the joint distribution of $X(t_1+k)$, $X(t_2+k)$, $X(t_n+k)$ for all n and k. Substituting n=1, we get $\mu(t)=\mu$ a constant and $\sigma^2(t)= \sigma^2$ a constant for all t.

It implies that the mean and the variance of the stochastic process do not depend on t and the autocovariance between Y_t and Y_{t+k} only depends on the lag k (Chatfield, 2003). So, a stationary series would contain no trend or seasonal variation.

Furthermore, a time series is said to be integrated of order d, denoted by $I(d)$, if you have to difference it d times to obtain a stationary process. Consequently, a time series Y_t is integrated of order 1, $I(1)$, if Y_t is not stationary but the first difference, Y_t-Y_{t-1}, is stationary and invertible (Greene, 2011). The relevance of this result is that unless the variables are integrated to the same order, the following equation does not make sense:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \varepsilon_t. \qquad (1)$$

On one hand, the order of integration of a serie is obtained by the application of a set of tests, usually known as tests for unit roots. In this sense, the most common test in economic literature for unit roots are Augmented Dickey and Fuller (ADF) unit root test

(Dickey and Fuller, 1979) and Phillips-Perron (PP) (1988). The ADF test involves estimating the following regression:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta y_{t-1} + \varepsilon_t, \qquad (2)$$

which includes a trend *t*, a constant term α, as well as lagged versions of the series, and where y_t is the variable of interest. The null hypothesis for this test is $H_0: \hat{\gamma} = 0$.

On the other hand, Phillips-Perron test (PP) is a unit root test used to test the null hypothesis that a time series is integrated of order 1. PP is a non-parametric test based on asymptotic theory which works better in large samples. This test estimates autocorrelations in the error process, rather than white noise errors. For this reason, this test is more generally applicable and Davidson and MacKinnon (2006) conclude that Phillips-Perron test could perform worse in finite samples than the ADF test.

However, from a statistical point of view, we are very interested in analyzing not only the short-run dynamics but also long-run equilibrium. Cointegration techniques provide powerful tools to test if there exists a statistically significant connection between two or more variables. Moreover, it is important to point out that the concept of cointegration was introduced by Granger (1981). In the last decades, cointegration theory has generated very much interest among economists (Johansen, 1991). From a theoretical point of view, two variables x_t and y_t are said to be cointegrated if there exists a parameter α such that $y_t = \alpha x_t + u_t$ is a stationary process (Engle and Granger, 1987). So, it is important that all the variables have the same integration order. Otherwise, the variables would not have a direct causal connection.

2.3. DATA DESCRIPTION AND EMPIRICAL RESULTS

The information used in this study were obtained from the Spanish Institute National of Statistics (INE). Besides, the data set of IVIE-BBVA (2015) contains annual data from 2002 to 2013 about public health care expenditure. This information allows us to compare the results and the main statistics about health spending for different regions. So in this study, we have used basic information available about total

expenditure on health (EXP) and Gross Domestic Product (GDP), both of them, in euros per capita (constant). As defined by the World Bank and the Organization for Economic and Cooperation Development (OECD), public health care expenditure covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.

Besides, we have also included one variable in this analysis that is the percentage of population of sixty five years and over (P65) as a proxy of elderly people. Thus, the definition of each variable used is given in Table 2.1. (Appendix include all the sources of information available in Tables A2.1-A2.3).

Table 2.1.
Variables: Names and definitions

Name	Definition
EXP	Public expenditure on health - /capita, Euros per capita (constant)
GDP	Gross domestic product - /capita, Euros
P65	Population: 65 and over - % total population

The country analyzed in this paper is Spain, where we have analyzed each region of this country. So, the results of ADF and PP unit root tests are reported in Tables 2.2. and 2.3. These findings are very close to some obtained in recent papers which use similar methodology. Under this framework, we confirm that exists a cointegration relationship between the three variables considered (health expenditure and Gross Domestic Product in per capita euros and Population of 65 years and over related with total population) for all the Spanish Autonomous Communities. Moreover, we suggest that the elderly (thar are very influenced by chronic diseases as Bain&Company recent report suggest (2016)) positively affects health-care expenditure per capita being different by Spanish regions.

Table 2.2.
Results of ADF and PP unit root test

Variables	ADF	PP	Order of Integration	Variables	ADF	PP	Order of Integration
Andalucia:				**Valencian Community:**			
LN(EXP)			**	LN(EXP)	-3.9979	-4.0956	I(2)
LN(GDP)		-4.0749	I(2)*	LN(GDP)		-4.9361	I(2)*
P65	-3.8778	-7.1107	I(2)	P65	-4.7197	-8.3318	I(2)
Aragon:				**Extremadura:**			
LN(EXP)	-3.5482	-3.2504	I(0)	LN(EXP)	-3.9817	-6.4546	I(2)
LN(GDP)	-3.8024		I(2)	LN(GDP)	-4.7124	-7.0065	I(2)
P65	-3.5600	-3.9020	I(2)	P65	-4.7389	-8.2608	I(2)
Asturias				**Galicia:**			
LN(EXP)	-3.9348	-3.9348	I(0)	LN(EXP)	-3.3781	-4.8810	I(0)/I(2)
LN(GDP)	-3.4635	-5.4899	I(2)	LN(GDP)		-4.8871	I(2)*
P65			**	P65	-4.9050	-5.6241	I(2)
Balearic Islands:				**Madrid:**			
LN(EXP)	-3.2421	-9.5057	I(2)	LN(EXP)	-3.3834	-17.6028	I(2)
LN(GDP)	-4.0430	-6.7923	I(2)	LN(GDP)		-3.2732	I(2)*
P65			**	P65	-3.7581	-8.3719	I(2)
Canary Islands				**Murcia:**			
LN(EXP)	-4.7489	-3.7919	I(2)	LN(EXP)			**
LN(GDP)	-3.5037	-6.3741	I(2)	LN(GDP)	-4.6730	-5.8641	I(2)
P65	-3.5338	-3.5729	I(2)	P65	-4.2214	-4.6111	I(2)

Cantabria:				**Navarre:**			
LN(EXP)	-3.4116	-3.4116	I(0)	LN(EXP)	-3.5918	-3.6263	I(2)
LN(GDP)	-3.9137	-6.8948	I(2)	LN(GDP)	-3.8876	-5.7812	I(2)
P65		-4.4543	I(2)*	P65		-4.8335	I(2)*
Castile and Leon:				**Basque Country:**			
LN(EXP)	-3.6187	-3.6182	I(0)	LN(EXP)	-4.3681	-7.2312	I(2)
LN(GDP)	-3.9077	-7.5299	I(2)	LN(GDP)	-3.9454	-6.8686	I(2)
P65		-5.3809	I(2)*	P65	-3.5465	-6.5184	I(2)
Castile La Mancha:				**La Rioja:**			
LN(EXP)		-6.2044	I(0)*	LN(EXP)	-3.4550	-7.8592	I(2)
LN(GDP)	-3.6004	-4.9612	I(2)	LN(GDP)	-3.4374	-6.481556	I(2)
P65	-3.9373	-6.6233	I(2)	P65	-6.4649	-5.9052	I(2)
Catalonia:							
LN(EXP)		-5.4972	I(0)*				
LN(GDP)		-6.3209	I(2)*				
P65	-5.5191	-7.3531	I(2)				

* The order of integration is different according to the test used, ** The order of integration is more than 2 with both tests
All the variables are statistically significant at the conventional level (that is, 1%, 5% and 10%)

Table 2.3.
Results of ADF and PP unit root test

Variables	ADF		PP		Order of Integration
	Adj. t-Stat	Prob	Adj. t-Stat	Prob	
Andalusia:					
EXP	-2.3914	0.1738	-1.7187	0.3910	**
LN(EXP)	-2.4455	0.1628	-1.6273	0.4306	**
GDP	-3.2611	0.0499	-3.9632	0.0187	I(2)
LN(GDP)	-2.9858	0.0780	-4.0749	0.0160	I(2)*
P65	-3.8778	0.0210	-7.1107	0.0004	I(2)
Aragon:					
EXP	-5.6989	0.0021	-7.0752	0.0004	I(2)
LN(EXP)	-3.5482	0.0278	-3.2504	0.0444	I(0)
GDP	-3.6426	0.0328	-5.3108	0.0033	I(2)
LN(GDP)	-3.8024	0.0267	-5.4380	0.0028	I(2)
P65	-3.5600	0.0366	-3.9020	0.0203	I(2)
Asturias:					
EXP	-6.1320	0.0012	-13.5029	0.0000	I(2)
LN(EXP)	-3.9348	0.0151	-3.9348	0.0151	I(0)
GDP	-3.3979	0.0412	-5.2611	0.0034	I(2)
LN(GDP)	-3.4635	0.0375	-5.4899	0.0026	I(2)
P65	-2.6752	0.11455	-2.8029	0.0955	**
Balearic Islands:					
EXP	-3.4982	0.0396	-9.9030	0.0000	I(2)
LN(EXP)	-3.2421	0.0555	-9.5057	0.0000	I(2)*
GDP	-3.9636	0.0186	-6.4019	0.0009	I(2)
LN(GDP)	-4.0430	0.0167	-6.7923	0.0006	I(2)
P65	-2.3093	0.1884	-2.2024	0.2172	**
Canary Islands:					
EXP	-3.9272	0.0268	-3.4864	0.0364	I(2)
LN(EXP)	-4.7489	0.0106	-3.7919	0.0237	I(2)
GDP	-3.3957	0.0453	-6.0204	0.0014	I(2)
LN(GDP)	-3.5037	0.0393	-6.3741	0.0009	I(2)
P65	-3.5338	0.0340	-3.5729	0.0322	I(2)

Table 2.3. (continue)

Results of ADF and PP unit root test

Variables	ADF		PP		Order of Integration
	Adj. t-Stat	Prob	Adj. t-Stat	Prob	
Cantabria:					
EXP	-2.9553	0.0812	-6.6770	0.0007	I(2)*
LN(EXP)	-3.4116	0.0345	-3.4116	0.0345	I(0)
GDP	-3.8129	0.0230	-6.4691	0.0008	I(2)
LN(GDP)	-3.9137	0.0200	-6.8948	0.0005	I(2)
P65	-3.2347	0.0518	-4.4543	0.0096	I(2)*
Castile and Leon:					
EXP	-4.1499	0.0171	-10.3547	0.0000	I(2)
LN(EXP)	-3.6187	0.0249	-3.6182	0.0249	I(0)
GDP	-3.7085	0.0301	-7.2859	0.0003	I(2)
LN(GDP)	-3.9077	0.0233	-7.5299	0.0003	I(2)
P65	-3.2355	0.0517	-5.3809	0.0030	I(2)*
Castile- La Mancha:					
EXP	-2.9435	0.0879	-5.0372	0.0045	I(2)*
LN(EXP)	-2.8985	0.0930	-6.2044	0.0011	I(2)*
GDP	-3.6038	0.0308	-4.7902	0.0062	I(2)
LN(GDP)	-3.6004	0.0310	-4.9612	0.0050	I(2)
P65	-3.9373	0.0193	-6.6233	0.0007	I(2)
Catalonia:					
EXP	-2.9850	0.0781	-4.9919	0.0048	I(2)*
LN(EXP)	-2.8840	0.0894	-5.4972	0.0026	I(2)*
GDP	-2.9711	0.0795	-5.916416	0.0016	I(2)*
LN(GDP)	-3.0229	0.0743	-6.3209	0.0010	I(2)*
P65	-5.5191	0.0034	-7.3531	0.0003	I(2)
Valencian Community:					
EXP	-3.9351	0.0194	-4.2411	0.0127	I(2)
LN(EXP)	-3.9979	0.0178	-4.0956	0.0155	I(2)
GDP	-2.7127	0.1127	-4.6899	0.0070	I(2)*
LN(GDP)	-2.8186	0.0977	-4.9361	0.0051	I(2)*
P65	-4.7197	0.0085	-8.3318	0.0002	I(2)

Table 2.3. (continue)
Results of ADF and PP unit root test

Variables	ADF		PP		Order of Integration
	Adj. t-Stat	Prob	Adj. t-Stat	Prob	
Extremadura:					
EXP	-3.8611	0.0215	-4.8751	0.0055	I(2)
LN(EXP)	-3.9817	0.0182	-6.4546	0.0009	I(2)
GDP	-4.3283	0.0137	-6.9292	0.0005	I(2)
LN(GDP)	-4.7124	0.0086	-7.0065	00005	I(2)
P65	-4.7389	0.0083	-8.2608	0.0001	I(2)
Galicia:					
EXP	-2.3009	0.1946	-5.6094	0.0023	I(2)*
LN(EXP)	-3.3781	0.0364	-4.8810	0.0055	I(0)/I(2)
GDP	-2.7915	0.1014	-4.8294	0.0059	I(2)*
LN(GDP)	-2.9022	0.0872	-4.8871	0.0055	I(2)*
P65	-4.9050	0.0068	-5.6241	0.0022	I(2)
Madrid:					
EXP	-3.6342	0.0332	-20.1669	0.0001	I(2)
LN(EXP)	-3.3834	0.0460	-17.6028	0.0000	I(2)
GDP	-2.5162	0.1425	-0.3066	0.0658	**
LN(GDP)	-2.5984	0.1275	-3.2732	0.0491	I(2)*
P65	-3.7581	0.0282	-8.3719	0.0001	I(2)
Murcia:					
EXP	-2.8176	0.0935	-2.7002	0.1106	**
LN(EXP)	-2.8608	0.0880	-2.9242	0.0804	**
GDP	-4.5050	0.0090	-5.5590	0.0024	I(2)
LN(GDP)	-4.6730	0.0072	-5.8641	0.0017	I(2)
P65	-4.2214	0.0131	-4.6111	0.0078	I(2)
Navarre:					
EXP	-3.6434	0.0291	-3.6915	0.0272	I(2)
LN(EXP)	-3.5918	0.0313	-3.6263	0.0299	I(2)
GDP	-3.6750	0.0315	-5.4860	0.0026	I(2)
LN(GDP)	-3.8876	0.0239	-5.7812	0.0019	I(2)
P65	-3.0834	0.0643	-4.8335	0.0059	I(2)*

Table 2.3. (continue)
Results of ADF and PP unit root test

Variables	ADF		PP		Order of Integration
	Adj. t-Stat	Prob	Adj. t-Stat	Prob	
Basque Country:					
EXP	-4.1276	0.0149	-5.8321	0.0017	I(2)
LN(EXP)	-4.3681	0.0107	-7.2312	0.0004	I(2)
GDP	-3.8631	0.0214	-6.5829	0.0007	I(2)
LN(GDP)	-3.9454	0.0191	-6.8686	0.0005	I(2)
P65	-3.5465	0.0334	-6.5184	0.0008	I(2)
La Rioja:					
EXP	-3.3597	0.0475	-8.5560	0.0001	I(2)
LN(EXP)	-3.4550	0.0419	-7.8592	0.0002	I(2)
GDP	-3.2916	0.0520	-6.2406	0.0011	I(2)*
LN(GDP)	-3.4374	0.0429	-6.4816	0.0008	I(2)
P65	-6.4649	0.0013	-5.9052	0.0016	I(2)

* The order of integration is different according to the test used
** The order of integration is more than 2 with both tests
All the variables are statistically significant at the conventional level (that is, 1%, 5% and 10%)

2.4. CONCLUSIONS

In this paper, the results found for Spanish regions over the period 2002-2013 are similar to some obtained in recent papers which use similar econometric techniques, An et. al. (2016). Using it, this research focus on cointegration tests to examine some new insights the long-term relationships between public health-care expenditure per capita, GDP per capita and population 65 years old and over.

In particular, it supports the hypothesis that exists a cointegration relationship between the three variables mentioned previously in all the Spanish Autonomous Communities. In particular, we find that the elderly (mainly affected by chronic conditions as World Health Organization demonstrated) positively affects public health care expenditure per capita. However, the empirical results are significant different by Spanish regions because heterogeneity of the population and income.

Finally, our empirical rfindings indicate that from a policy economic perspective, rising health care expenditures in a framework of an ageing population had concerned about the sustainability of health care systems (OECD, 2010) due to additional pressure by introducing drugs and high-cost techniques conditioned by our GDP possibilities (García and Manrique, 2012). Besides, governments` polities to cover the future health care expenditure of an aging population will likely depend on other factors such as innovations in health care delivery that improve cost- effectiveness and trade-offs among health coverage and taxation.

CHAPTER 3

HUMAN CAPITAL AND GDP: AN EMPIRICAL ANALYSIS BASED ON COINTEGRATION TECHNIQUES

3.1. INTRODUCTION

Today most of the countries are involved in a serious economic and financial crisis. As a result of this crisis, there exists an important increase of unemployment rates, especially in Spain. Unemployed workers try to improve their training in order to access to a new and better job. Another possibility, given the economic problems, even if it is of a lower category, is to accept a job, thus resulting in overeducation.

On one hand, although in Europe the different education and training systems take into account differences by national cultures, there exists a common objective to create new knowledge and transfer it to students. However, as the number of years of schooling is increasing, education expenditure is also greater. In this sense, the relationship between education and economic growth has been largely studied. Barro (1989) using a cross-country sample of 120 countries showed that the ratio of spending to Gross Domestic Product (GDP) tends to rise with the level of per capita income. Cheng and Hsu (1995) studied the cointegration and causality between human capital and economic growth in Japan for the period from 1952 to 1993. They concluded that there exists bidirectional causality between human capital and economic growth. In and Doucouliagos (1996) studied the causality relation between human capital formation and US private sector GDP. They showed that there is a strong evidence of causality from human capital formation to private sector GDP and vice versa.

On the other hand, Bils and Klenow (2000) using a cross section data from eighty five countries found that the channel from schooling to growth rate of per capita GDP is too weak to plausibly explain more than one-third of the observed relation between schooling and growth. Alternatively, Francis and Iyare (2006) used cointegration models to analyze the causal relationship between the expenditure on education and GDP using annual time series data from 1964 to 1998. They concluded that there is no evidence of causation running from per capita expenditure on education to per capita gross national income in either the short or long run in Barbados, and Trinidad and Tobago. Besides, Huang et al. (2009) applied the method of cointegration to study the problems of long-term and short-term interactional mechanism between scale evolution

of higher education and economic growth in China. They showed that long-term cointegration relationship exists between enrollment of higher education and actual GDP per capita in China, and the long-term influence between them is positive.

Furthermore, Dahal (2010) studied the causality relation between real GDP and higher education. He concluded that the causality runs from real GDP to enrolment in higher education. Colombier (2011) showed that public expenditures on transport infrastructure, education and administration promote growth for the Swiss case. Babalola (2011) evaluated the impact of education on economic growth in Nigeria. He used time series and showed that the unit root properties of the variables were verified using various test. This author concluded that causality which runs from economic growth to education. Teles and Joiozo (2011) applied cointegration techniques to pooled data for 27 countries from 1960 to 2000 and they concluded that government spending in education and innovation indicators is cointegrated. Muktdair-Al-Mukit (2012) studied the long-run relationship between public expenditure on education sector and economic growth in Bangladesh. He obtained, employing cointegration techniques, that a one percent increase in public expenditure in education contributes 0.34% increase in GDP per capita in the long run.

As a result, the relationship between education expenditure and GDP is not clear enough although education is an important objective, not only for researchers but also for policy makers. In 2000, all 193 United Nations member States agreed to achieve the Millennium Development Goals (MDGs) by the year 2015 which include, among others, achieving universal primary education.

The aim of this paper is to analyse the relationship between education expenditure and GDP. We will use the most recent available European data and econometrically we use different regression models. Thus, the structure of the paper is as follow. Section 3.2 describes the methodological decisions adopted. And finally, Section 3.3 describes the empirical results and the main conclusions.

3.2. THEORETICAL FRAMEWORK

This paper is based on the analysis of different time series. Related with them there are three important developments which have been widely discussed during the last years (see Maddala, 1992): vector autoregressions (VARs), unit roots and cointegration. For that, when we are studying several time series, one of the most important points is the possible interdependence between them. In this sense, a time series is a collection of random variables ordered in time and is said to be stationary if statistical properties do not change over time. It implies that mean and the variance of the stochastic process do not depend on t and the autocovariance between Y_t and Y_{t+k} only depends on the lag k. So a stationary series would contain no trend or seasonal variation. Furthermore, a time series is said to be integrated of order d, denoted by $I(d)$, if you have to difference it d times to obtain a stationary process. Thus, we say a time series Y_t is integrated of order 1, $I(1)$, if Y_t is not stationary but the first difference, Y_t-Y_{t-1}, is stationary and invertible.

The most common test in economic literature for unit roots are Augmented Dickey and Fuller unit root test (ADF, 1979) and Phillips-Perron (1978). The ADF test involves estimating the following regression:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta y_{t-1} + \varepsilon_t,$$

which includes a trend t, a constant term α, as well as lagged versions of the series, and where y_t is the variable of interest. The null hypothesis for this test is H_0: $\hat{\gamma} = 0$.

Additionally, there exists another important test: Phillips-Perron test (PP), which is a unit root test used to test the null hypothesis that a time series is integrated of order 1. This test estimates autocorrelations in the error process, rather than white noise errors. For this reason, this test is more generally applicable.

Moreover, we are very interested, from a statistical point of view, in analyse also long-run equilibrium. For this reason, cointegration techniques provide powerful tools to test if there exists a statistically significant connection between two or more variables. The concept of cointegration was introduced by Granger (1981). From a theoretical point of

view, two variables x_t and y_t are said to be cointegrated if there exists a parameter α such that $y_t = \alpha x_t + u_t$ is a stationary process. So, it is necessary all the variables to have the same integration order. Otherwise, variables would not have direct causal connection.

3.2. EMPIRICAL RESULTS AND CONCLUSIONS

Participation in higher education in the European Union has increased considerably for the last years. The proportion of population attending tertiary education has varied considerably among countries (see Table 3.1. and 3.2.). Thus, in 2007, Finland has the highest value (36%) followed by Denmark (33%), Belgium (32%), Netherlands (31%), Sweden (31%), United Kingdom (32%) and Spain (29%). On the other side, the lowest rates are for Italy (14%), Portugal (14%) and Austria (18%).

However, in Spain the proportion of population with education attainment less than upper secondary level is one of the highest levels in the European Union countries (see Table 3.3.). The highest level is found in Portugal (73%) follows by Spain (49%) and Italy (48%). As consequence, Spain has a low percentage of population with attainment upper secondary level. Also, Spain is one of the European Union countries with higher level of unemployment as percentage of labour force (8.3% in 2007).

Table 3.1.

Attainment tertiary level (% population)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Austria	11	14	14	14	14	15	15	18	18	18	18
Belgium	25	25	27	27	28	28	29	30	31	32	32
Denmark	n.a.	25	27	26	28	30	32	33	34	35	32
Finland	29	30	31	32	32	33	33	34	35	35	36
France	20	21	21	22	23	24	24	24	25	26	27
Germany	23	23	23	23	23	23	24	25	25	24	24
Greece	16	17	17	18	18	19	19	21	21	22	23
Ireland	23	21	20	19	24	25	26	28	29	31	32
Italy	n.a.	9	9	9	10	10	10	12	12	13	14
Luxembourg	n.a.		18	18	18	19	14	24	27	24	27
Netherlands	n.a.	24	23	23	23	25	28	30	30	30	31
Portugal	n.a.	8	9	9	9	9	11	13	13	13	14
Spain	19	20	21	23	24	24	25	26	28	28	29
Sweden	28	28	29	30	32	33	33	35	30	31	31
United Kingdom	23	24	25	26	26	27	28	29	30	31	32

Source: OECD Health Data.

Table 3.2.

Attainment upper secondary level (% population)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Austria	63	61	61	62	63	64	64	62	63	63	63
Belgium	30	31	31	31	32	33	33	34	35	35	36
Denmark	n.a.	53	53	52	52	52	49	48	47	47	43
Finland	39	39	40	41	42	42	43	43	44	44	44
France	39	40	40	41	41	41	41	41	41	41	42
Germany	61	61	58	58	59	60	59	59	59	59	60
Greece	29	29	30	32	32	33	34	35	36	37	37
Ireland	27	30	35	28	32	35	35	35	35	35	35
Italy	n.a.	32	33	33	33	34	38	37	38	38	39
Luxembourg	n.a.		38	38	35	43	45	40	39	42	39
Netherlands	n.a.	40	32	41	42	43	42	41	42	42	42
Portugal	n.a.	10	10	11	11	11	12	13	14	14	14
Spain	13	13	14	16	16	17	18	19	21	21	22
Sweden	48	48	48	47	49	49	49	48	54	54	53
United Kingdom	37	36	37	37	37	37	37	37	37	38	37

Source: OECD Health Data.

Table 3.3.

Attainment below upper secondary level

(% population)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Austria	26	26	25	24	23	22	21	20	19	20	20
Belgium	45	43	43	41	41	39	38	36	34	33	32
Denmark	n.a.	21	20	21	19	19	19	19	19	18	25
Finland	32	31	28	27	26	25	24	22	21	20	19
France	41	39	38	37	36	35	35	34	33	33	31
Germany	17	16	19	18	17	17	17	16	17	17	16
Greece	56	54	52	51	50	48	47	44	43	41	40
Ireland	50	49	45	54	45	40	38	37	35	34	32
Italy	n.a.	59	58	58	57	56	52	51	50	49	48
Luxembourg	n.a.		44	44	47	38	41	37	34	34	34
Netherlands	n.a.	36	45	35	35	32	31	29	28	28	27
Portugal	n.a.	82	81	81	80	79	77	75	74	72	73
Spain	69	67	65	62	60	59	57	55	51	50	49
Sweden	25	24	23	22	19	18	18	17	16	16	15
United Kingdom	41	40	38	37	37	36	35	34	33	32	32

Source: OECD Health Data.

European Union countries are suffering an important economic slowdown which has an important effect on unemployment rates. For this reason, the number of years of schooling is increasing in these countries considerably. However, this fact has important effects on education expenditure.

In this paper, we have analysed the relationship between education expenditure and Gross Domestic Product (GDP) in different developed countries with different education systems. The empirical results reported, based on cointegration techniques, suggest that there exist important differences by country and variables are not integrated with the same order.

Moreover, it is important to point out thatThe data used in this paper are obtained from the Organization for Economic Co-operation and Development (OECD) Health Data and the World Bank. The OECD Health Data contains annual data since 1960 about population health, social protection, demographic and economic references for OECD countries. This information allows us to compare the results and main statistics about education and GDP per capita for different countries. Also, the information about education expenditure (as % of GDP) has been obtained from the World Bank statistic.

Table 3.4.
Results of ADF and PP unit root tests

Variables	ADF	PP	Order of Integration	Variables	ADF	PP	Order of Integration
Austria:				Portugal			
EXP	-3.2705	-3.5476	I(0)	EXP	.	-4.7691	I(1)*
GDP	-4.4613	-2.4553	I(1)*	GDP	-4.3585	-4.3679	I(2)
France:				Spain:			
EXP	-5.7922	-5.7922	I(1)	EXP	.	-3.8704	I(2)*
GDP	-3.9362	-3.8962	I(2)	GDP	-1.8610	0.3464	**
Ireland:				United Kingdom:			
EXP	.	-4.0331	I(1)*	EXP	.	-4.1264	I(1)*
GDP	0.8777	-0.4824	**	GDP	-3.3751	-0.6190	I(2)*

* The order of integration is different according to the test used
** The order of integration is more than 2 with both tests
All the variables are statistically significant at the conventional level (that is, 1, 5 and 10%)
Source: Author´s elaboration

Because of the information is not available for all the European Union countries for a long period of time, we have focused our analysis on only six of them: Austria, France, Ireland, Portugal Spain and United Kingdom. These countries are members of European Union and represent different educational systems.

The empirical results of ADF and PP unit root tests are presented in Table 3.4. As we can see, the order of integration for each variable and country is not the same. Also, our finding are very different by country, which suggests that it is not possible apply cointegration techniques. In fact, long run relationship is not always guaranteed. Therefore, we have test our hypothesis and we can confirm that these variables are not integrated with the same order. For this reason, the causality reason, from a statistical point of view, is not so clear although formal education should be more market orientated (Behrooznia et. al, 2016).

CHAPTER 4

EXPLAINING CHILD MORTALITY DIFFERENCES IN THE EUROPEAN UNION

4.1. INTRODUCTION

Within the last years, the world has experienced remarkable gains in health outcomes. In this way, there exists a large improvement in the provision of in-kind benefits to children such as education and health services so that child mortality has been reduced exceptionally quickly in the European Union since the eighties. However, some communities (or societies) are still healthier than others and the determinants of these issues have preoccupied researchers and policy makers for the last decades.

International comparisons of one of the most commonly used health output indicators as child mortality (life expectancy is other important one) have attracted a lot of interest. Since health is a multidimensional phenomenon, some authors have suggested that it should be explained through multiple outcomes (Strauss et al., 1998). In this paper, we identify different factors that could explain child mortality differences in the European Union. The reason for that is children are a largely vulnerable group among the poor given their dependence on adults´ status.

Firstly, it is also important to highlight that of all the socio-economic variables, the relationship between income and health is probably the most complicated (Fuchs, 2004). The correlation can vary from highly positive to weakly negative, depending on context, covariates and level of aggregation. Even when the positive correlation is strong and stable, the interpretations can include causality running from income to health, from health to income, and/or "third variables" that affect health and income in the same direction. In this sense, Gross Domestic Product (GDP) may also be inversely related to key health indicators (Kanavos and Mossialos, 1996). For example, it does not explain why poorer Southern Member States of the European Union have a higher life expectancy compared with the richer Northern ones. It also fails to explain why child mortality in a country like the United States (one of the wealthiest countries in the world in terms of per capita GDP) is higher than in other Organization for Economic Cooperation and Development (OECD) countries with similar or even lower per capita income levels (Starfield, 2000). So, there are additional variables which affect and explain health indicators.

Secondly, the link between income inequality and health is an issue of major concern since the seminal paper based on aggregated data of Rodgers (1979) and has important policy implications. In fact, the relationship between income inequality and health has been analysed by different authors (Preston, 1975; Gravelle, 1998; Lynch et al., 1998; Wilkinson, 2000; Gravelle et al., 2002). Given the concavity on the income-health relationship (i.e. diminishing returns to health with rising income), it is possible that redistributing income from the rich to the poor could improve average health outcomes (Kawachi and Kennedy, 1999).

On the other hand, other authors have suggested conceptual difficulties in using aggregate cross-section data to test hypothesis about the effect of income, and its distribution, on the health of individuals. If the individual level relationship between health and income is concave, aggregate cross-section studies are subject to aggregation problems (Deaton and Muellbauer, 1980) and income has a diminishing marginal effect on health. An increase on income inequality will tend to reduce average health as the increase in the health of the rich is less than the reduction in the health of the poor (Wildman et al., 2003). Thus, in this research and in order to explain child mortality differences in the European Union and the aggregation problem, we have considered one measure of the income gap between “the rich” and “the poor” and different poverty measures.

Also, lifestyles could explain the relationship between socio-economic characteristics and health. Sleeping well, exercising and not smoking have positive effects on the probability of reporting excellent or good self-assessed health (Contoyannis and Jones, 2004). Another approach to investigate the determinants of health status in different groups of the population is based on individual data. Although recent health economics literature is focused on the identification of the factors (socio-economic characteristics, health-related behaviours, health expenditure, utilization of medical services, etc.) that could explain health inequalities, different econometric problems have arisen such as heterogeneity or selection bias.

Thus, the purpose of this research is to determine whether there exists an effect of income, income inequality and other explanatory variables on health indicators taking into account the aggregation problem. In particular, we will focus our research on European Union countries in the period 1995-2014. With this aim, we have used the new information released by the European Commission's Statistical Office (EUROSTAT) and health indicators taken from the Organisation for Economic Development and Cooperation (OECD) Health Data.

The chapter is structured as follows. Section two describes the data sources we have used and characteristics of the variables involved in our analysis together with the principal methodological decisions we have taken. In Section three, we examine the empirical evidence of the relationship between child mortality and other explanatory variables in the European Union countries using aggregated data. Finally, Section four gives our main conclusions.

4.2. DATA AND METHODS

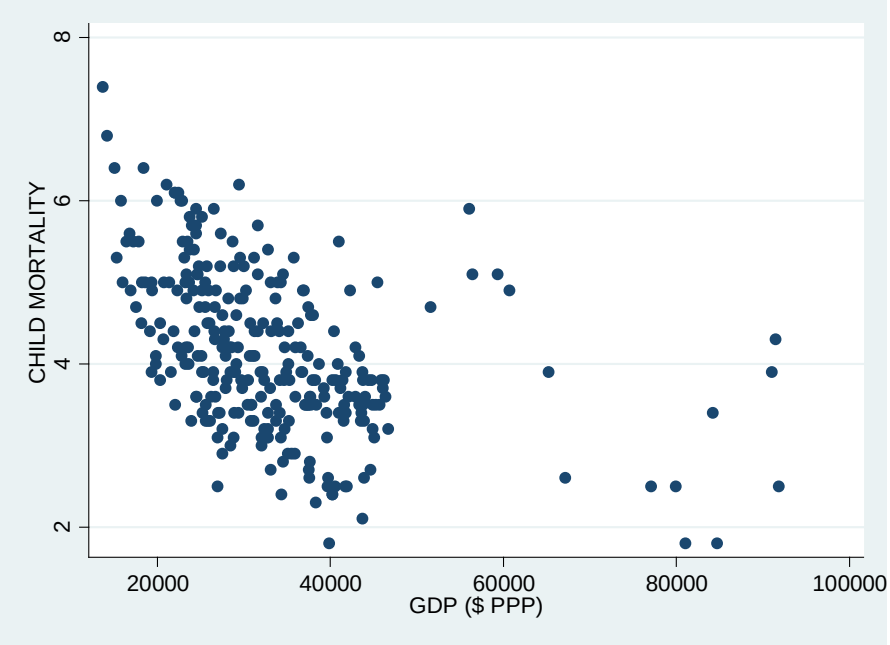
We have considered two different sources of information. Firstly, we have used the data contained in the ECHP and EU-SILC to consider different inequality and poverty measures taking into account the different size and composition of the households. We have used household information rendering the component family by using equivalence scales. In particular, we have considered the modified OECD equivalence scale. This scale gives a weight of 1 to the first adult, 0.5 to other person aged 14 or over and 0.3 to each child aged less than 14. For each person the "equivalized total net income" is calculated as its household total net income divided by the equivalized household size.

Secondly, we have used health and economic indicators taken from the Organization for Economic Development and Cooperation OECD Health Data Statistics. It allows for the comparison and the analysis of international health care systems.

This study is focused on the relative income hypothesis. That is, the health of individuals not only depends on their income but also on the degree of income inequality in its society. Thus, we empirically investigate the relationship between income inequality and socio-economic factors with health inequality in the European Union using aggregated data. We will show that income inequality and GDP are associated with child mortality.

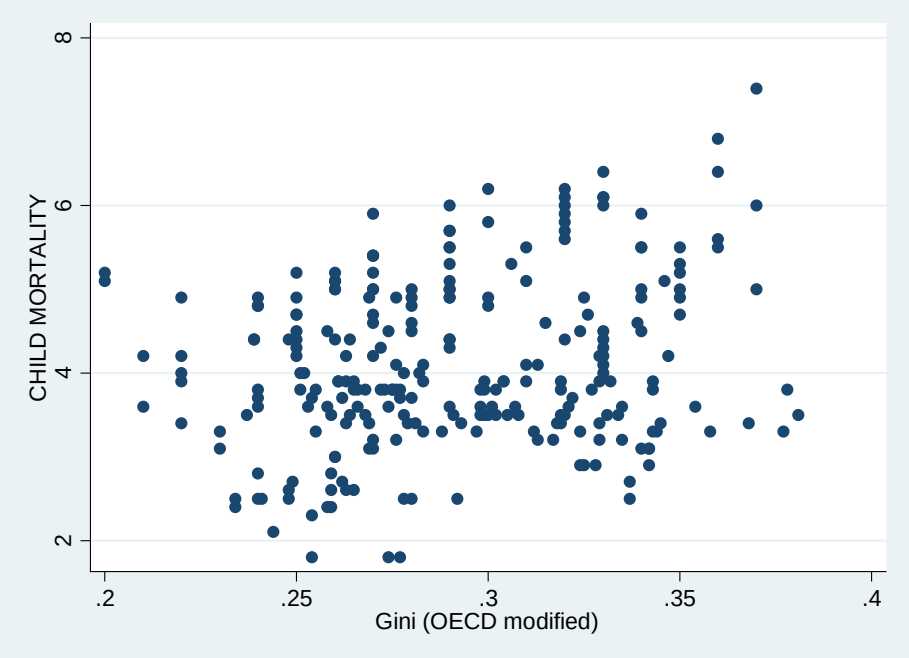
Income inequality measured by the Gini index is positively related with child mortality. However, an aggregation problem, which will be discussed in the next section, is detected. Figure 4.1 shows the scatter plot of child mortality against per capita income (GDP per capita-$ Purchasing Power Parity) in the European Union countries (UE- 15) from 1995 to 2014 and Figure 2 plots child mortality against Gini indices (OECD modified equivalence scale) for the same period and countries. Log specification in child mortality and real income is used because inspection of scatter plots suggests an approximately log-linear relationship between GDP per capita and child mortality.

Figure 4.1.
Child mortality and GDP per capita ($ PPP). UE-15 countries (1995-2014)



Source of data: Authors' calculation from OECD Health Data.

Figure 4.2.
Gini index (OECD modified equivalence scale) and Child Mortality. UE-15 countries (1995-2014)



Source of data: Authors' calculation from Eurostat and OECD Health Data

Also, different poverty measures have been used. Policy makers are concerned with reducing poverty which at the same time is positively related with child mortality. The reduction of poverty and social exclusion is a key objective of the European Union countries. The context of this process of coordination initiated in the matter of social and in relation to the goals set in Lisbon, several countries have presented National Action Plans to combat poverty and social exclusion. In this way, they have detailed social inclusion policies and future commitments. The origin of these Plans were adopted by the Nice Council of Europe and at the Lisbon Council of Europe held in March 2000. The European Union countries agreed to reduce poverty and social exclusion. Thus, a wide range of policies were established related with employment, gender equality, social protection systems, poverty and social exclusion faced by immigrants. In particular, European Union countries are focused on the following facts:

- To promote access to stable and quality employment (for women and men).
- To develop policies to promote the reconciliation of work and family life.
- To improve employability and life-long learning.
- To provide access for housing and the basic services necessary to live (electricity, water, etc.).
- To provide access for healthcare, education, justice and other public services such as culture.
- Reintegration of drug addicts into society and the world of work.
- Preventing alcohol abuse and smoking specially among young people.

Also, in the matter of support for family income and for the purpose of stimulating an increase in the birth-rate, most European Union countries have introduce a bonus of around 1200 euros in favour of mothers for each child born. In this sense, employment is one of the most important safeguard against social exclusion. In consequence, European Union countries are promoting the acquisition of skills and life-long learning. As well, social protection systems play a key role.

FuthermoreOn the other hand, in a seminal article, Sen (1976) described the main problems involved in the definition of poverty. Mainly, the author distinguished three elements that should be included in a poverty index: the relative number of poor (the

persistence of poverty), the average income shortfall of the poor (the poverty gap) and the distribution of income among the poor, indicating their relative deprivation. Also, in most of the poverty indices, an axiomatic framework is used to list the desirable properties of such an index. The main axioms that a poverty index should verify are: *Monotonicity axiom* (a decrease in the income of a poor person should increase the poverty index, and vice versa), *transfer axiom* (a transfer from a poor person to a richer person should increase the poverty index, and vice versa), *population symmetry axiom* (if two or more identical populations are pooled, the poverty index should not change), *proportion of poor axiom* (an increase in the relative number of poor should increase the poverty index), *focus axiom* (the poverty index should be independent of the income levels of people above the poverty line), *transfer sensitivity axiom* (the increase of a poverty index as a result of a transfer of a fixed amount of money from a poor person to a richer person should be decreasing in the income of the donator, and vice versa) and *decomposability axiom* (the poverty index should increase when poverty in a subgroup increases, other things being equal, and vice versa). However, problems arise when a choice has to be made between two axiomatic requirements that are both desirable.

The definition of poverty used by the European Commission appears in the Council decision (December 1984): "This poor shall be taken to mean persons, families and groups where resources (material, cultural and social) are so limited as to exclude them from a minimum acceptable way of life in the Member States in which they live" (Mejer, 1999).

Besides, absolute poverty is defined by the United Nations as a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to social service. On the other hand, relative poverty is defined by a threshold in relation to the average income or consumption level of society.

Following the approach adopted in most poverty research, we will focus on relative economic poverty, that is, the poverty line adopted is not fixed over the period analyzed.

However, the choice of a poverty line is arbitrary so it is important to ensure that the poverty line chosen does resonate with social norms, as recommend the World Bank. The conventional definition for the poverty line which used by EUROSTAT is 60 percent of the median. Thus, people living in households with a disposable income below 60 percent of the national median are characterised as poor. However, as the arbitrariness of thresholds is widely recognized we are going to use another threshold: the 50 percent of the national mean. Obviously, the choice of any equivalence scale and the poverty line affects the poverty index value. So, it is important to test the sensitivity of the results to different measures.

Our results are based on the following general model:

$$H = H(E, HC, L), \tag{1}$$

where H denotes some health indicator (in particular we have considered child mortality); E represents a vector of economic references; HC, represents health care resources and L denotes lifestyle and behaviour. In particular, we have considered the following variables (see Table 4.1.) for the European Union countries since 1995 to 2014: Gross Domestic Product (per capita US$ Purchasing Power Parity), the ratio 95^{th} percentile/5^{th} percentile of the income distribution, distribution of income (median and mean)s, income gap ratios, accute care beds per 1000 population, general practitioners (density per 1000 population), alcohol consumption (litres per capita) and tobacco consumption (grammes per capita). Finally, a dummy variable has been built (NHS) in order to take into account the type of health care system. This one takes value 1 if the country has National Health Service and 0 if not.

Table 4.1.
Variables and definitions

DEPENDENT VARIABLE (HEALTH STATUS-*H*)		DEFINITION
CHILDM-log		Logarithm of Child Mortality (deaths per 1000 live births). Source: OECD Health Data.
INDEPENDENT VARIABLES		
VECTOR	VARIABLES	DEFINITION
Economic references (*E*)	GDP-log	Logarithm of Gross Domestic Product (per capita US$ PPP). Source: OECD Health Data.
	P95/P5	95^{th} percentile divided by 5^{th} percentile. Source: Author's elaboration based on Eurostat. Share of national equivalised income.
	DI(MEAN)	Distribution of income. Source: Eurostat. Equivalence net income. Poverty line: 50 percent of the mean.
Health care resources (*HC*)	ACB-log	Logarithm of Acute Care Beds per 1000 population. Source: OECD Health Data.
	GP-log	Logarithm of General Practitioners (density per 1000 population). Source: OECD Health Data.
	NHS	1 if the country has National Health Service and 0 otherwise
Lifestyle and behaviour (*L*)	ALC-log	Logarithm of Alcohol consumption (liters per capita). Source: OECD Health Data.
	TOB-log	Logarithm of Tobacco consumption (grammes per capita). Source: OECD Health Data.

Source: Authors' elaboration.

4.3. RESULTS

In this section, estimates of the determinants of child mortality in the European Union countries are presented. The basic framework is a regression model of the form:

$$CHILDM_{it} = \alpha_i + \beta_1 GDP_{it} + \beta_2 (P95/P5)_{it} + \beta_3 P_{it} + \beta_4 ACB_{it} + \beta_5 GP_{it} + \beta_6 ALC_{it} + \beta_7 TOB_{it} + \beta_8 NHS_{it} + \varepsilon_{it} \quad (2)$$

where *i* refers to the country (*i* = 1,...., 15 Member States), *t* is the year (*t* = 1995, ..., 2014), *GDP* denotes Gross Domestic Product, *P95/P5* denotes 95th percentile divided by 5th percentile calculated using the microdata from the ECHP and EU-SILC, *P* denotes the poverty measure, *ACB* denotes acute care beds, *GP* represents general practitioners, *ALC* denotes alcohol consumption, *TOB* represents tobacco consumption and *NHS* represents those European countries with National Health Service.

As it was pointed before, income inequality measured through the Gini index is positively related to child mortality, however an aggregation problem is detected as other authors have shown (Waldmann, 1992). Results of summary statistics are shown in Table 4.2. Thus, child mortality appears to be positively related to the ratio 95th percentile/5th percentile and the poverty measure considered. Table 4.3. presents the estimation results using STATA 11.2 for the pooled model, all countries and periods combined. The models pass a RESET test of model misspecification.

The statistics show that our variables are very stable and standard deviation is always smaller than the mean. The results obtained should not be interpreted as meaning that only an increase in the wealth of the rich raises child mortality because there exist other important factors to take into account. Thus, we have considered the proxy consumption of medical services (through the number of general practitioners per 1000 population and acute care beds per 1000 population) and variables related with lifestyle and behaviour (alcohol and tobacco consumption).

Table 4.2.
Summary Statistics of selected variables used in estimations

Variables	Number of observations	Mean	Std. Dev.	Minimum	Maximum
CHILDM	285	4.13	0.99	1.80	7.40
GDP	300	33789.80	12925.35	13687.00	93134.90
P95/P5	168	0.18	0.04	0.09	0.25

Source: Authors' calculations from Eurostat and OECD Health Data.

Table 4.3.
Estimates of the determinants of Child Mortality in the European Union countries.
Dependent variable: Logarithm of Child Mortality

Variable	Model 1
GDP-log	
Coefficient	-0.3204
(*t* Statistic)	(1.16)
P95/P5	
Coefficient	-1.8668**
(*t* Statistic)	(2.30)
DI(MEAN)	
Coefficient	-0.1260
(*t* Statistic)	(1.45)
ACB-log	
Coefficient	-0.1491
(*t* Statistic)	(0.81)
GP-log	
Coefficient	-0.5179*
(*t* Statistic)	(1.62)
ALC-log	
Coefficient	0.2425*
(*t* Statistic)	(1.75)
TOB-log	
Coefficient	0.7921***
(*t* Statistic)	(3.14)
NHS	
Coefficient	-0.1043
(*t* Statistic)	(0.85)
Number of observations	44
Hausman test	RE

Note: (***) denotes 1% significance. (**) denotes 5% significance. (*) denotes 10% significance.
Source: Authors' calculation.

It is very interesting to point out that wealthier European Union countries (in terms of GDP per capita) seem not to be necessarily healthier nations measured in terms of child mortality. In this way, Luxembourg has the highest level of GDP per capita since 1993 to 2000 but its child mortality rate is not the lowest. In fact, in 1998 and 1999 it was the eighth and in 2000 it was the ninth in terms of child mortality. Furthermore, Luxembourg has one of the highest level of total expenditure on health (per capita), as OECD Health Data shows, and this does not imply better health in terms of child mortality. However, the results obtained considering EU-15 countries show that GDP per capita is negatively related to child mortality. Alcohol and tobacco consumption are positively related to child mortality. On the other hand, medical services resources (measured through acute care beds per 1000 population) are not significantly related to child mortality. This fact could be justified because we are considering developed countries with a high level of them. Also, the level of explanation, as measured by R^2, is acceptable, signs of variables are those to be expected and their statistical significance is accepted. The results indicate that among the explanatory variables analysed *GDP*, *P95/P5*, *GP*. *ALC*, *TOB* and *NHS* are the most likely to affect child mortality rates.

4.4. DISCUSSION AND CONCLUSIONS

This research has empirically examined the determinants of child mortality differences in the European Union countries. Although there is no consensus about how to avoid the aggregation problem afflicting cross-sectional studies of the relationship between population health and income inequality, we have analysed different hypothesis using information for the European Union countries. Our results indicate that child mortality is negatively related to the relative number of, general practitioners and GDP per capita. Also, child mortality is positively related to tobacco and alcohol consumption, and "the income of the rich" measured through the ratio 95^{th} percentile/5^{th} percentile of the income distribution. In this way, higher incomes for the rich are related positively to child mortality. Besides, medical technology plays a significant role in improving the efficiency of health care. Finally, if we consider the relationship between income inequality measured through the Gini index and child mortality we can observe that greater inequality is always associated with higher child mortality. These results should be taken into account in order to make adequate health care policies in the European Union countries.

CHAPTER 5

IMPACT OF IMMIGRATION ON SPANISH REGIONAL HEALTH SERVICES: AN EMPIRICAL APPROACH

5.1. INTRODUCTION

Migrations are one of the main challenges of European and developed countries. In global terms, the number of international emigrations has been increased in last decades (OECD,2013). Also during the last decade, migratory flows to European Union countries have transformed Spain into a receiving country of reasonable migratory flows, frequently, from countries with very different conditions of health (Collado *et al*., 2004; Solsona and Viciana, 2004). However, Spain is one of the European Union countries hit hardest by the economic crisis with some of Europe's highest levels of unemployment. In this sense, policy makers are also very worried about their integration which is seen as a process where immigrants are assimilated into the Spanish culture through education, access to social benefits, pensions, etc. But what happens with immigrants`health?

According to data of Spanish National Institute of Statistic (INE), foreign population in 2006 in Spain already overcomes four million people (already represent 9,3 percent of total population's). However, in 2015, foreign population is 4.729.644 persons and total population is 46.449.565 (Revision of the Spanish Municipal Register, 2015). That is, 10,18 percent of total population are foreign nationals. In fact, these immigrants respond to a demographic and health profile as well as different public and health services utilization than native population(Rivera *et al*., 2008).

The studies related with immigration and population's health come mainly from those countries that have received in last decades a greater number of immigrants (Sharma *et al*., 1990; Lalonde and Topel, 1991; Dunn and Dick, 2000; Gustaffson and Osterberg, 2001; McKay *et al*., 2003; McDonald and Kennedy, 2004; Mayr, 2005; Chiswick *et al*., 2006), being in Spain a relatively recent phenomenon, what justifies the smallest number of academic studies about it (Sanz *et al*., 2000; Borrell *et al*., 2000; Cots *et al*., 2002; Urbanos, 2000; Vall *et al*., 2001; Jansá and García de Olalla, 2004; Clavero and Gonzalez, 2005; Mora and Gallo, 2006; Rivera, 2007).

This research is focused on the demand for health services of immigrant population measured as counts of utilization using the information contained in the European Community Household Panel (ECHP), the European Statistics on Income and Living Conditions (EU-SILC) and the European Health Survey (EHIS**)**. We will use an econometric framework and following these theoretical and methodological approaches, health care utilization by immigrants can be analysed across socio-economic groups, educational attainment and social class group. Thus, recent research on the demand for medical care is focused mainly on discrete measures such as the number of physician or non-physician visits (see López Nicolás, 1998 and 2001; Urbanos, 2000; Clavero and González, 2005; Deb and Trivedi, 1997).

More recently, different papers are also motivated by the relationship between different health outcomes, natives and immigrant groups (see Table 5.1.). In fact, we can point out the following points:

- Health inequalities do not affect immigrant groups in equal measure and confirm the poorer and more steeply deteriorating health status of Eastern European immigrants (Lanari et al., 2015).
- The health status and use of health services among immigrants differ significantly from those of natives. Results highlight the higher frequency of Unmet Needs for Health Care (UNHC) among immigrants, especially being higher in Moroccans (Tormo et al., 2015).
- Immigrants had poorer perceived health than natives in the Basque Country, regardless of age (Alvarez et al., 2014).
- Italian immigrants are much less likely to use specialist health care and medical telephone consultations than natives but more likely to use emergency rooms (De Luca et al., 2013).
- Some immigrants were more likely to report a decline in health, while others were more likely to report an improvement in health relative to native-born residents (So and Quan, 2012).
- Immigrants who were users of the primary care system reported a similar level of access as Canadian-born individuals. Meanwhile, recent immigrants

are in poorer health compared with Canadian-born, they report adequate access to primary care (Muggah et al., 2012).

- The immigrant patients do not find barriers that can make their access to health services more difficult. Professionals detect differences in the access and use of health services depending on their origin and the level of social integration of the immigrant group (Gistau et al., 2012).
- Foreign immigrant women from countries with limited economic resources who came to the hospital for laboring did not present a higher risk of complication during pregnancy and labor, contrary to what it seems to be generally perceived (Liberal et al., 2012).
- Immigrant men generally use health services less frequently than Spanish people. The main exceptions are Latin American men, who more often use emergency services and Sub-Saharan men, who use specialists more frequently. Immigrant women use health services about as frequently as Spanish women. The main exceptions are North African women, who less frequently use specialists and Sub-Saharan women who more frequently use General Practitioners (GPs), specialists and emergency services (Sanz et al., 2011).
- Turkish immigrants are as healthy as the native German population when different variables related to socio-economic status and coping resources are taken into account. Turkish immigrants in East Germany are healthier than their East German counterpart (Wengler, 2011).
- First generation immigrants show remarkable differences in Health Care Utilization (HCU) compared to the native-born Germans and the second generation immigrants. Their HCU seems to be focused on primary care, and access to secondary care might be complicated. It seems relevant to especially pay attention to HCU of first generation immigrants and to support equal access to care for this subgroup (Glaesmer et al., 2011).
- There is no significant difference in utilization of public health care between Latin American immigrants and native-born populations in Spain, with the exception of a higher frequency of use of emergency rooms by the former (Muñoz and Anton, 2010 and 2009).

- Undocumented female immigrants have unmet health care needs (56%) and low health care utilization. Besides, sixty-nine per cent of the women reported significant obstacles in accessing health care facilities (Marianne et al., 2010).
- Rural-urban labor migration increased the risk of psychological disorder as measured by depressive symptoms. The deleterious effect was particularly strong for migrants who moved alone and was negligible for migrants moving with family members. In contrast, migration had little impact on physical health in the medium term (Lu, 2010).
- Asian Americans demonstrated lower rates of any type of mental health–related service use than did the general population, although there are important exceptions to this pattern according to nativity status and generation status (Abe-Kim et al., 2007).
- Immigrants seemed to have less adequate access to formal medical care (Frisbie et al., 2001).
- Immigrants who are not United States citizens are much less likely to receive employer-sponsored health insurance or government coverage (Carrasquillo et al. 2000).

Thus, there is no consensus about the relationship between health outcomes and health care utilization by nativity status. The distinctive features of this research are the following. As far as we are concerned, it is among the first to disentangle health care utilization by place of birth 8foreign born and native born) covering a broad period 1994-2014 and using Self-Assessed Health as a proxy for health status.

The chapter is organised in five sections. In section two we present the methodological decisions we have taken. Section three describes the data sources we have used and characteristics of the variables involved in our analysis. In section four, we describe the main results and empirical framework and finally, section five gives a summary and conclusion.

Table 5.1.

Literature Review about the relationship between health inequalities and immigrant groups

Authors	**Data**	**Conclusion**
Lanari, D., Bussini, O., Minelli, L. (2015).	Data were obtained from the Survey of Health, Ageing and Retirement in Europe (SHARE).	Health inequalities do not affect immigrant groups in equal measure and confirm the poorer and more steeply deteriorating health status of Eastern European immigrants.
Tormo MJ, Salmerón D, et al, (2015)	National Health Survey	The health status and use of health services among immigrants differ significantly from those of natives. Results highlight the higher frequency of Unmet Need for Health Care (UNHC) among immigrants, especially high in Moroccans
Álvarez, E. R., González-Rábago, Y., et al. (2014).	The Basque Health Survey 2007 (n=4,270) and the Basque Health Survey for Immigrants 2009 (n = 745)	Immigrants had poorer perceived health than natives in the Basque Country, regardless of age.
De Luca G, Ponzo M, Andrés AR (2013)	Italian Health Conditions survey	Italian immigrants are much less likely to use specialist health care and medical telephone consultations than natives but more likely to use emergency rooms.
So,L; Quan,H (2012)	Longitudinal data from Statistics Canada National Population Health Survey, which represented 8,474 native-born residents and 1,339 immigrants from 1994/95 to 2004/05.	Some immigrants were more likely to report a decline in health, while others were more likely to report an improvement in health relative to native-born residents.
Muggah, E., Dahrouge, S., & Hogg, W. (2012)	Data from the Comparison of Models of Primary Care Study (COMP-PC),in 2005-2006 in Canada	Immigrants who were users of the primary care system reported a similar level of access as Canadian-born individuals. While recent immigrants are in poorer health compared with Canadian-born they report adequate access to primary care.

Source: Author's elaboration.

Table 5.1. (continue)

Literature Review about the relationship between health inequalities and immigrant groups

Gistau, J. L., Duch, I. V., Orpinell, M. M., Serra, C. P., & Rojas, À. G. (2012).	Qualitative, descriptive and phenomenological study carried out in Barcelona between September and December of 2007	The immigrant patients do not find barriers that can make their access to health services more difficult. Professionals detect differences in the access and use of health services depending on their origin and the level of social integration of the immigrant group.
Liberal M.L., Garrido Sánchez, Tello E., Mestanza J.A., Iglesias E.(2012)	56 women have been analyzed, both Spanish and foreign immigrants, giving birth on Nuestra Señora del Prado Hospital, from January 1st 2009 and December 31st 2010.	Foreign immigrant women from countries with limited economic resources who came to our hospital for laboring did not present a higher risk of complication during pregnancy and labor, contrary to what it seems to be generally perceived.
Sanz, B., Regidor, E., Galindo, S., Pascual, C., Lostao, L., Díaz, J. M., & Sánchez, E. (2011).	Spanish National Health Survey (2006)	Immigrant men generally use health services less frequently than Spanish nationals. The main exceptions are Latin American men, who more often use emergency services and Sub-Saharan men, who use specialists more frequently. Immigrant women use health services about as frequently as Spanish women. The main exceptions are North African women, who less frequently use specialists and Sub-Saharan women who more frequently use GPs, specialists and emergency services
Wengler, A. (2011)	Turkish immigrants currently living in Germany and evaluates their subjective health status using relatively new data from the Generations and Gender Survey (2005/2006).	Turkish immigrants are as healthy as the native German population when different variables related to socio-economic status and coping resources are taken into account. Turkish immigrants in East Germany are healthier than their East German counterpart

Source: Author's elaboration.

Table 5.1. (continue)

Literature Review about the relationship between health inequalities and immigrant groups

Glaesmer, H., Wittig, U., Braehler, E., Martin, A., Mewes, R., & Rief, W. (2011)	A representative population survey in Germany (N = 2,510), immigrant background generational cohort and HCU in the preceding 12 months were screened by means of self-rating instruments.	First generation immigrants show remarkable differences in Health care Utilization (HCU) compared to the native-born Germans and the second generation immigrants. Their HCU seems to be focused on primary care, and access to secondary care might be complicated. It seems relevant to especially pay attention to HCU of first generation immigrants and to support equal access to care for this subgroup.
Muñoz, R., Antón, JM (2010)	The 2006 National Health Survey in Spain	There is no significant difference in utilization of public health care between Latin American immigrants and native-born populations in Spain, with the exception of a higher frequency of use of emergency rooms by the former.
Marianne A. Schoevers Maartje J. et al.(2010)	Undocumented women aged >18 years, living in different parts in the Netherlands	Undocumented female immigrants have unmet health care needs (56%) and low health care utilization.Sixty-nine per cent of the women reported obstacles in accessing health care facilities.
Lu, Y. (2010)	Longitudinal data for 1997 and 2000 from Indonesia	Rural-urban labor migration increased the risk of psychological disorder as measured by depressive symptoms. The deleterious effect was particularly strong for migrants who moved alone and was negligible for migrants moving with family members. In contrast, migration had little impact on physical health in the medium term.
Muñoz-de Bustillo, R., Antón,JM (2009)	Using a nationally representative health survey from 2006-2007 in Spain.	There is no statistically significant difference in the patterns of visits to physicians and hospital stays between migrants and natives in Spain. However, immigrants have a lower access to specialists and visit emergency rooms with higher frequency than nationals.

Source: Author's elaboration.

Table 5.1. (continue)

Literature Review about the relationship between health inequalities and immigrant groups

Abe-Kim, J., Takeuchi, D. T., Hong, S., Zane, N., Sue, S., Spencer, M. S. & Alegría, M. (2007)	Data were derived from the National Latino and Asian American Study (2002–2003).	Asian Americans demonstrated lower rates of any type of mental health–related service use than did the general population, although there are important exceptions to this pattern according to nativity status and generation status.
Frisbie, W. P., Cho, Y., & Hummer, R. A. (2001)	The 1992–1995 National Health Interview Survey in US.	Immigrants seemed to have less adequate access to formal medical care.
Carrasquillo, O., Carrasquillo, A. I., & Shea, S. (2000)	Data from the 1998 Current Population Survey in US.	Immigrants who are not United States citizens are much less likely to receive employer-sponsored health insurance or government coverage

Source: Author's elaboration.

5.2. METHODOLOGICAL DECISIONS

The analytical framework of this research is based on exploring the health care utilization in Spain by immigrant population using different econometric techniques. Also, socio-demographic characteristics of immigrants (like age, gender, education, marital and health status and some economic data) are analysed (Grossman, 1972a and b, 2000; Zweifel, 1981; Pohlmeier and Ulrich, 1995). There are two different approaches in health care utilization: discrete choice models and count data models.

In discrete choice models our dependent variable in the statistical model is a dichotomy variable which takes a value of 1 if the individual has a particular characteristic and 0 otherwise. In this way, a set of factors, such as age, marital status, education, etc., gathered in a vector *x* explain this fact so that:

$$\begin{aligned} &\text{Prob}\,(Y=1) = F(x,\beta), \\ &\text{Prob}\,(Y=0) = 1 - F(x,\beta). \end{aligned} \tag{1}$$

The set of parameters β reflects the impact of changes in *x* on the probability. In order to estimate this equation, a nonlinear specification of *F*(.) can prevent logical inconsistency and the possibility of predicted probabilities outside the range [0,1]. The most common nonlinear parametric specifications are logit and probit models which have been analysed. So, we will use a latent variable interpretation (Jones, 2000). Let

$$\begin{aligned} y &= 1 \quad if \;\; y_i^* > 0 \\ y &= 0 \quad if \;\; y_i^* \leq 0 \end{aligned} \tag{2}$$

where

$$y^* = x'\beta + \varepsilon\,. \tag{3}$$

On one hand, If we assume that ε has a standard normal distribution, we obtain the probit model, while assuming a standard logistic distribution, we obtain the logit model.

These models are usually estimated by maximum likelihood estimation and the log-likelihood for a sample of independent observations is:

$$\ln L = \sum_{i=1} \left\{ y_i \ln F(x_i^{'}\beta) + (1 - y_i) \ln\left[1 - F(x_i^{'}\beta)\right] \right\}. \tag{4}$$

On the other hand, there are different approaches to econometric modelling of count measures of health care utilisation (López-Nicolás, 1998 and 2001; Jones, 2000; Bago, 2006). For example, in the case of count data models the Poisson model has been widely used to study count data (Cameron and Trivedi, 1998; Greene, 2011). The model stipulates that each y_i is drawn from a Poisson distribution with parameter λ_i, which is related to the regressors, x_i.

The basic equation of the model is as follows,

$$\Pr(Y_i = y_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!}, \tag{5}$$

$$y_i = 0,1.2,...,\infty \tag{6}$$

In this sense, the most common formulation for λ_i is

$$\ln \lambda_i = \beta' x_i. \tag{7}$$

So, it is easily shown that

$$E\left[y_i / x_i\right] = Var\left[y_i / x_i\right] = \lambda_i = e^{\beta' x_i}, \tag{8}$$

And

$$\frac{\partial E\left[y_i / x_i\right]}{\partial x_i} = \lambda_i \beta. \tag{9}$$

In this regard, Poisson regression model can be interpreted as a simply nonlinear regression but it is far easier to estimate the parameters with maximum likelihood techniques and the log-likelihood function is

$$\ln L = \sum_i \left[-\lambda_i + y_i \beta' x_i - \ln y_i ! \right] \tag{10}$$

A general Poisson model is the negative binomial one that deals with cases where there is more variation than would be expected were the process Poisson. In this case, the probability that a random variable *Y* has a certain value, with the hypothesis that parameter λ follows a gamma (ϕ, υ) is obtained from

$$\Pr(Y_i = y_i) = \int_0^\infty \Pr(Y_i = y_i / \lambda) f(\lambda) d\lambda = \frac{\Gamma(y_i + \upsilon)}{\Gamma(y_i + 1)\Gamma(\upsilon)} \left(\frac{\upsilon}{\upsilon + \phi} \right)^{\upsilon} \left(\frac{\phi}{\upsilon + \phi} \right)^{y} \tag{11}$$

with $E(y_i) = \phi$ and $Var(y_i) = \phi + \alpha\phi^2$, where $\alpha = 1/\upsilon$.

In other way, count data often show a higher incidence of zero counts than would be expected if the data were Poisson distributed. Zero-inflated Poisson regression models are a useful class of models for such data, but parameter estimates may be seriously biased if the nonzero counts are over-dispersed in relation to the Poisson distribution.

Moreover, there are different specifications of zero inflated negative binomial models that fit distributions, like health care utilization, where exists a greater number of replies with zero (or “zero inflated”) (Yin, 2002).

5.3. DATA DESCRIPTION

In this research, besides other administrative registrations, three sources of information will be used. These data have been fundamental for analysis of population's socio-demographic characteristics not only in our country but also in the European Union. These databases are the European Community Household Panel (ECHP), the European Statistics on Income and Living Conditions (EU-SILC) and the European Health Survey (EHIS). Next, we will describe each shortly one of them.

5.3.1 THE EUROPEAN COMMUNITY HOUSEHOLD PANEL (ECHP)

The first source of data used in this chapter is taken from the European Community Household Panel (ECHP) for Spain. This survey contains data on individuals and households for the European Union countries with eight waves available (1994-2001)[3].

The ECHP is a representative database of households of different European Union countries. It was elaborated for the first time in 1994 and it was composed by 60.500 households (approximately 170.000 individuals). In the case of Spain, the first wave was composed by 7.206 households (23.025 individuals). Thus, Table 5.2. includes information about households and individuals´ sample composition for Spain.

Table 5.2.
Household´s sample composition in ECHP (1994-2001). Number of unweighted observations

Country		Wave 1 (1994)	Wave 2 (1995)	Wave 3 (1996)	Wave 4 (1997)	Wave 5 (1998)	Wave 6 (1999)	Wave 7 (2000)	Wave 8 (2001)
Spain	Household	7206	6522	6267	5794	5485	5418	5132	4966
	Individuals	23025	20708	19712	18167	16728	16222	15048	14320

Source: Author´s calculation based on ECHP data.

The main advantage of this survey is that information is homogeneous among countries since the questionnaire is similar across them. This source of data is coordinated by the *European Commission's Statistical Office* (EUROSTAT). Also, it includes rich new information about income, education, employment, health, etc. In this sense, it is important to highlight that it is the first fixed and harmonized panel for studying socio-economic factors of the households and individuals inside the European Union.

In the ECHP we have a section dedicated to the migratory trajectory that will be used in this research. In particular, we will be able to classify the population according to their migratory trajectory and country of birth.

[3] See Peracchi (2002) and Cantarero *et al.* (2005).

5.3.2 THE EUROPEAN STATISTICS ON INCOME AND LIVING CONDITIONS (EU-SILC)

The European Statistics on Income and Living Conditions (EU-SILC) is a new source of statistical information harmonized at European level whose objective is the systematic production of statistical community on income and life conditions of European Union. This survey substitutes to the ECHP that began in 1994 and it concluded in 2001. However, in order to upgrade the content with arrangement to new demands it motivates the elaboration of this new source of information.

By this way, EU-SILC allows us to study sociodemographic characteristics (revenues, life conditions of households, economic activity, health status, access to health care services, education level, children's care, etc.) at European level. Table 5.3. describes the number of households and individuals that compose the sample in Spain in 2004 by Autonomous Communities (AACC).

Table 5.3.
Number of unweighted observations

	Households	**Individuals**
Galicia	1039	2293
Asturias	661	1409
Cantabria	471	836
Basque Country	832	1684
Navarre	472	1139
La Rioja	480	942
Aragon	699	1546
Madrid	1393	2128
Castile and Leon	1035	2191
Castile - La Mancha	746	1632
Extremadura	589	1298
Catalonia	1693	3211
Valencian Community	1192	2631
Balearic Islands	553	1006
Andalusia	1840	3939
Murcia	615	1394
Ceuta	262	585
Canary Islands	459	1458
SPAIN	**15031**	**31322**

Source: Author´s calculation based on EU-SILC, 2004.

EU-SILC (2004) provides transversal and longitudinal information with a high degree of quality. In the Spanish case, it is expected that period of this new panel will be four years. Actually, we have information of about 15.000 households and 31.000 adults (greater than 16 years). Thus, the rise of immigrant population in Spain has created a new socio-demographic situation that requires a deep study of health status and new assistance and preventive priorities.

5.3.3 THE EUROPEAN HEALTH SURVEY (EHIS)

In 2002, Eurostat launched the European Health Survey System (EHSS) in order to obtain health data by means of official surveys and meet the demand for information on health and its determinants. The European Health Survey (EHIS) is a five-yearly research addressed to all people aged 15 and over who reside in family dwellings throughout the national territory. It includes data of health services and health determinants and it is harmonized and comparable at a European level. The first wave for Spain was published in 2009.

Thus, the EHIS 2014 sample (the most recent information) is approximately based on 23,000 dwellings distributed in 2,500 census tracts. Another point of interest is that this survey provides national results by Autonomous Communities. Also, the information is divided into four modules: health status, health care use, health determinants and socio-economic background variables.

The European Health Care Module (ECHM) collects data on the use of health care services and the unmet needs for health care. Information on health care consumption is an essential part of this study in order to assign necessary resources to the population. In fact, we are very interested in these points:

1. General activity limitation: Limitation in activities people usually do because of health problems for at least the past six months.
2. Admission as an inpatient in a hospital in the past 12 months.
3. Number of times admitted as a day patient in a hospital in the past 12 months.

4. Number of times consulted a GP (General Practitioner) or family doctor on your own behalf.

In this study we are very interested not only in GPs and specialists consults but also average number of visits to the family doctor and specialist in the last 4 weeks, according to sex and age group (Tables 5.4. and 5.5.). If we compare the results for 2009 and 2014, we can observe that both have decreased except for males between 35 and 54 years old. However, as noted by INE, in 2014, 20.9% of population has visited a GP in the last 4 weeks (this percentage was 28.5% in 2009) and 14.2% of the population has visited a specialist versus 11.2% in 2009. So, more people have consulted a GP or specialist but less number of times. Thus, we consider that this point is very important to analyze deeply what has really happened.

Table 5.4.

Average number of visits to the family doctor or general practitioner in the last 4 weeks, according to sex and age group. Average and standard deviation. Population aged 16 years old and over that has visited the family doctor or general practitioner in the last 4 weeks

	2009		2014	
	Average	Standard deviation	Average	Standard deviation
Both sexes				
Total	1.42	1.07	1.34	0.91
16 to 24 years old	1.27	0.62	1.21	0.58
25 to 34 years old	1.44	1.15	1.33	0.78
35 to 44 years old	1.39	0.83	1.35	0.93
45 to 54 years old	1.4	0.84	1.37	0.91
55 to 64 years old	1.4	0.91	1.34	0.91
65 to 74 years old	1.41	1.05	1.3	0.97
75 years old and over	1.53	1.52	1.37	0.89
Male				
Total	1.41	1.2	1.32	0.94
16 to 24 years old	1.34	0.7	1.1	0.45
25 to 34 years old	1.38	1.13	1.2	0.54
35 to 44 years old	1.33	0.76	1.34	0.9
45 to 54 years old	1.41	0.86	1.44	1.07
55 to 64 years old	1.4	0.9	1.34	0.93
65 to 74 years old	1.31	0.89	1.25	1.03
75 years old and over	1.63	2.1	1.37	0.93
Female				
Total	1.42	0.97	1.35	0.9
16 to 24 years old	1.22	0.54	1.28	0.64
25 to 34 years old	1.47	1.17	1.41	0.88
35 to 44 years old	1.42	0.88	1.36	0.96
45 to 54 years old	1.39	0.83	1.33	0.77
55 to 64 years old	1.39	0.92	1.34	0.9
65 to 74 years old	1.48	1.15	1.34	0.91
75 years old and over	1.47	0.97	1.37	0.86

Source: Spanish National Statistical Institute.

Table 5.5.

Average number of visits to the specialist in the last 4 weeks, according to sex and age group. Average and standard deviation. Population aged 16 years old and over that has visited the specialist in the last 4 weeks

	2009		2014	
	Average	Standard deviation	Average	Standard deviation
Both sexes				
Total	1.49	1.45	1.4	1.22
16 to 24 years old	1.42	1.17	1.18	0.55
25 to 34 years old	1.46	1.44	1.37	0.82
35 to 44 years old	1.38	0.91	1.45	1.5
45 to 54 years old	1.5	1.03	1.49	1.53
55 to 64 years old	1.67	2.23	1.39	1.17
65 to 74 years old	1.52	1.53	1.38	0.99
75 years old and over	1.43	1.5	1.35	0.91
Male				
Total	1.51	1.61	1.41	1.48
16 to 24 years old	1.48	0.88	1.25	0.71
25 to 34 years old	1.37	0.94	1.27	0.61
35 to 44 years old	1.38	1.15	1.55	2.23
45 to 54 years old	1.53	1.14	1.59	1.95
55 to 64 years old	1.71	2.65	1.36	1.32
65 to 74 years old	1.47	1.12	1.35	1.06
75 years old and over	1.66	2.14	1.33	0.77
Female				
Total	1.47	1.35	1.39	0.99
16 to 24 years old	1.38	1.32	1.15	0.42
25 to 34 years old	1.49	1.59	1.41	0.9
35 to 44 years old	1.38	0.74	1.39	0.88
45 to 54 years old	1.49	0.96	1.41	1.09
55 to 64 years old	1.65	1.82	1.41	1.04
65 to 74 years old	1.55	1.8	1.42	0.91
75 years old and over	1.29	0.84	1.36	1

Source: Spanish National Statistical Institute.

Indeed, we are going to base our results on the following questions:

a) SEX

- Male
- Female

b) AGE

Age of the person at the moment of interview

c) What is your legal marital status?

- Single, that is, never married
- Married (including registered partnership)
- Widowed and not remarried
- Divorced and not remarried (including legally separated and dissolved registered partnership)?

d) What is the highest education leaving certificate, diploma or education degree you have obtained? Please include any vocational training.

- No formal education or below (ISCED 1)
- Primary education (ISCED 1)
- Lower secondary education (ISCED 2)
- Upper secondary education (ISCED 3)
- Post-secondary but non-tertiary education (ISCED 4)
- First stage of tertiary education (ISCED 5)
- Second stage of tertiary education (ISCED 6)

e) How would you define your current labour status?

- Working for pay or profit (including unpaid work for a family business or holding, including an apprenticeship or paid traineeship, including currently not at work due to maternity, parental, sick leave or holidays)
- Unemployed
- Pupil, student, further training, unpaid work experience
- In retirement or early retirement or has given up business

- Permanently disabled
- In compulsory military or community service
- Fulfilling domestic tasks
- Other

f) How is your health in general? It is…

- Very good
- Good
- Fair
- Bad
- Very bad
- Don't know
- Refusal

g) Do you have any longstanding illness or [longstanding] health problem? [By longstanding I mean illnesses or health problems which have lasted, or are expected to last, for 6 months or more].

- Yes
- No
- Don't know
- Refusal

h) For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do? Would you say you have been …

- Severely limited
- Limited but not severely
- Not limited at all
- Don't know
- Refusal

i) During the past 12 months, that is since (date one year ago), have you been in hospital as an inpatient, that is overnight or longer?

- Yes
- No
- Don't know
- Refusal

j) How many separate stays in hospital as an inpatient have you had since (date one year ago)? Count all the stays that ended in this period.

- Number of stays
- Don't know
- Refusal

k) Thinking of this/these inpatient stay(s), how many nights in total did you spend in hospital?

- Number of nights
- Don't know
- Refusal

l) During the past 12 months, that is since (date one year ago), have you been admitted to hospital as a day patient, that is admitted to a hospital bed, but not required to remain overnight?

- Yes
- No
- Don't know
- Refusal

m) How many days have you been admitted as a day patient since (date one year ago)?

- Number of days
- Don't know
- Refusal

n) During the past 12 months, was there any time when you really needed to be hospitalized following recommendation from a doctor, either as an inpatient or a day patient, but did not. When was the last time you consulted a GP (general practitioner) or family doctor on your own behalf?

- Less than 12 months ago
- 12 months ago or longer
- Never
- Don't know
- Refusal

o) During the past four weeks ending yesterday, that is since (date), how many times did you consult a GP (general practitioner) or family doctor on your own behalf?

- Number of times
- Don't know
- Refusal

p) When was the last time you consulted a medical or surgical specialist on your own behalf?

- Less than 12 months ago
- 12 months ago or longer
- Never
- Don't know
- Refusal

q) During the past four weeks ending yesterday, that is since (date), how many times did you consult a specialist on your own behalf?

- Number of times
- Don't know
- Refusal

r) Was there any time during the past 12 months when you really needed to consult a specialist but did not?

- Yes, there was at least one occasion
- No, there was no occasion
- Don't know

s) Do you smoke at all nowadays?

- Yes, daily
- Yes, occasionally
- Not at all

t) What tobacco product do you smoke each day?

Manufactured cigarettes

- Yes
- No

Hand-rolled cigarettes

- Yes
- No

Cigars

- Yes
- No

Pipefuls of tobacco

- Yes
- No

Other

- Yes

u) During the past 12 months, how often have you had an alcoholic drink of any kind (that is beer, wine, spirits, liqueurs or other alcoholic beverages)?

- Never
- Monthly or less
- 2 to 4 times a month

- 2 to 3 times a week
- 4 to 6 times a week
- Every day
- Refusal

v) How many drinks containing alcohol do you have each day in a typical week when you are drinking?

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

w) During the past 12 months, how often did you have 6 or more drinks on one occasion?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily
- Refusal

Thus, we are going to focus our results on information about demography and socio-economic status (sex, age, education, etc.), health status (self-perceived health, chronic conditions, limitation in daily activities or obesity), health determinants/ health results of lifestyles (smoking and alcohol consumption), and region of residence.

Given the structure of our database, the aim is to model health care utilization as a function of a range of socio-economic characteristics. In order to do it, we have classified them into ten groups of variables: personal characteristics, education level,

marital status, income, occupational status, health status, lifestyles, immigrants, and region of residence. By this way, Table 5.6. shows explanatory variables used in estimations and their corresponding definitions.

Table 5.6.
Variables: Names and Definitions

Variable Name	Variable Definition
Personal Characteristics	
male	1 if male, 0 otherwise
age	Age in years
Education Level	
secondary_lower	1 if first stage secondary education, 0 otherwise
secondary_upper	1 if second stage secondary education, 0 otherwise
tertiary	1 if university studies or advanced vocational training, 0 otherwise
Marital status	
married	1 if separated, 0 otherwise
widowed	1 if widowed, 0 otherwise
separated_divorced	1 if separated or divorced, 0 otherwise
Income	
high_income	1 if monthly household income is in the highest range (more than 3280 euros), 0 otherwise
Occupational Status	
unemployed	1 if individual is unemployed, 0 otherwise
Health Status	
Self-Assessed Health (SAH)	1 if individual has very good or good Self-Assessed Health, 0 otherwise
chronic	1 if individual declares chronic illness, 0 otherwise
limited	1 if limited, 0 otherwise
obesity	1 if obese, 0 otherwise
Lifestyles	
smoker	1 if smoke, 0 otherwise
drinker	1 if drinks alcohol daily, 0 otherwise
Immigrant	
Spanish	1 if individual is Spanish, 0 otherwise
Region	
north	1 if the region is sited on the North of Spain: Asturias, Cantabria, Galicia and Basque Country.
mediterranean	1 if the region is sited on the Mediterranean area of Spain: Andalusia, Balearic Islands, Canary Islands, Catalonia, Valencian Community and Murcia.

Source: Author's elaboration from EHSS.

5.4. EMPIRICAL RESULTS

Firstly, let us use information from an existing dataset which is the ECHP, and obviously, the way immigration is defined can be questioned. In fact, the ECHP is not designed to obtain only information about immigrants *per se* but it contains important socio-demographic information about individuals and households in the European Union. Also, we have employed information from the data base EU-SILC because of this source of information substituted to the ECHP since 2001.

Our key variable in the statistical model is number of physician or non-physician visits. Moreover, factors such as age, education, marital status, income, occupational status, self-assessed health, immigrants, and some economic data could be relevant in explaining health care utilization.

We will focus this analysis on the relationship between health care utilization and socio-demographic characteristics with special attention to immigrant population. Obviously, health care utilization is related with individuals' health. Thus, Table 5.7. reports frequencies for the response to the question "Are you hampered in daily activities by a chronic or mental health problem, illness or disability?" considering individual's Self-Assessed Health (SAH). So, SAH is a subjective response to the question "How is your health in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" (very bad). As can be noticed, those individuals who are not hampered in daily activities report better health.

By this way, the SAH has been calculated by AA.CC in Spain from the EU-SILC (Table 5.8.). In all AA.CC is observed that the perception of our population's health is good although this valuation is more optimistic in Baleares, Murcia, Basque country and Navarre.

Table 5.7.
Self-Assessed Health in Spain by extent hampered in daily activities by a chronic or mental health problem, illness of disability. ECHP, 2001.

SAH	Hampered in daily activities		
	Severely (%)	**To some extent (%)**	**No (%)**
Very Good	0,69	0,58	5,11
Good	5,79	12,74	39,85
Fair	20,94	49,63	44,71
Bad	52,48	34,90	9,71
Very bad	20,11	2,15	0,62
TOTAL	100	100	100

SOURCE: Own elaboration from ECHP.

Table 5.8.
Self-Assessed Health by AACC

	Average	**Std. Dev.**
Galicia	2,590	0.987
Asturias	2.442	0.929
Cantabria	2.358	0.984
Basque Country	2.250	0.974
Navarre	2.293	0.919
La Rioja	2.445	0.898
Aragon	2.312	0.932
Madrid	2.267	0.928
Castile and Leon	2.301	0.982
Castile - La Mancha	2.360	0.964
Extremadura	2.337	0.881
Catalonia	2.326	0.988
Valencian Community	2.343	0.974
Balearic Islands	2.193	0.890
Andalusia	2.359	1.040
Murcia	2.222	1.078
Ceuta	2.396	0.965
Canary Islands	2.356	0.806
SPAIN	**2.343**	**0.968**

Source: Author´s elaboration from ECHP.

The incorporation of immigrant population in Spain has created a new sociodemographic situation and the EU-SILC allows us to analyze variables like SAH according to the country of birth of the individuals considering four categories: Spain, Rest of the European Union (24 countries), Rest of Europe and Rest of the world. The classification allows us to detect some behaviour rules (Table 5.9.). With regard to SAH according to immigrants is observed that those individuals born in Spain declare to have a worse health comparing with other countries of the European Union and other foreign countries.

Table 5.9.
SAH by country (immigrants)

	Average	Std. Dev.
Spain	2,359	0,971
Rest of European Union (24 countries)	2,049	0,865
Rest of Europe	1,798	0,731
Rest of World	2,053	0,826

Source: Author´s elaboration from EU-SILC, 2004.

Given our database whose structure we use, the aim of this research is to model health care utilization as a function of a range of socio-economic characteristics. In order to it, we have classified them into seven groups of variables: personal characteristics, education level, marital status, income, occupational status, health status and immigrants. By this way, Table 5.10. shows explanatory variables used in estimations and their corresponding definitions.

Table 5.10.
Variables: Names and Definitions

Variable Name	Variable Definition
Personal Characteristics	
Gender (MALE)	1 if male, 0 otherwise
Age (AGE)	Age in years at 31st December of current wave
Age squared (AGE2)	Age^2
Education Level	
Higher Education (HEDUC)	1 if highest academic qualification is third level (ISCED 5-7), 0 otherwise
Marital status	
Never Married (NVRMAR)	1 if never married, 0 otherwise
Separated (SEPARATED)	1 if separated, 0 otherwise
Divorced (DIVORCED)	1 if divorced, 0 otherwise
Widow (WIDOW)	1 if widowed, 0 otherwise
Income	
Net Income (LINCOMEOCDMO)	Logarithm of equivalised annual household net income (OECD modified scale)
Occupational Status	
Status in employment (UNEMPLOYED)	1 if individual is unemployed, 0 otherwise
Health Status	
Self-Assessed Health (SAH)	1 if individual has very good or good Self-Assessed Health, 0 otherwise
Immigrant	
Immigrant (IMMIGRANT)	1 if individual is immigrant, 0 otherwise

Source: Author´s elaboration from ECHP.

Firstly, as personal characteristics we have included two variables: individual's age and gender. To allow for a flexible relationship between health care utilization and age, a quadratic polynomial function of this variable is included (AGE; AGE2=Age^2). Also, the gender of individuals (MALE) has been taken into consideration and a dummy variable, which takes value of 1 if individual is male, has been built.

On one hand, the second group of variables are referred to the maximum level of education completed. In the ECHP, education is classified into three categories based on ISCED classification: less than secondary level (ISCED 0-2), second stage of secondary level (ISCED 3) and third level (ISCED 5-7). Thus, one dummy variable has been included and it is the third level of education (HEDUC). In this sense, many studies have shown that education is an important socioeconomic characteristic in determining health status (and health care utilization).
Thirdly, representing marital status, we have considered four variables (never married, separated, divorced and widow) with married as the reference category.

On the other hand, we are concerned with the influence of income on health care utilization. In fact, higher income should be associated with better health although this relationship is not clear and correlation can vary from highly positive to weakly negative, depending on context, covariates and level of aggregation (Fuchs, 2004). Our income variable is the equivalised annual net household income (LINCOMEOCDMO) adjusted using OECD modified scale to take into account household size and composition. In this sense, we have used household information rendering the component family by using equivalence scales. The modified OECD scale gives a weight of 1 to the first adult, 0.5 to other persons aged 14 or over and 0.3 to each child aged less than 14. For each person, the "equivalised total net income" is calculated as its household total net income divided by equivalised household size. In this case, we use the logarithm of household´s income (OECD modified scale) taking into account the concavity in the health-income relationship (Gravelle, 1998; Jones and Wildman, 2004; Cantarero *et al*., 2005).

Other variables included in the analysis of health care utilization related to occupational status are status in employment. Thus, we have considered a dummy variable that takes value one if the individual is unemployed and zero otherwise (UNEMPLOYED). Finally, we have considered if individual has a very good or good Self-Assessed Health (SAH) and if individual is not born in Spain (IMMIGRANT).

In this sense, Tables 5.11-5.14 reports the empirical results from 1995 to 2001 using Poisson and negative binomial models (access to health care measured as number of

physicians visits – general or specialist services). The purpose of differentiating the models, as in Abasolo et. al. (2008) is to organize health care system, due to the fact that visits of general physician are of free access for patients, while specialized health care services can only be recommended by another professional of health system. Similar results are obtained for different specifications of Zero-inflated Poisson regression models and Zero inflated negative binomial models for ECHP.

Our estimates show that most of the coefficients are significant and have the expected signs for ECHP. For example, MALE has a negative coefficient and AGE has a positive coefficient in general terms. Also, those with more education (HEDUC) are more likely to use less health care services in primary services but more in specialist services. UNEMPLOYMENT coefficients maintain statistical significance showing that more unemployment leads to an increase in the probability of increase health care utilization. In addition, LINCOMEOCDMO has a negative coefficient in general visits and a positive coefficient in specialist visits. Also, physicians visits are reduced in case of the individual declares good or very good health. Moreover, IMMIGRANT is an important determinant of health care utilization.

Table 5.11.: Poisson Regression Estimates (Number of physician visits - general). ECHP

1998						1999			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,2397	0,0093	-25,8900	0,0000	MALE	-0,2637	0,0097	-27,1800	0,0000
AGE	0,0090	0,0016	5,7200	0,0000	AGE	0,0111	0,0016	6,8000	0,0000
AGE^2	0,0000	0,0000	0,7600	0,4470	AGE^2	0,0000	0,0000	0,1900	0,8470
HEDUC	-0,2275	0,0199	-11,4300	0,0000	HEDUC	-0,2292	0,0203	-11,3000	0,0000
NVRMAR	-0,1143	0,0148	-7,7100	0,0000	NVRMAR	-0,0892	0,0154	-5,7900	0,0000
SEPARATED	-0,1955	0,0398	-4,9100	0,0000	SEPARATED	-0,1126	0,0392	-2,8700	0,0040
DIVORCED	-0,5241	0,0646	-8,1100	0,0000	DIVORCED	-0,3767	0,0587	-6,4200	0,0000
WIDOW	-0,0526	0,0144	-3,6500	0,0000	WIDOW	-0,0011	0,0149	-0,0800	0,9400
LINCOMEOCDMO	-0,0001	0,0001	-13,5300	0,0000	LINCOMEOCDMO	-0,0001	0,0001	-8,9400	0,0000
UNEMPLOYED	0,0483	0,0187	2,5900	0,0100	UNEMPLOYED	0,0434	0,0211	2,0600	0,0390
SAH	-1,0004	0,0108	-93,0100	0,0000	SAH	-0,9445	0,0111	-84,8200	0,0000
IMMIGRANT	0,0254	0,0495	0,5100	0,6070	IMMIGRANT	-0,1862	0,0586	-3,1800	0,0010
Number of obs.	13532				Number of obs.	13007			
Pseudo R2	0,1959				Pseudo R2	0,1996			
Log likelihood	-4819,4630				Log likelihood	-43782,09			
2000						**2001**			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,2692	0,0101	-26,5200	0,0000	MALE	-0,2803	0,0096	-29,1600	0,0000
AGE	0,0191	0,0017	11,1700	0,0000	AGE	0,0200	0,0016	12,3900	0,0000
AGE^2	-0,0001	0,0000	-5,0400	0,0000	AGE^2	-0,0001	0,0000	-4,9900	0,0000
HEDUC	-0,2247	0,0206	-10,9200	0,0000	HEDUC	-0,2713	0,0200	-13,5700	0,0000
NVRMAR	-0,1115	0,0161	-6,9300	0,0000	NVRMAR	-0,0908	0,0152	-5,9900	0,0000
SEPARATED	0,0471	0,0389	1,2100	0,2260	SEPARATED	-0,0419	0,0388	-1,0800	0,2810
DIVORCED	0,0926	0,0454	2,0400	0,0410	DIVORCED	-0,0070	0,0424	-0,1700	0,8680
WIDOW	-0,0467	0,0157	-2,9800	0,0030	WIDOW	-0,0847	0,0146	-5,7900	0,0000
LINCOMEOCDMO	-0,0001	0,0001	-11,6400	0,0000	LINCOMEOCDMO	-0,0001	0,0001	-18,2700	0,0000
UNEMPLOYED	0,0018	0,0236	0,0800	0,9390	UNEMPLOYED	-0,0002	0,0227	-0,0100	0,9930
SAH	-0,8632	0,0118	-73,3000	0,0000	SAH	-0,9600	0,0110	-86,9300	0,0000
IMMIGRANT	-0,0771	0,0572	-1,3500	0,1770	IMMIGRANT	-0,1114	0,0559	-1,9900	0,0460
Number of obs.	12275				Number of obs.	11904			
Pseudo R2	0,1870				Pseudo R2	0,2170			
Log likelihood	-39307,9330				Log likelihood	-44255,8150			

(*) dF/dx is for discrete change of dummy variable from 0 to 1. z and P>|z| are the test of the underlying coefficient being 0. SOURCE: Own elaboration from ECHP.

Table 5.12.: Poisson Regression Estimates (Number of physician visits – specialist services). ECHP

1998						1999			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,3270	0,0142	-23,0600	0,0000	MALE	-0,3580	0,0149	-24,0700	0,0000
AGE	-0,0116	0,0024	-4,7600	0,0000	AGE	-0,0140	0,0025	-5,5800	0,0000
AGE^2	0,0001	0,0000	3,1600	0,0020	AGE^2	0,0001	0,0000	4,8700	0,0000
HEDUC	0,1306	0,0238	5,4800	0,0000	HEDUC	0,1312	0,0249	5,2800	0,0000
NVRMAR	-0,3110	0,0224	-13,9000	0,0000	NVRMAR	-0,2789	0,0232	-12,0100	0,0000
SEPARATED	0,1257	0,0506	2,4800	0,0130	SEPARATED	-0,0248	0,0555	-0,4500	0,6550
DIVORCED	-0,2816	0,0830	-3,3900	0,0010	DIVORCED	-0,0846	0,0729	-1,1600	0,2460
WIDOW	-0,1141	0,0244	-4,6700	0,0000	WIDOW	-0,1488	0,0251	-5,9200	0,0000
LINCOMEOCDMO	0,0001	0,0001	16,8000	0,0000	LINCOMEOCDMO	0,0001	0,0001	17,6300	0,0000
UNEMPLOYED	-0,0085	0,0277	-0,3100	0,7580	UNEMPLOYED	0,0157	0,0310	0,5100	0,6130
SAH	-1,2080	0,0162	-74,4000	0,0000	SAH	-1,3167	0,0172	-76,7700	0,0000
IMMIGRANT	-0,0773	0,0738	-1,0500	0,2950	IMMIGRANT	0,0967	0,0737	1,3100	0,1890
Number of obs.	13536				Number of obs.	13005			
Pseudo R2	0,1134				Pseudo R2	0,1316			
Log likelihood	-32892,4880				Log likelihood	-30792,0530			
2000						**2001**			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,3241	0,0151	-21,3900	0,0000	MALE	-0,2744	0,0147	-18,7100	0,0000
AGE	-0,0041	0,0026	-1,5700	0,1170	AGE	0,0011	0,0025	0,4500	0,6530
AGE^2	0,0000	0,0000	1,3100	0,1900	AGE^2	0,0000	0,0000	-1,3400	0,1810
HEDUC	0,1536	0,0250	6,1500	0,0000	HEDUC	0,1775	0,0230	7,7300	0,0000
NVRMAR	-0,3863	0,0242	-15,9700	0,0000	NVRMAR	-0,1932	0,0224	-8,6200	0,0000
SEPARATED	0,0743	0,0544	1,3700	0,1720	SEPARATED	-0,2579	0,0633	-4,0700	0,0000
DIVORCED	0,0824	0,0642	1,2800	0,1990	DIVORCED	0,2800	0,0545	5,1400	0,0000
WIDOW	-0,2620	0,0260	-10,0700	0,0000	WIDOW	-0,1998	0,0258	-7,7400	0,0000
LINCOMEOCDMO	0,0001	0,0001	9,1100	0,0000	LINCOMEOCDMO	0,0001	0,0001	9,2500	0,0000
UNEMPLOYED	0,0613	0,0332	1,8500	0,0650	UNEMPLOYED	-0,2204	0,0358	-6,1600	0,0000
SAH	-1,1987	0,0177	-67,8300	0,0000	SAH	-1,2080	0,0168	-71,7100	0,0000
IMMIGRANT	-0,3578	0,0879	-4,0700	0,0000	IMMIGRANT	0,1583	0,0702	2,2500	0,0240
Number of obs.	12275				Number of obs.	11906			
Pseudo R2	0,1257				Pseudo R2	0,1119			
Log likelihood	-27652,2330				Log likelihood	-30392,3010			

(*) dF/dx is for discrete change of dummy variable from 0 to 1. z and P>|z| are the test of the underlying coefficient being 0. SOURCE: Own elaboration from ECHP.

Table 5.13.: Negative Binomial Regression Estimates (Number of physician visits - general). ECHP

1998						1999			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,3153	0,0226	-13,9400	0,0000	MALE	-0,3294	0,0223	-14,7800	0,0000
AGE	-0,0059	0,0039	-1,5000	0,1330	AGE	-0,0023	0,0038	-0,6000	0,5490
AGE^2	0,0002	0,0000	4,6300	0,0000	AGE^2	0,0001	0,0000	3,9800	0,0000
HEDUC	-0,1810	0,0397	-4,5500	0,0000	HEDUC	-0,2030	0,0380	-5,3400	0,0000
NVRMAR	-0,1144	0,0344	-3,3300	0,0010	NVRMAR	-0,1315	0,0333	-3,9400	0,0000
SEPARATED	-0,2260	0,0927	-2,4400	0,0150	SEPARATED	-0,0469	0,0895	-0,5200	0,6000
DIVORCED	-0,5087	0,1326	-3,8400	0,0000	DIVORCED	-0,3047	0,1216	-2,5100	0,0120
WIDOW	-0,0865	0,0437	-1,9800	0,0470	WIDOW	-0,0323	0,0427	-0,7600	0,4490
LINCOMEOCDMO	-0,0001	0,0001	-5,9300	0,0000	LINCOMEOCDMO	-0,0001	0,0001	-5,0400	0,0000
UNEMPLOYED	0,0709	0,0414	1,7100	0,0860	UNEMPLOYED	0,0494	0,0438	1,1300	0,2590
SAH	-1,0105	0,0260	-38,8400	0,0000	SAH	-0,9597	0,0254	-37,7100	0,0000
IMMIGRANT	0,0950	0,1157	0,8200	0,4120	IMMIGRANT	-0,1930	0,1191	-1,6200	0,1050
Number of obs.	13532				Number of obs.	13007			
Pseudo R2	0,0540				Pseudo R2	0,0582			
Log likelihood	-30691,5060				Log likelihood	-29090,0990			
2000						**2001**			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,3141	0,0220	-14,2600	0,0000	MALE	-0,3332	0,0238	-13,9800	0,0000
AGE	0,0092	0,0037	2,4900	0,0130	AGE	0,0073	0,0040	1,8200	0,0690
AGE^2	0,0000	0,0000	0,9100	0,3640	AGE^2	0,0001	0,0000	1,7400	0,0820
HEDUC	-0,2062	0,0370	-5,5700	0,0000	HEDUC	-0,2593	0,0394	-6,5900	0,0000
NVRMAR	-0,1029	0,0332	-3,1000	0,0020	NVRMAR	-0,0919	0,0358	-2,5700	0,0100
SEPARATED	0,0602	0,0869	0,6900	0,4890	SEPARATED	-0,0794	0,0975	-0,8100	0,4160
DIVORCED	0,0216	0,1082	0,2000	0,8410	DIVORCED	-0,0132	0,1158	-0,1100	0,9090
WIDOW	-0,0517	0,0415	-1,2500	0,2120	WIDOW	-0,0981	0,0447	-2,1900	0,0280
LINCOMEOCDMO	-0,0001	0,0000	-5,8900	0,0000	LINCOMEOCDMO	-0,0001	0,0000	-7,6200	0,0000
UNEMPLOYED	0,0613	0,0461	1,3300	0,1840	UNEMPLOYED	0,0447	0,0509	0,8800	0,3790
SAH	-0,8641	0,0257	-33,5800	0,0000	SAH	-0,9653	0,0272	-35,4900	0,0000
IMMIGRANT	-0,0718	0,1169	-0,6100	0,5390	IMMIGRANT	0,0113	0,1240	0,0900	0,9270
Number of obs.	12275				Number of obs.	11904			
Pseudo R2	0,0571				Pseudo R2	0,0586			
Log likelihood	-27322,4450				Log likelihood	-27486,3890			

(*) dF/dx is for discrete change of dummy variable from 0 to 1. z and P>|z| are the test of the underlying coefficient being 0. SOURCE: Own elaboration from ECHP.

Table5. 14.: Negative Binomial Regression Estimates (Number of physician visits – specialist services). ECHP

	1998					1999			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,4282	0,0324	-13,2000	0,0000	MALE	-0,4344	0,0343	-12,6700	0,0000
AGE	-0,0175	0,0056	-3,1200	0,0020	AGE	-0,0169	0,0057	-2,9600	0,0030
AGE^2	0,0002	0,0001	2,7800	0,0060	AGE^2	0,0002	0,0001	2,7400	0,0060
HEDUC	0,1402	0,0534	2,6300	0,0090	HEDUC	0,1355	0,0556	2,4400	0,0150
NVRMAR	-0,3233	0,0485	-6,6700	0,0000	NVRMAR	-0,3488	0,0500	-6,9800	0,0000
SEPARATED	0,2445	0,1271	1,9200	0,0540	SEPARATED	0,0012	0,1355	0,0100	0,9930
DIVORCED	-0,3236	0,1818	-1,7800	0,0750	DIVORCED	-0,1604	0,1788	-0,9000	0,3700
WIDOW	-0,1672	0,0642	-2,6000	0,0090	WIDOW	-0,2111	0,0677	-3,1200	0,0020
LINCOMEOCDMO	0,0000	0,0000	8,4000	0,0000	LINCOMEOCDMO	0,0001	0,0001	7,7300	0,0000
UNEMPLOYED	0,0302	0,0593	0,5100	0,6100	UNEMPLOYED	0,0403	0,0679	0,5900	0,5520
SAH	-1,2355	0,0377	-32,8100	0,0000	SAH	-1,3488	0,0403	-33,5000	0,0000
IMMIGRANT	-0,0792	0,1658	-0,4800	0,6330	IMMIGRANT	0,0828	0,1741	0,4800	0,6340
Number of obs.	13536				Number of obs.	13005			
Pseudo R2	0,0359				Pseudo R2	0,0410			
Log likelihood	-21034,5370				Log likelihood	-19452,4690			
	2000					**2001**			
	Coef.	Std. Err.	z	P>z		Coef.	Std. Err.	z	P>z
MALE	-0,4191	0,0322	-13,0000	0,0000	MALE	-0,3719	0,0341	-10,9200	0,0000
AGE	-0,0007	0,0054	-0,1400	0,8910	AGE	-0,0025	0,0058	-0,4400	0,6630
AGE^2	0,0000	0,0001	0,2900	0,7700	AGE^2	0,0000	0,0001	0,2000	0,8390
HEDUC	0,1176	0,0514	2,2900	0,0220	HEDUC	0,1392	0,0536	2,6000	0,0090
NVRMAR	-0,3973	0,0468	-8,4800	0,0000	NVRMAR	-0,2585	0,0499	-5,1800	0,0000
SEPARATED	-0,0132	0,1254	-0,1100	0,9160	SEPARATED	-0,4045	0,1430	-2,8300	0,0050
DIVORCED	-0,0274	0,1558	-0,1800	0,8610	DIVORCED	0,1206	0,1605	0,7500	0,4520
WIDOW	-0,2979	0,0632	-4,7200	0,0000	WIDOW	-0,2712	0,0670	-4,0500	0,0000
LINCOMEOCDMO	0,0001	0,0001	5,7000	0,0000	LINCOMEOCDMO	0,0001	0,0001	5,0900	0,0000
UNEMPLOYED	0,0841	0,0670	1,2600	0,2090	UNEMPLOYED	-0,1645	0,0740	-2,2200	0,0260
SAH	-1,2197	0,0380	-32,0800	0,0000	SAH	-1,2400	0,0399	-31,0600	0,0000
IMMIGRANT	-0,3626	0,1725	-2,1000	0,0360	IMMIGRANT	0,1239	0,1708	0,7300	0,4680
Number of obs.	12275				Number of obs.	11906			
Pseudo R2	0,0425				Pseudo R2	0,0348			
Log likelihood	-18963,9290				Log likelihood	-18949,1980			

(*) dF/dx is for discrete change of dummy variable from 0 to 1. z and P>|z| are the test of the underlying coefficient being 0. SOURCE: Own elaboration from ECHP.

Thus, as a preliminary conclusion, we can argue that over the period 1994-2001, immigrant population report better health status than native one but the empirical results based on health care utilization are not clear because, among other factors, depends on the year considered. To deep in this analysis, we have analysed the results using the EU-SILC. database. Again, immigrant population reports better health (Table 5.15.) but we do not have information about health care utilization. In fact, particular attention should be focused on self-reported unmet need and their causes (mainly, distance to facilities, waiting times, labour status, etc.).

Table 5.15.
SAH by country of birth. EU-SILC

2009	**Average**	**Std.Dev**
Spain	2,287	0,887
Rest of European Union	2,114	0,753
Rest of World	2,111	0,471
2010	**Average**	**Std.Dev**
Spain	2,268	0,883
Rest of European Union	2,055	0,805
Rest of World	2,007	0,760
2011	**Average**	**Std.Dev**
Spain	2,196	0,897
Rest of European Union	1,931	0,751
Rest of World	1,927	0,735
2012	**Average**	**Std.Dev**
Spain	2,199	0,920
Rest of European Union	2,002	0,741
Rest of World	1,962	0,756
2013	**Average**	**Std.Dev**
Spain	2,241	0,906
Rest of European Union	2,009	0,778
Rest of World	2,029	0,803
2014	**Average**	**Std.Dev**
Spain	2,256	0,885
Rest of European Union	2,051	0,833
Rest of World	2,064	0,758

Source: Author`s elaboration from EU-SILC

Moreover, Eurostat (based on EU-SILC survey) points out the following aspects to take into account:

- **Self-reported unmet needs***: Person's own assessment of whether he or she needed examination or treatment for a specific type of health care, but didn't have it or didn't seek for it. EU-SILC collects data on two types of health care services: medical care and dental care.*
- **Medical care***: refers to individual health care services (medical examination or treatment excluding dental care) provided by or under direct supervision of medical doctors or equivalent professions according to national health care systems.*
- **Main reasons for unmet needs** *observed in SILC are the following:*
    - *Could not afford to (too expensive)*
    - *Waiting list*
    - *Could not take time because of work, care for children or for others*
    - *Too far to travel or no means of transportation*
    - *Fear of doctors (resp. dentists), hospitals, examination or treatment*
    - *Wanted to wait and see if problem got better on its own*
    - *Didn't know any good medical doctor (resp. dentist)*
    - *Other reasons.*
- **"Reasons of barriers of access"** *combines the following three reasons: 'Could not afford to (too expensive)', 'Waiting list' and 'Too far to travel or no means of transportation'.*

In fact, if we compare "unmet needs" by country of birth during the last years, we do not appreciate huge differences (Table 5.16.). This empirical result is quite similar if we compare SAH and hampered degree in daily activities by a chronic or mental health problem, illness or disability (Tables 5.17-5.20).

Table 5.16.
Self-reported unmet needs by country of birth (% of population)

	2009	2010	2011	2012	2013	2014
Spain	8.078	6.393	5.280	5.364	6.466	5.472
Rest of European Union	8.451	6.839	6.317	7.059	8.840	5.596
Rest of World	8.275	6.923	4.167	4.593	9.260	5.090
Total	8.097	6.434	5.240	5.356	6.685	5.451

Source: Author`s elaboration.

Table 5.17.

Self-Assessed Health in Spain by extent hampered in daily activities by a chronic or mental health problem, illness of disability. EU-SILC. Sample: Total population (without considering country of birth).

SAH	Hampered in daily activities - 2009		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0,44	2,25	97,31
Good	0,77	7,50	91,72
Fair	5,99	51,79	42,22
Bad	35,07	56,42	8,51
Very bad	74,57	23,55	1,88
SAH	**Hampered in daily activities -2010**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0,38	2,33	97,29
Good	0,66	6,88	92,47
Fair	6,13	49,24	44,62
Bad	36,83	54,70	8,47
Very bad	78,02	18,68	3,30
SAH	**Hampered in daily activities -2011**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0,37	1,40	98,23
Good	0,47	6,59	92,94
Fair	5,68	55,31	39,02
Bad	37,59	55,33	7,09
Very bad	75,93	22,78	1,29
SAH	**Hampered in daily activities - 2012**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0,19	1,00	98,81
Good	0,44	6,46	93,10
Fair	5,64	54,65	39,72
Bad	36,67	55,72	7,61
Very bad	78,25	18,99	2,76
SAH	**Hampered in daily activities - 2013**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0,12	1,94	97,94
Good	0,83	8,21	90,96
Fair	6,43	51,91	41,66
Bad	34,77	56,96	8,27
Very bad	75,50	22,34	2,16
SAH	**Hampered in daily activities - 2014**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0,30	2,23	97,47
Good	0,61	6,66	92,73
Fair	6,30	53,01	40,70
Bad	36,00	56,68	7,32
Very bad	75,00	21,28	3,72

Source: Author`s elaboration.

Table 5.18.

Self-Assessed Health in Spain by extent hampered in daily activities by a chronic or mental health problem, illness of disability. EU-SILC, Sample: Native population

SAH	Hampered in daily activities 2009		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.46	2.33	97.20
Good	0.78	7.69	91.53
Fair	6.19	52.90	40.91
Bad	35.38	56.43	8.19
Very bad	74.89	23.62	1.49
SAH	**Hampered in daily activities 2010**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.41	2.18	97.41
Good	0.67	7.02	92.31
Fair	6.40	50.28	43.32
Bad	36.91	54.72	8.37
Very bad	78.03	18.74	3.23
SAH	**Hampered in daily activities 2011**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.37	1.43	98.20
Good	0.47	6.90	92.62
Fair	5.78	55.94	38.28
Bad	37.51	55.60	6.88
Very bad	76.12	22.55	1.33
SAH	**Hampered in daily activities 2012**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.19	0.93	98.87
Good	0.46	6.76	92.78
Fair	5.69	55.66	38.65
Bad	36.97	55.81	7.22
Very bad	78.43	19.06	2.51
SAH	**Hampered in daily activities 2013**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.14	1.99	97.87
Good	0.89	8.29	90.83
Fair	6.64	52.63	40.73
Bad	34.88	57.25	7.87
Very bad	75.79	22.16	2.05
SAH	**Hampered in daily activities -2014**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.34	2.26	97.40
Good	0.66	6.84	92.50
Fair	6.39	53.70	39.90
Bad	36.45	56.69	6.86
Very bad	76.15	20.37	3.49

Source: Author`s elaboration.

Table 5.19.

Self-Assessed Health in Spain by extent hampered in daily activities by a chronic or mental health problem, illness of disability. EU-SILC, Sample: Immigrant population from EU

SAH	Hampered in daily activities - 2009		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	0.88	99.12
Good	1.34	4.30	94.35
Fair	2.38	40.48	57.14
Bad	33.33	50.00	16.67
Very bad	75.00	0.00	25.00
SAH	**Hampered in daily activities - 2010**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	1.30	98.70
Good	0.86	7.43	91.71
Fair	2.42	37.10	60.48
Bad	41.67	45.83	12.50
Very bad	66.67	16.67	16.67
SAH	**Hampered in daily activities - 2011**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	1.15	98.85
Good	0.27	4.83	94.91
Fair	4.94	45.68	49.38
Bad	40.00	40.00	20.00
Very bad	50.00	50.00	0.00
SAH	**Hampered in daily activities - 2012**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	2.27	97.73
Good	0.28	3.09	96.63
Fair	4.65	41.86	53.49
Bad	31.25	50.00	18.75
Very bad	80.00	0.00	20.00
SAH	**Hampered in daily activities - 2013**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	2.29	97.71
Good	0.33	8.61	91.06
Fair	5.62	39.33	55.06
Bad	43.75	50.00	6.25
Very bad	60.00	40.00	0.00
SAH	**Hampered in daily activities - 2014**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	1.45	98.55
Good	0.00	6.32	93.68
Fair	5.88	43.14	50.98
Bad	13.04	69.57	17.39
Very bad	50.00	50.00	0.00

Source: Author`s elaboration.

Table 5.20.

Self-Assessed Health in Spain by extent hampered in daily activities by a chronic or mental health problem, illness of disability. EU-SILC, Sample: Immigrant from rest of the world.

SAH	Hampered in daily activities - 2009		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.32	1.62	98.06
Good	0.50	5.86	93.64
Fair	3.80	36.26	59.94
Bad	23.53	58.82	17.65
Very bad	63.16	26.32	10.53
SAH	**Hampered in daily activities -2010**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.23	4.21	95.56
Good	0.48	4.55	94.97
Fair	2.08	32.53	65.40
Bad	32.20	57.63	10.17
Very bad	81.82	18.18	0.00
SAH	**Hampered in daily activities 2011**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.46	1.14	98.41
Good	0.43	2.59	96.98
Fair	3.64	44.09	52.27
Bad	40.00	48.57	11.43
Very bad	80.00	20.00	0.00
SAH	**Hampered in daily activities - 2012**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.25	1.48	98.28
Good	0.21	3.53	96.26
Fair	4.78	35.89	59.33
Bad	27.08	54.17	18.75
Very bad	69.23	23.08	7.69
SAH	**Hampered in daily activities - 2013**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	1.25	98.75
Good	0.24	6.89	92.87
Fair	3.03	43.43	53.54
Bad	28.57	50.00	21.43
Very bad	69.23	23.08	7.69
SAH	**Hampered in daily activities - 2014**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very good	0.00	2.22	97.78
Good	0.10	4.36	95.54
Fair	4.63	43.63	51.74
Bad	31.67	51.67	16.67
Very bad	38.46	46.15	15.38

Source: Author`s elaboration.

Because of the limitation of the EU-SILC database related with health care utilization, we have extended this research to the most recent information. In particular, as pointed out before, we focus on the Spanish part of the European Health Survey. Empirical results are presented in Tables 5.21-5.28.

In this regard, those persons who are not very hampered in daily activities declare in general good health (table 5.21). In table 5.22 SAH are calculated by regions in Spain. We can observe that, broadly speaking, the opinion about population`s health is good being better in Asturies, Balearic Islands, Cantabria, Catalonia, Valencian Community, Extremadura, Madrid, Navarre, Basque Country, La Rioja, Ceuta and Melilla.

Table 5.21.

Self-Assessed Health in Spain by extent hampered in daily activities

SAH	**Hampered in daily activities**		
	Severely (%)	**To some extent (%)**	**No (%)**
Very Good	0.63	2.76	24.93
Good	6.35	25.89	59.88
Fair	27.96	49.94	13.74
Bad	38.42	18.23	1.20
Very bad	26.64	3.18	0.25
TOTAL	100	100	100

SOURCE: Own elaboration from European Health Survey (EHIS, 2014)

Table 5.22.
Self-Assessed Health by AACC

	Average	**Std. Dev.**
Andalusia	2.287	1.014
Aragon	2.270	0.883
Asturias	2.433	0.889
Balears Islands	2.108	0.978
Canary Islands	2.378	0.873
Cantabria	2.190	1.041
Castile and León	2.396	0.916
Castile - La Mancha	2.289	0.921
Catalonia	2.199	0.958
Valencian Comunity	2.209	0.922
Extremadura	2.183	0.956
Galicia	2.529	0.967
Madrid	2.153	0.838
Murcia	2.326	0.925
Navarre	2.203	0.854
Vasque Country	2.239	0.841
La Rioja	2.259	0.874
Ceuta	2.199	1.002
Melilla	2.215	0.804
SPAIN	2.267	0.930

Source: Author's elaboration from EHIS, 2014.

As table 5.23. it can be argued that there is a difference between health of native people and not born in Spain, being greater in the case of immigrants.

Table 5.23.
SAH by immigrants

	Average	Std. Dev.
Born in Spain	2.284	0.937
Not born in Spain	2.081	0.827

Source: Author's elaboration from EHIS, 2014.

Table 5.24.
Variables: Names and Definitions

Variable Name	Variable Definition
Personal Characteristics	
Gender (MALE)	1 if male, 0 otherwise
Age (AGE)	Age in years
Age squared (AGE^2)	Age^2
Education Level	
Higher Education (HEDUC)	1 if highest academic qualification is third level (university studies or advanced vocational training), 0 otherwise
Marital status	
Single (NVRMAR)	1 if never married, 0 otherwise
Separated (SEPARATED/DIVORCED)	1 if separated or divorced, 0 otherwise
Widow (WIDOW)	1 if widowed, 0 otherwise
Income	
High Income (HI)	1 if monthly household income is in the highest range (more than 3280 euros), 0 otherwise
Occupational Status	
Status in employment (UNEMPLOYED)	1 if individual is unemployed, 0 otherwise
Health Status	
Self-Assessed Health (SAH)	1 if individual has very good or good Self-Assessed Health, 0 otherwise
Immigrant	
Immigrant (IMMIGRANT)	1 if individual is not born in Spain, 0 otherwise

Source: Author's elaboration from EHIS, 2014.

The estimates includes in tables 5.25 – 5.28 demonstrates that most of the coefficients are significant and with the expected signs. In this regard, being male, immigrant or has higher education, income, SAH. reduce their medical visits while has more age or being unemployed increase health care utilization.

Table 5.25.
Poisson Regression Estimates (Number of physician visits - general)

	Coef.	Std. Err.	z	P>z
MALE	-0.0931	0.0216	-4.3	0.0000
AGE	0.0069	0.0035	1.98	0.0480
AGE^2	0.0000	0.0000	-0.17	0.8680
HEDUC	-0.0542	0.0277	-1.96	0.0500
NVRMAR	-0.0261	0.0305	-0.85	0.3930
SEPARATED/DIVORCED	0.0415	0.0405	1.02	0.3060
WIDOW	-0.0666	0.0322	-2.07	0.0390
HI	-0.1052	0.0432	-2.44	0.0150
UNEMPLOYED	0.0777	0.0333	2.34	0.0190
SAH	-0.7019	0.0223	-31.41	0.0000
IMMIGRANT	-0.0301	0.0415	-0.72	0.4690
Number of obs.	18148			
Pseudo R2	0.0458			
Log likelihood	-17340.322			

Source: Author's elaboration from EHIS, 2014.

Table 5.26.
Poisson Regression Estimates (Number of physician visits – specialist services)

	Coef.	Std. Err.	z	P>z
MALE	-0.0003	0.0310	-0.01	0.992
AGE	0.0136	0.0052	2.64	0.008
AGE^2	-0.0002	0.0000	-3.69	0.000
HEDUC	0.1626	0.0352	4.62	0.000
NVRMAR	-0.0255	0.0422	-0.6	0.545
SEPARATED/DIVORCED	0.1276	0.0538	2.37	0.018
WIDOW	-0.0222	0.0511	-0.43	0.664
HI	-0.2054	0.0662	-3.1	0.002
UNEMPLOYED	-0.0541	0.0485	-1.12	0.264
SAH	-0.7927	0.0326	-24.33	0.000
IMMIGRANT	-0.1280	0.0620	-2.06	0.039
Number of obs.	12931			
Pseudo R2	0.0307			
Log likelihood	-10473.636			

Source: Author's elaboration from EHIS, 2014.

Table 5.27.
Negative Binomial Regression Estimates (Number of physician visits - general)

	Coef.	Std. Err.	z	P>z
MALE	-0.0994	0.0236	-4.22	0.0000
AGE	0.0068	0.0038	1.81	0.0710
AGE^2	0.0000	0.0000	-0.06	0.9490
HEDUC	-0.0574	0.0298	-1.93	0.0540
NVRMAR	-0.0248	0.0330	-0.75	0.4520
SEPARATED/DIVORCED	0.0391	0.0443	0.88	0.3780
WIDOW	-0.0675	0.0356	-1.9	0.0580
HI	-0.0986	0.0468	-2.11	0.0350
UNEMPLOYED	0.0834	0.0361	2.31	0.0210
SAH	-0.7008	0.0241	-29.08	0.0000
IMMIGRANT	-0.0272	0.0448	-0.61	0.5450
Number of obs.	18148			
Pseudo R2	0.0386			
Log likelihood	-17141.659			
Alpha p-value	0.000			

Source: Author's elaboration from EHIS, 2014.

Table 5.28.
Negative Binomial Regression Estimates (Number of physician visits - specialist services)

	Coef.	Std. Err.	z	P>z
MALE	-0.0125	0.0380	-0.33	0.7410
AGE	0.0125	0.0062	2	0.0450
AGE^2	-0.0002	0.0001	-2.84	0.0050
HEDUC	0.1559	0.0431	3.62	0.0000
NVRMAR	-0.0414	0.0513	-0.81	0.4200
SEPARATED/DIVORCED	0.1330	0.0677	1.96	0.0490
WIDOW	-0.0210	0.0621	-0.34	0.7350
HI	-0.2055	0.0788	-2.61	0.0090
UNEMPLOYED	-0.0391	0.0596	-0.65	0.5130
SAH	-0.7829	0.0393	-19.91	0.0000
IMMIGRANT	-0.1061	0.0752	-1.41	0.1580
Number of obs.	12931			
Pseudo R2	0.0215			
Log likelihood	-9874.7198			
Alpha p-value	0.000			

Source: Author's elaboration from EHIS, 2014.

5.5. CONCLUSIONS.

The Spanish National Health System enables people, independent of their nationality, to protect their health and to provide equal health care access. However, the increasing arrival of immigrants in Spain made necessary to establish adequate policies which guarantee not only their social integration but also their health care needs. This empirical research explores the health care utilization in these country by immigrant population using discrete choice and countdata models. Also, socio-demographic characteristics of immigration are analysed in this study. Empirical work is based on data from the European Community Household Panel (ECHP), the European Statistics on Income and Living Conditions (EU-SILC) and the European Health Survey (EHIS).

One of the main objectives of this research is to analyse the sociodemographic characteristics, with special focus on immigration, which could have an important impact on health outcomes. In particular, Self-Assessed Health (subjective measure) and health care utilization are important variables to take into account to establish better health policies than the current ones.

Our study demonstrates that econometric models of health care utilization can be profitably employed in the analysis of immigrants´ health. This is very important because the access to public health care system is made basically through the urgencies services, which it is the starting point of most of later entrances. According to that, it is basic to identify imbalances in health resources and to manage treatment and preventive programs. So, there is a possible way of achieving better health levels if we restructure the systems to enhance incentives that could serve to achieve cost-saving and efficient interventions.

Finally, empirical finding is consistent with research focused on the links between immigrant, socio-economic characteristics (like greater health needs of a younger immigrant population) and health care utilization. Also, it is expected that health status and health care utilization of immigrant people will converge with the levels of general population which will confirm the existence of "*healthy immigrant effect*" in Spain. The

existence of this systematic phenomenon is confirmed when health status of immigrant people tends to decline with length of time since immigration and to converge to native-born levels". (Rivera *et al*., 2008).

Conclusiones

Esta tesis concluye con esta sección final que contiene un resumen de los principales resultados obtenidos en los capítulos anteriores. De la misma manera, se plantean algunas de las posibles líneas de investigación futuras relacionadas con la Economía de la salud y el bienestar.

El objetivo final de dichas futuras líneas de investigación sugeridas al final de esta tesis es vital para el diseño y evaluación de las distintas políticas públicas que se pretendan implantar. Es decir, dada la importancia de la salud y correcta atención en enfermedades crónicas en el bienestar de la población, es necesario seguir acometiendo los diferentes análisis empíricos que nos permitan mejorar nuestros niveles actuales de bienestar y protección de la salud.

1. Resultados e implicaciones en términos de políticas públicas

En esta tesis se ha tratado de abordar el estudio de diferentes elementos que permiten conocer las interrelaciones entre la salud y bienestar con la economía real. Así, se han analizado, por ejemplo, diversas temáticas relacionados con el gasto del sector público en general e incluso con el de tipo social, y el crecimiento económico.

Los resultados empíricos obtenidos en este campo proporcionan así nueva evidencia empírica en el campo de la Economía de la salud y bienestar. De esta manera, se han empleado datos regionales, nacionales e internacionales. Las principales fuentes de información utilizadas han sido las estadísticas de salud de la OCDE y del Banco Mundial así como la información proporcionada por el Instituto Nacional de Estadística (INE) que me ha permitido acceder al Panel de Hogares de la Unión Europea (PHOGUE), la Encuesta de Condiciones de Vida (ECV), la Encuesta Nacional de Salud (ENS) y la Encuesta Europea de Salud. El software utilizado principalmente ha sido Stata 10.0 y Eviews 6.0.

Por tanto, es importante destacar también las limitaciones de la investigación llevada a cabo especialmente en el último capítulo para el cual se emplearon micro datos. Y es que, aunque los datos de las diferentes encuestas permiten incluir características individuales en nuestro estudio, debe irse siempre con cautela al interpretar los resultados, porque la información es reportada por los individuos (autodeclarada). Por ejemplo, con respecto a la utilización sanitaria debe señalarse que el número de visitas está solo contabilizado desde el último mes respecto a cuándo el individuo contesta. Así, para concluir este estudio, las contribuciones más originales de la tesis que se han obtenido en los cinco capítulos expuestos anteriormente, se resumen a continuación.

El Sistema Nacional de Salud de España como sistea "universalista" y equitativo, garantiza, la protección de la salud y la atención sanitaria de todos los ciudadanos que se encuentran en nuestro país, independientemente de su nacionalidad. Sin embargo, la creciente llegada de inmigrantes a nuestro pais ha hecho necesario establecer políticas que garanticen no sólo su integración social, sino también cubrir sus necesidades básicas de atención médica. Esta investigación empírica analiza el grado de utilización sanitaria en nuestro país efectuado por la población inmigrante mediante modelos de elección discreta. También, se estudian las características socio-demográficas del fenómeno de la inmigración. El trabajo empírico se basa en datos del Panel de Hogares de la Unión Europea (PHOGUE), la Encuesta de Condiciones de Vida (ECV), la Encuesta de Salud así como otras estadísticos y datos proporcionados tanto por la OCDE como EUROSTAT.

Igualmente, uno de los principales objetivos de esta investigación es analizar las características sociodemográficas, con especial atención a la inmigración, que podrían tener un fuerte impacto sobre los resultados de salud. En particular, la autovaloración de salud y el grado de utilización sanitaria son variables importantes a tener en cuenta a la hora de implementar políticas de salud que sean mejores que las actuales. Este estudio además demuestra que los modelos econométricos sirven para explicar el grado de utilización sanitaria pueden emplearse provechosamente en el estudio de la salud de los inmigrantes. Esto es muy importante porque el acceso al sistema de atención sanitaria se realiza básicamente a través de los servicios de urgencias, como punto de partida real de

la mayoría de entradas posteriores. Según esa premisa, resulta básico identificar los desequilibrios entre los recursos de salud para asegurar en derecho constitucional de protección de la salud y la administración de programas de tratamiento y prevención.

Por último, en el capítulo 5 se han analizado, con los datos más recientes posibles, el grado de utilización sanitaria efectuado por la población inmigrante contenido en el Panel de Hogares de la Unión Europeo (PHOGUE), la Encuesta de Condiciones de Vida (EU-SILC), y las Encuestas de salud nacionales y europea. Utilizamos para ello un marco econométrico actual y seguimos ese tipo de enfoques teóricos y metodológicos, por lo que la utilización sanitaria que efectúan los inmigrantes se analizan a través de su división por grupo socio-económico, nivel educativo y grupo de clase social. Nuestros resultados empíricos son consistentes así con la investigación actual que se centra en estudia los estrechos vínculos existentes entre inmigrantes, características socio-económicas (como las mayores necesidades de una población inmigrante más joven) y grado de utilización sanitaria. Además, se espera que el estado de salud y utilización sanitaria de la población inmigrante sea cada vez más cercano al nivel que alcanzan esas variables en la población en general para así confirmar la existencia del "efecto inmigrante sano" (entendido éste como el hecho de la salud de los inmigrantes tenderá a disminuir con el tiempo pues al principio suelen llegar al país de acogida siendo jóvenes convergiendo luego a los niveles de salud de la población autóctona de dicho país de acogida)

2. Futuras líneas de investigación

Una vez se han contestado a algunas importantes preguntas científicas en el campo de la economía de la salud y el bienestar, creemos necesario resaltar que quedan abiertas varias cuestiones que se pueden abordar de manera más pormenorizada en el futuro. Sin embargo, todas estas posibles líneas de investigación futura estarán limitadas por la calidad y disponibilidad de los datos existentes en cada momento.

Relacionado con los debates actuales sobre la sostenibilidad futura de la salud y sistemas de bienestar así como con los costes y beneficios de los diferentes programas,

pensamos que en la temática relacionada con cómo mejorar el crecimiento económico debe hacerse un mayor esfuerzo para generar nuevos resultados empíricos que sean válidos para las autoridades públicas que han de tomar finalmente decisiones como en el Capítulo 1 se sugiere.

El Capítulo 2 podría ampliarse en el futuro abriendo de ese modo nuevas líneas de investigación. Sería valioso entonces comprobar de nuevo la validez de nuestros resultados en el marco de otro tipo de variables de control relativas a la manera de medir el número de personas mayores y también centrarse en las causas específicas de las enfermedades crónicas (problemas cardiovasculares (como infartos y derrame cerebral), cáncer, enfermedades respiratorias crónicas (enfermedad pulmonar obstrucción crónica y asma) o diabetes). Además, seguir trabajando desde una perspectiva multidisciplinar podría ser muy importante para así encontrar nuevos resultados empíricos más allá de los demostrados en los capítulos 3 (capital humano) y 4 (mortalidad infantil) de la presente tesis doctoral.

Por otra parte, el último aspecto de la tesis (capítulo 5) podría ampliarse para incluir más propuestas científicas innovadoras que se sustentasen en nuevos hallazgos. Así, sería útil comprobar si nuestros resultados empíricos cambiarían en otro tipo de escenarios al emplearse otras encuestas, métodos y variables de control, o replicar el mismo estudio para otros países de la OCDE o más allá del ámbito europeo. Para ello, la información proporcionada por otros estudios como la Encuesta europea de salud, Encuestas sobre discapacidad, Encuestas sobre consumo de drogas o la Encuesta de salud, envejecimiento y jubilación en Europa (SHARE) (que en inglés es la Survey of Health, Ageing and Retiremment in Europe) podrían considerarse en futuras investigaciones.

Finalmente, el impacto de los cambios de comportamiento de la población inmigrante podría estar relacionado con ciertos estilos de vida “perjudiciales” para la salud (sedentarismo, obesidad o trastornos de la alimentación) aumentando así el impacto del denominado "efecto inmigrante sano". En esta misma línea, es interesante teniendo en cuenta sus implicaciones sobre los gastos de salud y bienestar, entre otras cuestiones, el

análisis de la información y difusión de nuevos medicamentos (innovadores, biológicos, biosimilares, etc.) así como el acceso a la tecnología sanitaria más puntera, las nuevas relaciones familiares (familias monoparentales, contactos a distancia vía internet, etc) o la medicina individualizada. Además, todo esto plantea una rica agenda de investigación para el futuro que podría contribuir a solucionar de algunos de los problemas sociales más apremiantes actualmente en nuestro país.

Conclusions

The thesis concludes with a final section which contains a summary of some basic lessons learned through the previous chapters. In the same way, some future research lines derived from this thesis on the health and welfare economics` are showed.

The final aim of all the future lines of research suggested in the end of this thesis would be vital in the designing and evaluation of public policies. That is, due to the importance of health and chronic disease on welfare, contribution to the empirical analysis of these issues should be noted.

1. Results and implications for public policy

In the thesis, we have tried to include the study of different elements that connect health and welfare with the real economy. Precisely, for example issues related to the effects of government and social expenditure and economic growth, both direct and indirect, has been analysed.

The empirical results obtained in this field provide new empirical evidence on health and welfare economics. In doing so, regional, national and international data have been used. The main sources of data were the OECD Health Statistics, World Bank and information provided by the Spanish National Institute of Statistics such as the European Community Household Panel, European Statistics on Income and Living Conditions and European and National Health Surveys. The software primarily used is Stata 10.0 and EVIEWS 6.0.

Therefore, it is important to highlight the limitations of the research carried out especially in the last chapter based on micro data. Although data from Surveys allow to include individual characteristics to the study, it should be taken with caution when interpreting the results, because the information are self-reported by individuals. For

example, regarding health care utilization it should be noted the number of visits asked for are related only with the last month.

Thus, to conclude this study, the most relevant conclusions that have been obtained in the five chapters previously exposed, are summarized below. It is also established, for each one, the most original contributions of the thesis in regard to previous evidence are the following ones:

Chapter 1, empirically examines in the European Union for period 1994-2012 the hypothesis that countries with a large public sector grow faster than the other ones. Our empirical results obtained based on regressions and panel techniques suggest that government spending is not always related with economic growth in the European Union countries. Similar conclusions could be applied to the case of social expenditures.

Chapter 2 has analysed the effects of ageing society and health care expenditure among the Spanish regions over the period 2002-2013, identifying their geographic differences and explain them based on GDP differences. The empirical findings of this study are similar to some obtained in recent papers. In particular, we find that the elderly (mainly affected by chronic conditions as World Health Organization demonstrated) positively affects public health care expenditure per capita. However, the results are significant different by Spanish regions due to its heterogeneity and income.

Chapter 3 analyses the relationship between education expenditure and GDP using the most recent available European data and different regression models. The empirical results suggests that it is not possible applying cointegration techniques. In fact, long run relationship is not always guaranteed. Using data from the OECD and the World Bank, we can confirm that the variables studied (education expenditure and GDP) are not integrated with the same order. Thus, the causality reason, from a statistical point of view, is not so clear.

Chapter 4 try different model specifications using panel data techniques and child mortality as dependent variable. Also, the aggregation problem afflicting cross-sectional studies of the relationship between population health and income inequality has been analysed. Our empirical results suggest that child mortality is negatively related to the relative number of acute care beds, general practitioners and GDP per capita. So, it is demonstrated that child mortality is positively related to poverty, tobacco and alcohol consumption, and "the income of the rich" measured through the ratio 95th percentile/5th percentile of the income distribution. In this way, higher incomes for the rich are related positively to child mortality. Besides, medical technology plays a significant role in improving the efficiency of health care. Thus, considering the relationship between income inequality measured through the Gini index and child mortality we can observe that greater inequality is always associated with higher child mortality.

Finally, in Chapter 5 it have been analysed for recent years the health care utilization by immigrant population measured as counts of utilization using the information contained in the European Community Household Panel (ECHP), European Statistics on Income and Living Conditions (EU-SILC) and European and National Health Surveys. We use an econometric framework and following these theoretical and methodological approaches, health care utilization by immigrants are analysed across socio-economic groups, educational attainment and social class group. Our empirical findings are consistent with research focused on the links between immigrant, socio-economic characteristics (like greater needs of a younger immigrant population) and health care utilization. Also, it is expected that health status and its utilization by immigrant population will converge with the levels of general population which will confirm the existence of "*healthy immigrant effect*" (understood as the fact when the immigrants` health tends to decline with length of time since immigration and to converge to native population levels)

2. Future lines of research

The five chapters of this thesis, while having answered some important scientific questions in the field of health and welfare economics, open several issues that can be addressed in future studies. Nevertheless, all future research lines will be restricted to the quality and availability of data.

Next, related to current debates about the future sustainability of health and welfare systems and the costs and benefits of different programs, how to enhance economic growth is an area in which greater effort must be made to generate empirical information for policymakers as chapter 1 suggested.

Chapter 2 could be extended in future lines of research. It would be valuable to test the results by using other elderly people proxies, and also to focus on specific causes of chronic diseases (cardiovascular problems (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) or diabetes). Besides, to keep on working from a multidisciplinary perspective could be very important in order to encourage the empirical results showed in Chapters 3 (Human capital) and 4 (Child Mortality).

Moreover, the last paper of this thesis (chapter 5) could be extended in order to include more innovative approaches. Thus, it would be valuable to test whether the empirical findings change in other scenarios by using other surveys, methods and control variables, or doing the same study for other European or OECD countries. For that, the information provided by other surveys such as the European Health Survey, the Survey on Disability, Surveys about drug use or the Survey of Health, Ageing and Retirement in Europe (SHARE) could be considered in our future research.

Finally, addressing the impact of immigration behavioural changes could emerge related with negative lifestyles (sedentarism, obesity or eating disorders) and enhances the called “healthy immigrant effect”. In the same line, it is interesting given their impact on health and welfare expenditure, among other issues, the analysis of information and

diffusion of new prescription drugs or technology supply, the new family relationships (monoparental families, contacts abroad via internet)or individualized medicine. Furthermore, all of that is configured as a research agenda for the future because it could contribute to solve some of the country`s most pressing social problems.

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Appendix

Table A2.1
Public health care expenditure (constant euros per capita)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ANDALUSÍA	921.9	1034.9	1148.1	1205.2	1237.2	1256.8	1362.7	1374.0	1308.0	1198.8	1097.4	1078.3
ARAGON	1044.7	1218.1	1384.1	1433.0	1463.9	1524.3	1537.8	1679.7	1602.6	1552.4	1394.0	1343.9
ASTURIAS	1081.0	1258.5	1385.9	1475.3	1483.8	1534.8	1569.5	1797.4	1691.3	1693.8	1610.0	1596.6
BALEARIC ISLANDS	921.1	1063.1	1172.4	1375.3	1271.7	1336.5	1335.7	1402.9	1550.0	1301.8	1167.6	1142.4
CANARY ISLANDS	1014.5	1165.6	1244.9	1378.9	1380.6	1426.2	1504.5	1590.3	1487.8	1341.9	1215.5	1193.0
CANTABRIA	1140.8	1359.5	1499.8	1611.9	1601.7	1655.4	1440.2	1527.4	1576.3	1463.4	1351.4	1387.2
CASTILE AND LEON	976.9	1161.1	1282.1	1384.5	1487.4	1391.6	1536.6	1536.2	1543.3	1596.7	1390.6	1310.6
CASTILE - LA MANCHA	969.4	1075.8	1094.6	1366.9	1421.4	1445.4	1509.5	1687.7	1667.9	1544.7	1248.7	1199.4
CATALONIA	1024.8	1169.4	1229.7	1298.2	1349.8	1427.6	1456.4	1562.7	1548.0	1358.2	1264.9	1198.6
VALENCIAN COMMUNITY	941.6	1084.0	1177.7	1268.2	1265.3	1308.5	1335.6	1466.3	1474.6	1381.4	1330.8	1168.3
EXTREMADURA	1022.5	1187.0	1311.9	1410.6	1464.4	1605.9	1641.9	1756.1	1704.5	1550.2	1423.2	1339.3
GALICIA	1012.6	1139.6	1301.7	1341.2	1387.2	1439.1	1492.6	1596.5	1496.8	1422.3	1306.7	1316.0
MADRID	886.9	974.9	1129.2	1197.3	1199.0	1255.7	1281.0	1392.1	1245.1	1305.2	1222.9	1133.8
MURCIA	977.7	1118.7	1244.8	1336.7	1343.7	1424.1	1604.5	1717.7	1667.3	1604.0	1387.8	1328.8
NAVARRE	1153.2	1281.1	1414.1	1458.9	1467.6	1542.9	1587.7	1751.0	1703.2	1600.4	1432.5	1355.0
BASQUE COUNTRY	1125.2	1251.3	1370.3	1491.6	1490.9	1609.1	1673.5	1822.5	1788.8	1678.4	1581.0	1521.6
LA RIOJA	1025.0	1160.8	1334.6	1480.4	1763.5	2038.4	1600.4	1614.9	1587.9	1439.8	1345.3	1305.8

Source: Ivie-BBVA database.

Table A2.2
Gross Domestic Product (GDP)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ANDALUSÍA	17593.3	18213.6	19020.9	19661.5	20066.8	20565.1	19900.8	18848.9	18528.4	17710.6	16899.8	16446.2
ARAGON	25085.1	25683.2	26575.6	27406.3	28138.6	29290.9	28554.3	26928.1	26872.2	25857.4	24551.5	24021.1
ASTURIAS	19962.6	20383.6	21189.9	22392.7	23386.6	24463.7	24026.2	22508.4	22443.8	21431.7	20295.7	19498.3
BALEARIC ISLANDS	27851.8	27080.1	27580.4	27853.3	28041.4	28200.2	27387.4	25626.1	25132.5	24298.7	23572.6	22871.5
CANARY ISLANDS	21497.5	21795.9	22073.6	22506.2	22738.1	23113.6	22205.5	20826.1	20875.9	20190.8	19392.6	18885.7
CANTABRIA	22149.6	22314.2	23002.2	23907.3	24351.0	25154.7	24471.0	23206.6	22852.5	21766.3	20837.9	19890.1
CASTILE AND LEON	21253.8	21771.5	22686.8	23435.7	23842.4	24680.1	23969.9	23181.7	23007.5	22200.2	21337.3	20699.9
CASTILE - LA MANCHA	18595.0	19118.6	19710.8	20423.7	20802.3	21584.7	21010.4	20128.5	19816.7	18915.9	18116.0	17774.4
CATALONIA	29172.7	29292.4	29923.7	30344.4	30881.5	31611.7	30506.8	28894.0	28573.2	27241.5	26319.0	25526.2
VALENCIAN COMMUNITY	22299.5	22310.7	22835.7	23204.6	23647.4	24037.3	23363.9	21833.4	21514.7	20555.1	19562.0	19155.6
EXTREMADURA	14686.6	15175.5	15867.1	16729.5	17139.6	17955.8	17774.7	17193.3	17230.1	16301.9	15435.0	15087.9
GALICIA	18553.2	19066.2	20019.8	21000.1	21784.2	22880.5	22733.5	21842.3	21681.7	20642.2	19730.1	19354.2
MADRID	31123.6	31369.6	32337.0	33356.3	34434.0	35181.6	34395.3	33274.3	32482.6	31562.0	30782.8	29811.1
MURCIA	20042.2	20290.7	20679.3	21335.0	21637.5	22163.5	21692.0	20368.7	20206.1	19100.4	18463.8	17882.0
NAVARRE	29190.7	29492.2	30404.3	31336.8	31864.7	32717.5	32120.1	30531.9	30226.4	29287.2	27754.0	26986.7
BASQUE COUNTRY	28752.1	29271.2	30337.1	31605.7	32696.7	33835.0	33544.8	31612.2	31618.1	30512.4	29414.5	28528.7
LA RIOJA	25811.5	26372.9	26737.0	27346.0	27917.3	28477.6	27859.3	26436.1	26459.7	25281.0	24217.2	23764.7

Source: Ivie-BBVA database..

Table A2.3
Percentage of population: 65 years and over

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ANDALUSIA	14.60	14.66	14.60	14.47	14.55	14.49	14.46	14.64	14.85	15.12	15.30	15.54
ARAGON	21.41	21.24	20.90	20.49	20.30	20.02	19.63	19.54	19.69	19.91	20.08	20.26
ASTURIAS	21.97	22.03	22.00	21.86	21.88	21.83	21.72	21.81	22.00	22.33	22.68	22.98
BALEARIC ISLANDS	14.64	14.29	14.02	13.84	13.77	13.58	13.47	13.53	13.74	14.01	14.29	14.54
CANARY ISLANDS	12.06	12.09	12.10	12.06	12.23	12.34	12.55	12.80	13.18	13.59	13.93	14.23
CANTABRIA	19.13	19.12	18.96	18.70	18.68	18.54	18.37	18.37	18.50	18.73	19.00	19.33
CASTILE AND LEON	22.68	22.73	22.62	22.45	22.50	22.43	22.26	22.36	22.56	22.83	23.02	23.20
CASTILE - LA MANCHA	19.73	19.61	19.27	18.71	18.66	18.16	17.66	17.54	17.57	17.64	17.64	17.71
CATALONIA	17.34	17.16	16.84	16.42	16.45	16.30	16.13	16.20	16.45	16.77	17.06	17.43
VALENCIAN COMMUNITY	16.37	16.32	16.19	15.92	16.11	16.02	15.96	16.17	16.52	16.88	17.21	17.62
EXTREMADURA	19.09	19.18	19.04	18.93	19.05	18.89	18.78	18.92	19.05	19.16	19.22	19.29
GALICIA	21.08	21.28	21.26	21.22	21.44	21.55	21.62	21.85	22.12	22.49	22.83	23.07
MADRID	14.49	14.37	14.23	14.06	14.29	14.23	14.19	14.38	14.71	15.10	15.44	15.87
MURCIA	14.24	14.13	14.05	13.75	13.78	13.63	13.49	13.52	13.68	14.00	14.28	14.53
NAVARRE	18.05	17.87	17.64	17.45	17.45	17.36	17.20	17.21	17.36	17.68	17.93	18.25
BASQUE COUNTRY	17.97	18.14	18.17	18.14	18.32	18.42	18.50	18.75	19.09	19.50	19.88	20.32
LA RIOJA	19.55	19.24	18.82	18.37	18.33	18.20	17.90	17.97	18.23	18.48	18.71	19.04

Source: INE