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PHD THESIS

ESSAY IN HEALTH ECONOMICS

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Alla mia famiglia,

alle mie passioni,

ai miei amici e colleghi

a chi c'è stato ed a chi non c'è più,

che in un modo o nell'altro

hanno indelebilmente lasciato un segno

durante questa mia importante avventura.

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Preface

This thesis, submitted in fulfilment for the degree of Doctor of Philosophy, is centred in the field of Health Economics. Over the past few decades, significant changes have occurred in healthcare policies. During my doctoral course, I had the opportunity to study and delve into topics of health economics, economic evaluation of treatments and healthcare technologies, pharmacoeconomics, and the implications of health policies, focusing on the public sector and therefore on macroeconomic and public accounting academic studies.

The aim of Health Economics is considerably large, ranging from the study of the functioning of healthcare systems to individual and social causes of health-affecting behaviours. However, some specific topics are currently arising as particularly important, capturing not only the interest of many researchers, but also policymakers and actors in the healthcare sector.

One of such topics concerns hospital performance in terms of cost containment and compliance with regulatory norms regarding the legal rights and legitimate interests of patients, especially when such hospitals are undergoing important reforms in terms of payment systems or management objectives. In fact, since the 1980s, several countries have been introducing financial incentives and management performance objectives in the relationship between funders and providers of healthcare (public and private). Such mechanisms, were thought to induce efficient management behaviour, in order to achieve better resource allocation, and in most cases, to contain the escalation of costs with the health system. However, many of these mechanisms designed to encourage efficiency comprise simultaneously and implicitly, some compensation for the selection of patients with lower expected treatment costs (creaming) and the rejection of patients with higher costs (dumping), and a perverse incentive for reduction of service costs through cutbacks in quality of the services provided, in ways not observable by consumers (moral hazard on the supply side).

Additionally, in recent years, data management is increasingly a major focus of most studies of health systems and in the study of health policies. Health Data Management (HDM), also known as Health Information Management (HIM) is the systematic organisation of health data in digital form. This can be anything from electronic medical records (EMRs) generated as a result of medical examinations, to electronic health records (EHRs), to handwritten medical notes scanned into a digital archive, to health and administrative data processed by central and local governments. Health data management has the task not only of organising medical data, but also of integrating them and enabling their analysis to make patient care more efficient and to derive information that can improve medical outcomes, while protecting privacy and data security, and public policy, providing policymakers with important feedback and analysis for better lawmaking and enforcement. More recently a distinct body of literature as arisen, focusing on disparities in care received by different ethnic and racial groups, and less frequently, on differences in healthcare utilisation and type of care based on sex and age of individuals.

Another important topic of Health Economics, with growing relevance, is the study of the phenomenon of informal caregiving in the field of health care to the patient often suffering from a disability, terminal illness or neurodegenerative disease. Informal care is the care provided without any form of economic retribution usually by family, friends or neighbours. Moreover, it is often associated with physical and mental health effects. This caregiving is not equitably distributed in society, but rather is assigned according to a hierarchy which has to do with gender and socioeconomic position. For this reason, since some individuals are more likely to perform caregiving tasks than others, it is difficult to estimate the causal impact of caregiving and therefore this topic is increasingly arousing curiosity in the world of health economists.

In the face of these facts, we have chosen to focus our research activities on issues of economic evaluation of health systems in terms of e.g. hospital performance, on the management of health and administrative data, provided by the public administration, through the use of statistical software, and the study of a public policy aimed at social protection for persons in need of long-term care, in order to observe and measure the impact on the quality of life of caregivers and family well-being .

The thesis is composed of three essays on such central topics of theoretical and empirical work in the field of Health Economics, as mentioned above.

The first chapter summarises the research activities carried out during the first year of the PhD course in Translational Medicine and Management of Health Systems. The initial research activities focused on a literature review on the topic of economic evaluation methodologies of healthcare treatments in order to acquire a broad theoretical background on the economic evaluations of healthcare treatments, such as the Budget Impact Analysis (BIA) and other alternative economic and financial evaluation techniques. The purpose is to highlight advantages and disadvantages of their applications, but, above all, to provide good practice suggestions to healthcare professionals and to build important lines of future research.

The second chapter represents the implementation of skills and knowledge in data management through the Stata software, a statistical software, widely used in academic research and in private companies where data analysis is carried out, capable of performing a variety of functions, including database management, statistical-econometric analysis and graphical analysis. In this regard, this chapter summarises those operations that were carried out, during the visiting PhD at the Centre for Research in Health and Economics of the University Pompeu Fabra Barcelona, relating to the management of administrative data of the "Muestra Continua de Vidas Laborales" provided by the Spanish government's Securidad Social with a time frame from 2005 to 2016.

The third chapter aims to study and understand how the Ley de Dependencia, a public policy introduced in 2007 and repealed in 2012, which established new rights for dependent people, influenced the quality of life of caregivers, gender inequality, the sexual division of the labor market and family well-being.

CHAPTER I

A critical appraisal of Budget Impact Analysis versus alternative techniques of the economic evaluation of healthcare treatments

Contents.

Abstract

The first chapter summarises the research activities carried out during the first year of the PhD course in Translational Medicine and Management of Health Systems. The initial research activities focused on a literature review on the topic of economic evaluation methodologies of healthcare treatments in order to acquire a broad theoretical background on the economic evaluations of healthcare treatments, such as the Budget Impact Analysis (BIA) and other alternative economic and financial evaluation techniques. The purpose is to highlight advantages and disadvantages of their applications, but, above all, to provide good practice suggestions to healthcare professionals and to build important lines of future research.

Keywords: Economic evaluation; healthcare; Budget Impact Analysis; Cost analysis; literature review.

1.1 Introduction

Since the 1990s, health economics has experienced a period of extraordinary development on the European scene. Many fundamental aspects in the world of healthcare have undergone radical changes and the economic discipline applied to the healthcare sector has also evolved, both qualitatively and quantitatively.

Until the end of the 1980s, the lack of awareness of the scarcity of resources, the indifference to performance evaluation, the failure to use cost control tools, and the pressure from professional associations and trade unions had relegated health economics to the group of disciplines practised only by a few insiders and destined to play a completely marginal role in the health sector.

The public finance crisis has made clear the need to contain the growth rate of expenditure on the National Health Service (NHS). The gaps between people's needs and the supply of services, particularly in some geographical areas and in some areas of care, have forced a critical rethink about the system's real capacity to meet citizens' needs, even though many gaps still remain to be filled.

Healthcare companies increasingly feel the need to know and interpret the changes taking place and to foster the process of cultural and professional growth of their employees.

The economic disciplines (in all their specialised components, from political economy to business economics, from economic policy to public economics) attempt to respond to these needs by providing a wealth of knowledge and methodological approaches. Numerous elements lead one to look with apprehension at the growth of interest in the world of health economics. In the current particular historical moment of the 'assault on universalism', a wrong approach to economics entails several risks, including the myth of balancing the books.

The fear is that balancing the books is seen by National Health Service companies as a goal to be achieved and not as an alley to be respected. The concern is that the growing attention to the problems of efficiency in the health industry may make it appear less urgent to reflect on the contribution of the health system to the improvement of community health levels and its ability to respond to the changing needs of the population.

Excessive attention to the problems of efficiency (where by efficiency is meant the ability to achieve a given objective with the minimum expenditure of resources) may in fact be functional to the continuous postponement of the evaluation of the overall effectiveness of the service (where by effectiveness is meant the ability of an action to achieve the objective for which it was undertaken) and of the uniformity in the supply of services.

The centrality of the problems of effectiveness must not, however, constitute an alibi for the postponement of actions to improve the economic-financial situation of the companies; on the contrary, compliance with the budget constraint must be considered an extraordinary opportunity for change.

1.2 Stylised fact

In recent decades, health technologies have contributed significantly to improving the health status of populations. It is precisely the role of economic evaluations for the efficient allocation of health resources that have been widely debated in recent years (Grootendorst, Pierard, & Shim, 2009).

Healthcare economists are not only concerned with maximising the outcome efficiency, but also have the more simplistic objective of containing expenditure in resources within annual budgets. However, it often happens that economic evaluations are carried out on a medium to long term time horizon, which does not answer the more immediate and frequent question of the decision-maker on the short-term financial sustainability (1-3 years) of a specific healthcare treatment and in a specific territorial area. The variable and complex nature of health technologies, coupled with limited national budgets, has led to a contrast between the need to provide cost-effective care and the enhancement of research and innovation within hospitals. It has become increasingly important to seek a balance between equitable and sustainable care on the one hand, and the use of innovative health technologies on the other (World Bank, 1993).

Health economists have recently developed the Budget Impact Analysis (BIA) which is an essential and additional analysis of a comprehensive economic assessment inherent in the introduction of a new health technology, which is increasingly in demand, and thus for the adoption of a new health treatment (Mauskopf, et al., 2007). Budget impact analysis is complementary to cost-effectiveness analysis (CEA). CEA assesses whether an intervention provides value compared to an existing intervention whereas a BIA assesses whether the high-value intervention is cost-effective. In other words, this analysis tests whether the investment is sustainable and to what degree it is sustainable for public health.

The research aims to examine the question of affordability, the relationship between affordability and efficiency, and explain why there is a growing need for budget impact analysis to complement economic assessment (Trueman, Drummond, & Hutton, 2001). The main objective of this research activity is to acquire a broader theoretical background on the economic evaluations of health treatments such as Budget Impact Analysis (BIA) and other alternative economic and financial evaluation techniques and also to provide some good practice suggestions as well as some foundations on which to build future research.

1.3 Methods

A literature review analysis was conducted for the development of the research activity of the first year PhD course. This report was divided into four sections: initially a general analysis of the topic, some research questions and a preliminary literature review will be described; subsequently the most relevant economic evaluation methodologies will be illustrated, paying attention to the issue of sustainability applied to health; finally, conclusions and reflections will be made useful for future research.

The research basically aims to study and make a critical, accurate and systematic evaluation to judge the feasibility and reliability of alternative evaluation techniques to Budget Impact Analysis. The main objectives to be pursued are to understand the different economic issues related to healthcare treatments; to associate methodologies to each problematic; to understand the pros and cons of each methodology and identify specific areas of application; and, to compare these methodologies with the Budget Impact Analysis (BIA), which is currently more widely used and applied.

The economic evaluation of healthcare treatments has become more important in recent years and this is reflected by an increase in the literature. It is now an accepted tool for the appraisal of healthcare programmes. Studies may be conducted from the viewpoint of individual recipients of healthcare, healthcare providers or society generally (Forbes & Donaldson, 1987) and such investigations are now being undertaken by researchers from many different fields including economists, medical researchers, and clinicians. Economic evaluation may be defined as "*the comparative analysis of alternative courses of action in terms of both their costs and consequences*" (Drummond, Stoddart, & Torrance, 1996).

It involves two main areas, first, the costs and consequences of healthcare treatments and, second, choices which must be made in allocation of resources. Although sometimes viewed with suspicion by both clinicians and the public, economic evaluation does aim to determine how resources can give the greatest benefit.

From this brief analysis, the following research questions arise: Are healthcare treatments in question worth doing compared with other things we could do with the same resources? Are we satisfied that the healthcare resources should be spent in this way rather than in any other way? How many economic evaluation methodologies in health are there? And which of these methodologies is the most relevant for the economic evaluation of healthcare treatments?

To answer these questions, an important literature review was conducted aimed at examining and summarising the research methodologies applied in the context of the economic evaluation of healthcare treatments.

A recent literature review indicates that there are only a limited number of published budget impact analyses and that they vary widely in the methods used. Instead of publication in peer-reviewed journals, budget impact analyses are more frequently presented directly to decision-makers as interactive computer programmes designed to calculate the budget impact of specific health plans using plan-specific inputs (Mauskopf, Earnshaw, & Mullins, 2005).

In addition, standards have recently been proposed for the development, content, and presentation of the results of a budget impact analysis, but detailed guidelines on the exact methods for estimating budget impact are not yet concretely available (ISPOR Task Force, 2014). BIA never compares individual treatment or diagnostic technologies, but always compares scenarios, in particular the current treatment scenario and another treatment or diagnosis scenario that the new health treatment will generate. Therefore, the change in costs caused by the change in a new diagnostic or treatment technology is assessed.

1.4 Results and Discussions

The main issues that emerged in the numerous economic assessments in health concern, from a managerial point of view, starting from limited economic resources, to maximise the level of health; from the sustainability point of view, to use health indicators that allow to evaluate in the population an improvement from the health point of view; and, from an economic point of view, to maximise the benefits by comparing outcomes and costs.

Instrumental and common to all analyses is the valuation of the inputs or costs (Luce & Elixhauser, 1990) and methods differ in how effects are measured. However, the concept of "cost" takes on concrete meaning only after we specify the perspective from which the evaluation is being conducted (Gold, Siegel, Russell, & Weinstein, 1996) (Stone, Chapman, Sandberg, Liljas, & Neumann, 2000). Studies may be motivated by policy decisions relevant to specific institutions or individuals. In this case, the perspective of primary interest may be that of a managed care organisation, hospital, employer, state health department, or other party.

Below are listed and described (table 1) the methodologies for the economic evaluation of healthcare treatments that emerged from the literature review.

Table 1 - Healthcare economic evaluations methodologies and their descriptions

HEALTHCARE ECONOMIC EVALUATIONS METHODOLOGIES	DESCRIPTIONS
Cost-Minimization Analysis (CMA)	It is used when the outcomes of two procedures being compared are identical and it is important that the outcomes of the alternative programs are proven to be the same if the method is used. The aim is usually to find the lowest cost program and the unit of measurement is cost per intervention. An important example of CMA can be found in (Brown & Brown, 2010) but this analysis is rarely used today.
Cost-Consequences Analysis (CCA)	An economic evaluation where disaggregated costs and a range of outcomes are presented to allow readers to form their own opinion on relevance and relative importance to their decision-making context (Drummond, Sculpher,

	Torrance, O'Brien, & Stoddart, 2005). CCAs have been recommended for interventions that have multiple effects, for example, public health interventions which have an array of health and non-health benefits that are difficult to measure in a common unit (Brazier, Ratcliffe, Salomon, & Tsuchiya, 2007).
Cost-Effectiveness Analysis (CEA)	CEA assumes that for each level of available resources, the social desire is to maximise the health level of society. The cost-effectiveness analysis can be used as a decision criterion when the main objective is the optimisation of the allocation of available resources. There are several similarities between CEA and CUA and the two terms are sometimes used synonymously (Cunningham, 2000). Also, it aims to assess the cost necessary to obtain an additional unit of effectiveness compatibly with the available resources or with a predetermined effectiveness that you want to achieve. CEA and CUA estimates are highly correlated with each other and do not generally lead to different implied resource allocation decisions (Tengs, 2004).
Cost-Utility Analysis (CUA)	CUA focuses mainly on evaluating the quality of the results deriving from the application of a health technology in terms of health obtained or events avoided. In the cost-utility analysis, the incremental cost due to the application of a new technology is compared with the increase in health assessed through a utility measure such as the years of life gained weighted for the quality of life (Quality-Adjusted Life-Years - QALYs) or variants of this measure as the equivalent years of health.
Cost-Benefit Analysis (CBA)	CBA compares the incremental benefits with the incremental costs related to the use of a new health technology compared to another. The resulting indicator indicates the net benefit due to the application of the new technology. The main purpose of this analysis is therefore to verify whether the benefits of using a new technology outweigh its costs. Cost-benefit analysis is a strictly economic analysis in that all its components, including the effectiveness of the intervention, are measured in monetary terms. The term cost-benefit approach was first used in (Williams, 1974) when he proposed an economic view of the health field to study the relationship between resource use and the production of health services.
Budget Impact Analysis (BIA)	The Budget Impact Analysis (BIA) can be defined as (Fantelli, Van de Vooren, & Garattini, 2011) a short-term economic assessment whose results are expressed as the difference between the overall health cost of the new technology and that of the mix of therapies currently used in the analysed context, also assessing the impact of the expected differential in clinical efficacy between the two alternatives should it arise in the short term.

CEA was the most widely used method of economic analysis until the 1980s (Gold, Siegel, Russell, & Weinstein, 1996), to solve the optimisation problem which can be explained in two ways (Stone, Larson, & Kawar, 2002): the decision-maker has a budget constraint and has the possibility to choose from a range of alternative interventions; the decision-maker aims to achieve certain effectiveness by using the least possible resources.

BIA is complementary to CEA, but BIA is an essential and additional analysis of a complete economic evaluation inherent in the introduction of new health technology, increasingly in demand, and therefore for the adoption of a new health treatment, especially verifying whether investment is sustainable and to what extent it is sustainable for public health (Mauskopf, et al., 2007) (Garber, 2000). Overhead costs are usually excluded from the BIA and this distinguishes the Budget impact analysis from the Cost-effectiveness analysis which includes overhead costs (Garattini & van de Vooren, 2011). Some differences between Budget Impact Analysis and Cost Effectiveness Analysis are summarised in Table 2.

Table 2 - Comparison of Budget Impact Analysis and Cost Effectiveness Analysis

	BUDGET IMPACT ANALYSIS	**COST-EFFECTIVENESS ANALYSIS**
ISSUE	Is this new technology sustainable?	What are the priorities?
PERSPECTIVE OBJECTIVE	Budget Holder	Societal
TIME HORIZON	Short/Mid-term (1-5 years)	Long-term (lifetime)
POPULATION SIZE	Included	Unknown
COSTS ASSESSED	Direct healthcare costs	Direct (health care and non-health care) and indirect costs
RESULTS	Incremental healthcare costs	Incremental cost-effectiveness ratio (ICR)
HEALTH OUTCOME	No	Yes
SENSITIVITY ANALYSIS	Analysis of extremes and scenario analysis	Various forms of sensitivity analysis (one-way, multi-way, extremes, scenarios, probabilistic, threshold)

Source: adapted from (Dervaux, et al., 2017) (Leelahavarong, 2014)

The methods for performing these analyses require static or dynamic analysis techniques depending on the type of health condition and the health impact of the new drug. Several factors, which are generally not required for cost-benefit analysis, should be part of an overall budget impact analysis that includes the size of the population treated, second-order costs, market uptake rates for the new drug, and off-label use.

1.5 Conclusions

We can conclude that all the economic evaluation methodologies are useful and each of them is specific to evaluate the new technologies and specific health treatments of the reference business context.

The Budget Impact Analysis, on the other hand, estimates the consequences of the adoption and diffusion of healthcare technology in financial terms in a specific context characterised by the limited availability of resources (which makes the time factor of primary importance) and mainly evaluates the higher costs due to new technologies and new drugs, which presumably will have a higher cost than previous health care, comparing them to lower organisational, social and logistical costs, determining the new target of patients subject to treatment and what the increase will be in terms of both public and private health.

In conclusion, the BIA can only provide concrete support for decision-making if the data are reliable and represent the territorial context examined.

1.6 References

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CHAPTER II

Data management of administrative data for research in public health: the use of the *Muestra Continua de Vida Laborales*

Contents.

Abstract

The use of administrative data is one of common practice in public health research. The aim of this chapter is to introduce the *Muestra Continua de Vida Laborales* (MCVL) and its usefulness in health economics studies. The MCVL is built on records that generate all contacts with the Social Security (work, disability, etc.), including fiscal data (money received, income, etc.) and census data (educational level, country of birth, etc.), without the possibility of individual identification. The MCVL began in 2004 with 4% (1.1 million people) of the total population contributing to or receiving Social Security. The data of the persons who form part of the MCVL are updated annually, and the cancellations produced are replaced. This continuous design makes it possible to generate a cohort with information on working and economic life, and to assess its association with incapacity for work. The assumption of connection with the clinical history would make it possible to analyse other health outcomes.

Keywords: Administrative data; Social security; Spain; working life; Data management.

2.1 Introduction

Because of the wealth of information they include, the fact that they are representative of the population and the continuity of their flow over time, administrative data have increasingly become a reference for health research and epidemiological studies in particular. The numerous experiences of their use in various contexts and with reference to different pathologies have made it possible to highlight their critical aspects and to develop strategies and methodologies to deal with them and, where possible, resolve them.

Since John Graunt (1620-1674) and William Farr (1807-1883) made use of mortality registers in England and Wales to quantify the major health problems of their time, many different administrative registers have proved useful for investigating and monitoring different health problems in the population. A classic example of the use of administrative registers in public health is the British registers. In some studies, administrative data have been supplemented by record linkage with data collected through surveys or clinical data from medical records. Currently, Scandinavian registers are another example of using administrative registers for epidemiological studies. Among them, the one based on linking the population census, the water quality register and hospital discharges in Finland, to determine the relationship between the concentration of fluoride in drinking water and hip fractures, stands out.

In Spain, since 2004 an administrative database provided by the Social Security, the Continuous Sample of Working Lives (MCVL), has been available to researchers, which includes 4% of the people who have a relationship with the Social Security, either as contributors (e.g., employees) or as beneficiaries (pensioners). The MCVL has been used mainly in labour and economic studies, including those assessing trends in entry into retirement and the duration of employment relationships. Only recently has MCVL started to be used in public health. The aim of this field note is to describe MCVL and to show its potential uses in public health research.

2.2 Healthcare and welfare

Health and welfare are two critical factors for the well-being of society. In an increasingly complicated and interconnected world, ensuring that every individual has equitable and appropriate access to high-quality health care and a robust social safety net is critical to developing a more equitable and inclusive society.

Health is a valuable commodity that should not be overlooked. A healthy population not only leads a more productive and satisfying life, but it also contributes to a nation's social and economic progress. As a result, public health plays an important role in promoting illness prevention, early detection, and appropriate treatment to promote individual and societal well-being.

Health care is an important aspect of every individual's life and of a nation's social structure: it is a complex and constantly evolving system that necessitates a careful analysis of its functions and apparatus in order to ensure an effective distribution of resources and a rational use of health expenditure, as well as a proper evaluation of results in order to improve them.

The latter two components are critical: because health spending accounts for a large portion of national income, it is critical to evaluate whether these resources are being spent efficiently and if the results produced meet expectations. Only via proper evaluation will it be possible to identify the health system's strengths and flaws and undertake focused remedial action.

Another critical aspect is the accessibility of healthcare. It is critical to guarantee that all residents, regardless of socioeconomic level, have access to quality care. Equity in resource distribution and the elimination of disparities in access to care must be major goals of a healthcare system aimed at the well-being of everyone.

The role of welfare in health care is so fundamental. Welfare refers to a wide range of social services aimed at providing assistance and a safety net to those in need; a strong welfare system serves to decrease inequities and guarantee that no one is left behind. Integrating social and health policy is a sensitive but crucial problem in developing a welfare system that fulfils the requirements of the entire community.

An in-depth and critical examination of health care and welfare reveals the need for ongoing reflection on the difficulties and potential in this sector. Data and empirical facts help to understand healthcare trends and provide an international perspective by comparing nations.

Understanding the public debate on health care and welfare is critical for assessing the effectiveness of policies implemented, as well as stimulating our reflection on how resources are allocated and used efficiently, but most importantly, it prompts us to consider the importance of an inclusive health and welfare system that ensures access to adequate care and a social protection network for all.

Examining the activities and structures that comprise health care allows us to go beyond costs and results and into the social and economic processes that impact the system as a whole.

2.3 Spanish Administrative data: The "*Muestra Continua de Vidas Laborales*"

The Muestra Continua de Vida Laborales began in 2004, from the Directorate General for Social Security Organisation, with a representative sample of 4% of the individuals registered with the Social Security in that year. Since then, each year a new sample is generated which, using the same algorithms, re-selects those who were already in contact with the Social Security, and if they are not (due to unemployment and termination of the associated benefit, or death of the beneficiary or member) they are replaced by people with similar characteristics, who will become part of the MCVL until they cease to be in contact with the Social Security. In this way, the sample is similar to a panel sample, where information is collected on the same persons in different waves, which allows maintaining the representativeness of the sample and accumulating the information that has been generated in that year. For example, changes from employee to self-employed, or moving to a permanent disability or retirement pension. In this way, a dynamic cohort of individuals can be constructed who are followed for as long as they are in contact with Social Security. In a follow-up from 2004 to 2009, based on those who are contributors to the general scheme, 88% of those in 2004 were followed for the whole period.

Table 3 - Variables found in the files that composing the Muestra Continua de Vida Laborales

DATASET GROUPS	VARIABLES	
Personal data (Personas)	• Date of birth • Sex • Nationality • Province of birth • Province of first affiliation	• Place of residence • Date of death • Country of birth • Educational level

Affiliation (Afiliacion)	• Contribution scheme • Contribution group • Type of contract • Part-time quotient • Actual dates of joining and leaving the company • Cause of leaving • Disability according to discharge of affiliation • Economic activity of the contribution account (CNAE 2009) • Number of workers in the contribution account	• Type of employment relationship • Collective group of the worker • Type of employer and entity • Registered office: province • Date of modification of contract • Type of contract until modification • Part-time quotient up to the modification • Date of modification of contribution group • Contribution group until modification
Contribution basis (Bases de cotización)	• Date of registration of the first worker • Identification of the contribution account (secondary) • Actual dates of entry and exit • Dates of effect of entry and leaving • Contribution group	• Economic activity, old classification (CNAE93) • Contribution year • Monthly contribution base for common contingencies, paid by employees • Contribution base for self-employed persons and others • Total contribution base for the year

For each person, data are available from various administrative registers, mostly Social Security, but also fiscal and demographic. Table 3 summarises all the information available for each person, such as types of contract, with dates of registration and deregistration, contribution group and deregistration due to permanent disability, which is complemented with information for that year from the Tax Agency and the continuous Register.

2.4 Data & Methods

There is a gap between raw data and statistical analysis. That gap, called data management, is often filled with a mix of pesky and strenuous tasks that stand between researchers and their data analysis.

We find that data management usually involves some of the most challenging aspects of a data analysis research. In this chapter we experienced the management of a series of administrative data packages of the "Muestra Continua de Vida Laborales", divided by year, provided by the Spanish ministry and used Stata to cope with these pesky and challenging data-management tasks.

In order to reach the data analysis stage, these data packages were cleansed of coding errors, duplications and cross-matching errors. In fact, we observed that there were insufficient variables to match the dataset with contribution data with the data on the type of contract entered into by the employer with the individual observed in the dataset with master data.

The variable common to the dataset with master data (but anonymous) and the dataset with the individual's work history data is certainly the ID code assigned to the individual. The ID variable, however, is not present in the dataset containing the contribution data. It was therefore necessary to analyse and cross-reference the contract start dates in order to merge the datasets in our possession.

As can be seen from the Table below, our generated dataset containing master data and employment contract data was divided into 12 years, totalling approximately 219 million observations. It can also be observed that the number of observations over the years is increasing because the MCVL collects data from the entire working life of each individual, and therefore as the number of contracts increases, the number of observations available to us increases.

Table 4 - Number of observations processed by matching the master dataset and the work history dataset

MCVL year dataset	Number of observations
2005	13.365.162
2006	13.645.085
2007	15.235.636

2008	16.145.346
2009	16.960.424
2010	17.937.371
2011	18.585.441
2012	19.556.470
2013	20.323.988
2014	21.275.176
2015	22.377.254
2016	23.497.627
Timeframe = 12 years	***Total numer of obs = 218.904.980***

During our data management work, we generated, through a series of looped commands on the Stata software, security variables for each individual dataset in order to avoid the risk of loss of data tracking.

Each individual data packet was then cleansed of duplicates and errors, merged with the other datasets, and sorted by the ID assigned to the individual.

Considering the amount of data we worked on, the data cleaning and merging work took time and careful work on the part of the study team.

It must also be considered that most of the time it is not possible to execute the 'append', 'joinby' or 'merge' command if the variables in each individual dataset are of different formats (string or int/byte), which therefore required significant recoding work.

In order to acquire a final dataset useful for our subsequent analysis on the impact of the Dependency Law introduced by the Spanish government in favour of women engaged in the care of dependent persons and therefore on the probability that these women received a new employment contract in the caregiving sector, we conducted merging and keeping operations.

This was done in order to extract and generate a single dataset, for our entire timeframe (2005-2016), containing only women engaged in sectors of activity potentially related to the caregiving sector.

The following Table shows the content of our final panel.

Table 5 - Women potentially engaged in careviging, extracted from the processed MVCL datasets

MCVL year dataset	Women Number of observations
2005	267.244
2006	311.778
2007	365.582
2008	391.845
2009	429.054
2010	461.756
2011	463.072
2012	449.220
2013	418.690
2014	428.796
2015	451.308
2016	459.091
Timeframe = 12 years	***Total numer of obs = 4.897.436***

Our dataset was therefore stripped of all other activity sectors that are not of interest for our analysis (performed in Chapter 3).

The sectors available in our dataset are divided into activity codes as per the Clasificación Nacional de Actividades Económicas (1993 and 2009 versions) according to the EU classification of economic activities NACE Rev.2.

In the following Table we have the breakdown of our observations by the following economic activities we have considered:

- ✓ Health services;
- ✓ Social services activities;
- ✓ Other personal services activities;
- ✓ Domestic staff activities.

Below is a double-entry table showing the number of women with employment contracts falling under the economic activities described above and therefore engaged in caregiving activities towards patients or dependent persons.

Table 6 - Women engaged in caregiving by year and sector of activity

Year	Health services	Social services activities	Other personal services activities	Domestic staff activities	Total
2005	217.699	33.853	14.572	1.120	267.244
2006	255,948	41,020	13,649	1,161	311.778
2007	300,156	49,194	15,016	1,216	365.582
2008	319.035	56.953	14.690	1.167	391.845
2009	377.159	27.632	23.026	1.237	429.054
2010	406.709	29.997	23.752	1.298	461.756
2011	379.760	69.362	12.657	1.293	463.072
2012	364.783	71.124	11.992	1.321	449.220
2013	330.379	72.903	14.074	1.334	418.690
2014	337.878	76.116	13.480	1.322	428.796
2015	355.108	81.103	13.860	1.237	451.308
2016	358.114	86.106	13.663	1.208	459.091
Total	4.002.728	695.363	184.431	14.914	4.897.436

From these tabular representations we can understand (in the next chapter in more detail about our analysis) that there has been an increase in the number of observations over the period considered for the assessment of the policy effect.

This is therefore a favourable starting point for our analysis because the trend does not prove to be flat and thus reflects a structural change that has taken place over the time in question.

In the next chapter we will also consider other variables of interest for the estimates of the probability that a job contract in the female labour market falls within the caregiving sector.

2.5 Results

The wealth of data makes the MCVL a useful tool in several areas of public health research. On the one hand, it allows the reconstruction of the employment history of each person from their first contract until their retirement, identifying in these persons the start and end date of each contract, together with the type of contract, their wage and contribution base, the economic activity of the company, or the periods in which they receive unemployment benefit (some of these data can be obtained since 1980). The date of the start of a permanent incapacity benefit due to illness or accident, with the degree of incapacity, is also added. In addition, if the contributor or beneficiary included in the MCVL is insured at the time of death, the register also reports the date of death.

The main advantage of the MCVL is that it is based on administrative records, which represents a reduced cost compared to the cost of studies with primary data, especially if they are follow-up studies. Also, compared to self-reported data, MCVL data are reliable for items such as employment status, salary, retirement age or degree of permanent disability. In addition, a third advantage is its large sample size (around one million people) and its representativeness of the reference population, which has been maintained since 2005 (see Table 4), and the 2021 edition is now available but which we chose not to take into account because our aim was to capture the policy effect in an earlier timeframe..

From a public health point of view, the main limitation is that the MCVL hardly includes health data, except for the type of contingency for permanent disability (common or occupational contingency). Nor do deaths have their basic cause. A second limitation is that in the MCVL we only find data on persons covered by the Social Security, and therefore contributors to other welfare systems, such as MUFACE (civil servants), ISFA (military) and MUGEJU (administration of justice) are left out, although these systems are in the process of convergence towards the General Social Security System. There is also no information on people working in the underground economy, and therefore without social security coverage.

2.6 Discussion and Conclusions

The MCVL represents a unique opportunity for the future of public health research in Spain. For example, in the next chapter we will see how I present it in the MCVL if it is used for the assessment of public policy which is the introduction of the Dependency Law and the effect of its population in Spain and in particular its category of informal caregiver.

Some previous experiences have moved in this direction. For this purpose, the data on temporary disability with the medical diagnosis at discharge, and its start and end date, have recently been incorporated into the MCVL of 2009, which make it possible to identify whether these episodes have occurred in the same person. These data are making it easier to analyse the incidence of temporary disability, infrequent in the literature and very useful, since there is the possibility of accurately estimating the times that each person has been at risk of being able to suffer temporary disability, allowing the periods in who is not active in a company and with the regime that covers that contingency. In this way, the incidence of temporary disability can be estimated using a rate, unlike studies that have only been able to use the cumulative incidence. Repeating this connection between the MCVL and the temporary disability data would make it possible to analyse trajectories of temporary disability and their association with permanent disability.

Finally, another potential is to connect the MCVL with information from some health registries, maintaining the protection of the identity of the people who are part of the sample, as is the case now, and after the supervision of the respective ethics committees.

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CHAPTER III

Evaluation of the effects of the *Ley de Dependencia* on the labour market of women engaged in long-term care: a panel study from the *Muestra Continua de Vida Laborales*

Contents.

Abstract

In Spain, responsibility for care of old people and those in situations of dependency is assumed by families, and has an unequal social distribution according to gender and socioeconomic level. This responsibility has negative health effects on the career. In 2007, the Dependency Law recognised the obligation of the State to provide support. This study analyses time trends in health inequalities attributable to caregiving under this new law.

The panel study using datasets between the 2005 to 2016 editions of the Spanish Administrative Working Data "*Muestra Continua de Vida Laborales*". We estimated by means of a Linear Probability Model (LPM) regression the probability that new employment contracts concluded after the introduction of the Dependency Law (1 January 2007) fall within the domestic staff (caregiving) sector.

In a second step, we also performed a logit regression and, unlike the LPM, calculated the marginal effects on each explanatory variable to interpret the results of the coefficients obtained. We observed a slight probability of an increase in new contracts in the caregiving sector in the timeframe studied and observed a strong relationship between education and new contracts. Between 2005 and 2016, trends in gender inequalities attributable to informal care show different trends according to education, nationality, age and Spanish region.

Redesigning and implementing policies that take into account the most impacted groups, such as women who are lone caregivers, is vital to eliminate inequities. Adopting policies that improve the equitable social allocation of care is also necessary.

Keywords: Panel study; Caregiving sector; Dependency Law; Linear Probability Model; Logistic regression.

3.1 Introduction

The number of persons dependent or who require assistance with daily living activities is steadily increasing in Western cultures today (Esparza, 2011).

The older population and higher chronic disease survival rates are to blame for this. As more women have entered the workforce and families' structures, have changed due to changing living arrangements, social and familial developments accompany this situation. The need for care and the availability of unpaid family care work have changed due to all these differences (Bettio et al., 2006).

The Spanish Law for the Promotion of Personal Autonomy and Care for Dependent People (hereinafter, the Dependency Law), regulated in 2006 and entered into force on 1 January 2007, was a great innovation in the family welfare model prevailing in Spain (Martínez-López et al., 2023) since it regulated both social protection for people in need of long-term care (elderly and disabled) and care work, which meant an advance in social policy.

This law is significant due to its universal scope. It creates the first subjective right in social services by recognising informal care in the family setting by establishing direct monetary transfers derived from care. It has thus provided access to many services and benefits funded partially or entirely by the Spanish government for people with dependency.

Our main objective is to analyse the probability of an employment contract inherent to the caregiving sector with women extracted from our Muestra Continua de Vida Laborales dataset.

We observed significant results on our linear regression variables and found important future research needs.

3.2 Informal care

A rising economic literature on informal care acknowledges that informal care is the most common type of long-term care, with far-reaching implications for family negotiations over shared resources, additional health-care costs, and the health of both carers and recipients.

Informal care is commonly defined as unpaid care. Despite the perception that informal care is a non-market product, economists are interested in it since there are often implicit and explicit transfers of time and money across generations. The consequences of informal care extend beyond the parent-child dyad to spouses, caregiver's siblings, and other long-term care providers.

Informal carers are the backbone of the world's long-term care systems. Although definitive dates are often difficult to obtain, more than two-thirds of American elderly living in the community with long-term care needs rely entirely on unpaid, informal care, and more than 90% rely on some informal care (O'Brien, 2005).

Although some contemporary socioeconomic developments work against the supply of informal services (such as the increasing female labor-force involvement and geographic dispersion of families), family members and friends remain the primary suppliers of services.

Even though informal care services are not reflected in national health accounts, never result in a payment from an insurer, do not add to the federal deficit, and are rarely included in any calculation of the overall cost of long-term care, they do represent a genuine opportunity cost burden. Furthermore, if these estimates incorporated the impacts of informal care on carers' health, formal health care costs, and labour market results, the total economic cost of informal caregiving would be substantially higher.

There are three major theoretical streams in the literature on informal care.

The first is concerned with the decision to provide informal care to an aging parent (Heitmueller, 2007; Lilly et al., 2007; Norton, 2000). These concepts are centered on the child-parent relationship. According to traditional labor theory, the supply of informal care is essentially determined by the opportunity cost of time. Those with a high labor market pay are less likely to give informal care, according to (Nocera & Zweifel, 1996). However, the choice may also be influenced by the income impact, the marginal rate of substitution between leisure and caring, and the potential caregiver's efficiency in delivering care. Nocera & Zweifel also include explicit payments from parents to child caregivers, which contradicts the term informal care but is compatible with the literature on informal care and bequests and transfers. (Carmichael & Charles, 1998) argue that there may be two additional effects in addition to the traditional substitution and income effects. A caregiver may appreciate the respite effect (non-monetary rewards) of employment more while giving more care, but her total productivity (and hence income) may fall in the long term.

A second thread focuses on the interaction between various forms of official care and informal care. (Van Houtven & Norton, 2004) suggest that informal care and formal care might be replacements or complements, that the connection would likely vary across various forms of formal care, and that informal care is endogenous to formal care usage using a model of two decision makers (parent and kid). A sufficient criterion for informal care to be a replacement for formal treatment is that the marginal benefit of formal medical care to parent's health in comparison to informal care is negative or zero.

The third thread, and by far the most innovative, is about family negotiation over living arrangements (Byrne et al., 2009; Pezzin et al., 2007).

Many of these contributions use game theory to describe parental and child decisions concerning living arrangements and informal caring. These games are frequently divided into two periods; for example, decisions concerning living arrangements are made in period one, while side payments are made in period two (Pezzin et al., 2007). The rationale for a game-theoretic approach stems from the awareness that preferences for living arrangements may differ across family members, and that the financial and non-financial incentives and costs for providing informal care may be contingent on the actions of other family members.

The game theory models differ in a number of ways. Although the foundational publications concentrated on a single parent-child dyad, more subsequent studies have focused on several children and their relationships (Callegaro & Pasini, 2007). Various assumptions are made regarding side payments, preference similarity, assumptions about the other players' strategies, and the sort of living arrangements (such as, living alone, living with one child, living in a nursing home, sometimes informal care but not co-habitation).

One recurring topic in these contributions is that shared decision making among extended family members results in wasteful decisions (Engers & Stern, 2002; Hiedemann & Stern, 1999; Pezzin et al., 2007). Another point of contention is the continuous dispute between structural and non-structural approaches.

According to (Hiedemann & Stern, 1999), a structural approach is preferable since it is based on explicit economic theory and can be used to assess the effects of specific policies on individual family members. They recognize, however, that structural models impose assumptions that may influence the outcomes, and that rigorous model robustness tests are expensive. However according to (Fontaine et al., 2009), structural models that assume just one caregiver omit a crucial characteristic of the real world, which is that there are frequently several carers. Multiple caregivers are possible with their "semi-structural" approach.

Several articles have lately advocated for the estimation of dynamic models (Dostie & Léger, 2005; Mentzakis et al., 2009; Michaud et al., 2010). These articles contend that current game-theoretic models are intrinsically dynamic, despite the fact that other models are typically presented as two-period models. These publications provide no additional theory and instead concentrate on the estimate of dynamic models using panel data.

3.3 Effect of informal care on workers and the long-term care system in Spain: the *Ley de Dependencia*

Informal care may save money on health care for the care receiver, and more lavish expenditure on formal long-term care may do nothing to limit the supply of informal care, but informal care may come at a cost by lowering time spent working and raising one's risk of poor health outcomes.

Caregiving may have an impact on work behavior on the extensive, intense, or both margins (Crespo & Mira, 2014; Heitmueller, 2007; Moscarola, 2010). Because adult children with limited labor market prospects and a looser labor force attachment are more likely to become caretakers, numerous economic research have taken care to account for the endogeneity of caring in relation to labor supply in empirical modeling. We highlight research that addressed endogeneity using instrumental variables or simultaneous equations estimates, or that employed longitudinal approaches to account for unobserved variability (Van Houtven et al., 2013).

When informal care is considered exogenously, most studies indicate that it decreases the chance of working, with informal carers having a 4 to 6% greater risk of not working compared to non-caregivers (Crespo & Mira, 2014; Heitmueller, 2007). When informal care is instrumented, the effect is substantially larger, reaching over 30% across Europe (Crespo & Mira, 2014). Aside from (Crespo & Mira, 2014), most studies are either unable to reject exogeneity of informal care in relation to work (either using strong instruments (Casado-Marín et al., 2011; Van Houtven et al., 2013) or weak instruments (Bolin et al., 2008; Heitmueller, 2007) or can reject exogeneity only at border (Johnson & Lo Sasso, 2006).

The linkage between informal care and work appears to vary depending on co-residence, caregiver intensity, gender, and marital status. However, there are inconsistent results about the influence of these domains on caregiver work, echoing the literature's mixed results.

A second set of studies from Europe use longitudinal methods, such as random or fixed effects - (Casado-Marín et al., 2011) are the exception by using both - to account for unobserved heterogeneity, and most also consider state dependence in the empirical models - e.g., past work and caregiving behaviour - (Casado-Marín et al., 2011; Michaud et al., 2010; Viitanen, 2010) and cross-state dependence (Moscarola, 2010). In general, these research discover that previous caring decreases present work (Michaud et al., 2010; Viitanen, 2010).

When looking at caring and work in the United States through time, (McGarry, 2006) discovers minimal link between labor market ties and later-life caregiving. Having a care-needy parent has little effect on work behavior, and delayed labor-force involvement has no effect on present caring. Because it relies on a preset endogenous variable to account for selection, the use of past work may not be a sufficient way of resolving the endogeneity of informal care and employment.

Endogeneity bias, on the other hand, may not be a required issue in this type of research. (Van Houtven et al., 2013) were unable to eliminate exogeneity between informal care and labor after correcting for repeated observations across persons over time with fixed effects and empirically robust instruments. They explore that providing personal care (Activities of Daily Living – ADLs - assistance) has the greatest negative work effects among women, with around a 2 percentage point reduction in the likelihood of any work for both men and women, whereas providing chore assistance increases the risk of retirement (1.5 percentage points) for both men and women.

Finally, carers may face salary penalties or be forced to retire prematurely. (Carmichael & Charles, 2003; Heitmueller & Inglis, 2007) find a pay penalty for both male and female carers in the United Kingdom, assuming caring is exogenous. Furthermore, there is evidence of lost wages from caring among those who stay in the labor force (Carmichael & Charles, 2003), missed promotions, and reduced pension benefits (Parker, 1990).

In December 2006, the Spanish government passed the Act on the Promotion of Personal Autonomy and Care of Dependent People (Spanish Government, 2006), henceforth termed the LTC Act or "Ley de Dependencia". This Act enabled the establishment of a universal LTC system, as it covers all losses of autonomy regardless of the cause (age, illness, or disability). Before this Act, public provision to meet LTC needs was restricted to poor people without family support who depended on municipal resources. Thus, meeting LTC needs remained the responsibility of the family (i.e. informal caregiving).

Informal care is the care provided without any form of economic retribution usually by family, friends or neighbours (IMSERSO, 2005). In society, caregiving is not distributed fairly; rather, it is delegated in accordance with a hierarchy based on financial status and gender.

In terms of quality of life, informal caregivers pay a hefty price for their duty as caretakers. Physical, emotional, relational, parental, and personal development components all play a part in the quality of life of caregivers. It is well known that providing care has a negative impact on one's health and other aspects of one's quality of life (Legg et al., 2013; Pinquart & Sörensen, 2003; Schulz & Sherwood, 2008).

Our study expands this literature in several dimensions and provides important contributions. First, as compared to previous evidence in Spain (Costa-Font et al., 2018) we use administrative data, instead of survey data, which allows us to examine the effect of policy about caregiving. Second, as compared to the international literature, we are the first one to take into account administrative data representative of 4% of the Spanish population. By doing so, we are able to get a range of information (including fiscal information) that would be difficult to capture through surveys, so these are issues that have remained unexplored in the previous literature. This may help policymakers to design more efficient integrated health and social care systems by identifying in detail the interdependencies between the two systems. Lastly, we estimate the policy intervention by two different regressions in order to capture the matching probability described before.

3.4 Data and Methods

As described in the previous chapter of this thesis, we used administrative data from the Muestra Continua de Vida Laborales .

We used administrative data from the Muestra Continua de Vida Laborales provided by the Spanish government's Seguridad Sociales. The data provided by the administration are divided into several datasets, each of them representing anonymous information representative of 4% of the Spanish working population (Arranz et al., 2013). Table 3 of the thesis shows the various datasets, which are subdivided into Personal Data (*Personas*), in which we find anagraphical information on the individual observed: date of birth, sex, province of birth, nationality, etc. Affiliation (*Afiliacion*), in which we find information on the employment history of the individual: contribution regime, contribution group, type of contract, start and end date of the contract, the activity code of the contract, information on the employer, etc.; and Social Security data (*Cotizacion*), in which we find statistical information on social security contributions, divided by month and year.

We worked with a panel of data with a timeframe from 2005 to 2016 and before conducting our estimations we performed a series of data cleaning, data coding and cross merging between datasets in order to obtain one large dataset containing all our variables of interest and keepped information. Actually, we selected all the information on women and economic activities of interest to us.

We then took into account the activity codes:

- Health activities
- Social services activities
- Other personal services activities
- Domestic staff activities

We obtained a panel of about 4 million observations as already described in chapter 2 above.

Our independent variables therefore concern the nationality, province of birth, level of education and age of the women extracted from our main datasets.

In order to conduct our regression analyses of the model specified later in the section, the corresponding categorical variables were generated in parallel with the main variables.

The study was conducted applying a mixed methodology, a Linear Probability Model as the first step regression and a Logit as the second step regression.

We modelled the probability of new contracts falling under the economic activity of domestic staff as follows:

$$Y_{it} = \beta_0 + \beta_1 P + \beta_2 T + \beta_3 X + \mu_{it}$$

Where Y is a dummy variable equal to 1 if the new individual working contract has as activity code the one for domestic staff and equal to 0 if none.

We estimated this model within different explanatory variables. All the individuals studied are women, so we have in our model all independent variables within the X variable, which includes N (Nationality) = 1 if Spanish and equal to 0 if not Spanish; BF (Before/After intervention), a dummy variable corresponding to Before or After the introduction of Dependency law where equals 1 is After; P (Province of Birth), where we studied how each Spanish province influenced the probability of domestic staff activity contract; E (Educational level) is the categorical variable which we divided all educational level in 4 groups [0= no studies, 1 =primary and middle school, 2 = secondary school and professional studies, 3 = academic studies and professional qualifications], and A (Age) is another categorical variable in which we divided individuals into 6 age groups. Also, T represents the variable “year” which is time fixed effect.

We modelled the probability of a non-native Spanish woman receiving a job contract in the caregiving sector (domestic staff) as follows:

$$L_{it} = \beta_0 + \beta_1 C + \beta_2 BF + \beta_3 E + \beta_4 T + \mu_{it}$$

Where Y is a dummy variable equal to 1 if the new individual working contract has as activity code (CNAE 1993) the one for domestic staff and equal to 0 if none.

Our logit equation is a traditional logistic linear function of the X-variables. We estimated this model within different explanatory variables from our dataset. All the individuals studied are women, so our model includes independent variables like C (Country of birth) = 1 if Spanish-native and equal to 0 if none; BF (Before/After intervention), a dummy variable corresponding to Before or After the introduction of Dependency law where equals 1 is After intervention; E (Educational level) is the categorical variable which we divided all educational level into 4 groups [0= no studies, 1 =primary and middle school, 2 = secondary school and professional studies, 3 = academic studies and professional qualifications], and A (Age) is another categorical variable in which we divided individuals into 6 age groups. Also, T represents the variable "year" which is time fixed effect.

We then analysed the marginal effects of the coefficients obtained from the regression using the following formula:

$$\varphi(Y = 1) = e^{L} = e^{\beta_0 + \beta_1 C + \beta_2 BF + \beta_3 E + \beta_4 T + \mu_{it}}$$

Then we transformed the odds to probability (p) and calculate directly from logit to probability:

$$p = \frac{\varphi}{1 + \varphi} = \frac{1}{1 + e^{-L}}$$

Having specified the model and the variables taken into account for our analysis, it is useful to recall the assumptions of the logistic regression before moving on to the analysis in the following section.

In logistic regression, four assumptions have to be met. If they are, the maximum likelihood estimates of logit parameters should be unbiased and sufficient. The assumptions are as follows:

- The model must be correctly specified; that is, the logit of Y is a linear function of the X-variables.
- No important variables must be left out of the model, and no unnecessary variables should be included.
- Each observation needs to be independent of the other observations.
- None of the explanatory variables must be linear functions of the other X-variables, as this will result in multicollinearity.

This latter point is not properly a model assumption, but it is an important estimability requirement. To test this, we can obtain the tolerance value of each X-variable.

Thus, having described this and having introduced our starting models, in the next section containing the results, we will then move on to the analysis of our data to understand the probability of women obtaining a contract in the caregiving sector considering the effect of the Spanish Dependency Law.

3.5 Results

The following Table shows the results of the first step of regressions using the Linear Probability Model (LPM). In order to validate our LPM results accurately, we also performed a second regression step using the Logistic model. Thus, the following table shows the results of the first and second step regressions using the Linear Probability Model.

Table 7 – Regression results: (1) first stage LPM; (2) second stage LPM

VARIABLE	*(1)*	*(2)*
Nationality		
Spanish	-.0059***	-.0061***
	(.0002037)	(.0002035)
Before/After Law dummy		
After Law	-.0015***	-.0021***
	(.0000513)	(.0000556)
Province of birth		
Araba	-.0051***	-
	(.0004004)	
Albacete	-.0043***	-
	(.0004128)	
Alicante	-.0039***	-
	(.0003758)	
Almeria	-.0043***	-
	(.0003847)	
Avila	-.0034***	-
	(.0005809)	
Badajoz	-.0018***	-
	(.0004107)	
Illes Balears	-.0048***	-
	(.0004019)	
Barcelona	-.0052***	-
	(.0003363)	
Burgos	.0016***	-
	(.0004256)	
Caceres	-.0010**	-
	(.0004324)	
Cadiz	-.0029***	-
	(.0003571)	
Castellon	-.0048***	-
	(.0004407)	
Ciudad Real	.0017***	-
	(.0004103)	
Cordoba	-.0049***	-
	(.0003671)	
Coruna	-.0055***	-
	(.0003624)	
Cuenca	.0009**	-
	(.0004589)	
Girona	-.0050***	-
	(.0004105)	
Girona	-.00068*	-
	(.0003737)	
Guadalajara	-.00034	-

	(.0006133)	
Gipuzkoa	-.0056***	-
	(.0003519)	
Huelva	-.0055***	-
	(.0004255)	
Huesca	-.0049***	-
	(.0004623)	
Jaen	-.0009***	-
	(.0003824)	
Leon	-.0015***	-
	(.0004013)	
Lleida	-.0052***	-
	(.0004175)	
La Rioja	-.0044***	-
	(.0004631)	
Lugo	-.0051***	-
	(.0003863)	
Madrid	-.0022***	-
	(.0003451)	
Malaga	-.00037	-
	(.0003649)	
Murcia	-.0029***	-
	(.0003856)	
Navarra	-.0050***	-
	(.0003689)	
Ourense	-.0058***	-
	(.0004176)	
Asturias	-.0036***	-
	(.000362)	
Palencia	-.0039***	-
	(.000534)	
Las Palmas	-.0026***	-
	(.0003851)	
Pontevedra	-.0050***	-
	(.0003599)	
Salamanca	.0027***	-
	(.0004217)	
Santa Cruz de Tenerife	-.0028***	-
	(.0003741)	
Cantabria	.0017***	-
	(.0004296)	
Segovia	-.0026***	-
	(.0004835)	
Sevilla	-.0031***	-
	(.0003587)	
Soria	-.0033***	-
	(.0005958)	
Tarragona	-.0059***	-
	(.0004022)	
Teruel	-.0021***	-
	(.0005469)	
Toledo	-.0018***	-
	(.0004096)	
Valencia	-.0025***	-
	(.0003459)	
Valladolid	-.0040***	-
	(.0004176)	
Bizkaia	-.0046***	-
	(.0003478)	
Zamora	-.0041***	-
	(.0005174)	
Zaragoza	-.0018***	-
	(.0003639)	
Ceuta	.0014***	-

	(.0006929)	
Melilla	-.0021***	-
	(.0006782)	
Servicios Centrales	.0004	-
	(.0003452)	
No education	.0115***	.0111***
	(.0002665)	(.0002663)
Low education	.0015***	.0010***
	(.000254)	(.0002543)
Medium education	-.0016***	-.0020***
	(.0002527)	(.0002528)
High education	-.0028***	-.0020***
	(.0002529)	(.0002528)
Age	-	0.0002***
β	.0130***	.0019***
	(.0002743)	(.0004813)

****, ** and * refer to signicance level at 1%, 5% and 10%, respectively. Standard error in brackets.*

From the results in the table 7, it can be seen that most of the regression results are significant at 1% and 5%.

The results of the dummy variable Before/After law allow us to draw important insights for future research. In fact, the probability of a woman falling into the careviging sector is slightly negative (-0.15%) after the law came into force and this can confirm that although the policy effect is not strong, it does confirm the presence of a relevant structural break in the economy of the Spanish country due to the financial crisis of 2007-2008.

Another important aspect concerns the issue of inequality of nationality of individuals, because the probability of a Spanish woman falling into the caregiving sector is also negative (-0.59%), thus favouring the regularisation of illegal immigrant labour. The phenomenon of inequality can often also result from migration. Those who migrate may face unequal access to rights and social resources.

A fundamental aspect inherent to the likelihood of employment in the dependent care sector concerns the individual's education. From the regression it can be observed that women with no or low education are much more likely to fall into the economic sector under study and that a decrease in the probability can be observed as the woman's level of education increases. So much so that for women with a medium to high level of education, the probability trend is even negative.

Finally, from an analysis of the provinces of birth, a negative probabilistic trend can be observed for almost all Spanish provinces, in favour of some provinces located in peripheral and rural areas of the Spanish territory. This leads one to reflect on another phenomenon related to regional socio-economic disparities.

In order to also observe the probability of Spanish immigrant women receiving a work contract in the caregiving sector and thus in order to also capture a migration effect on Spanish women, a third step of analysis was conducted by means of a logistic regression.

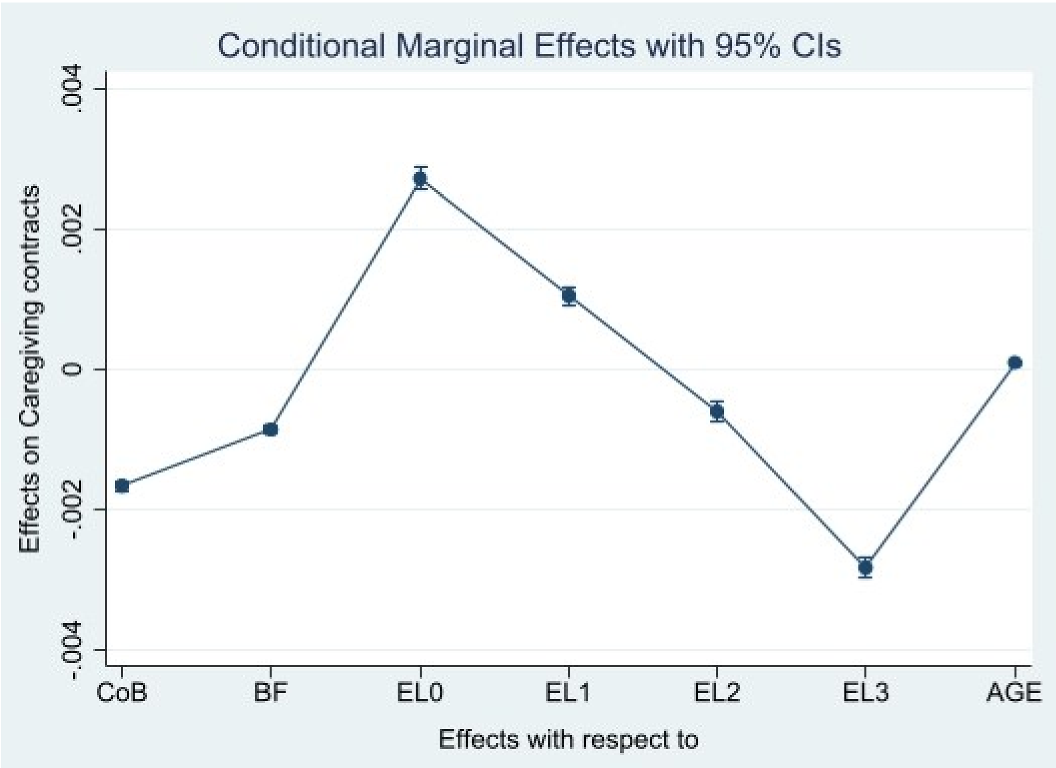
Table 8 – Regression results: (3) Logistic regression; (4) Logistic regression using margins

VARIABLE	*(3)*	*(4)*
Country of Birth		
Spanish	-1.1821*** (.0230937)	-.0017*** (.0000391)
Before/After Law dummy		
After Law	-.6108*** (.0182015)	-.0009*** (.0000275)
Educational level		
No education	1.9263*** (.0456967)	.0027*** (.0000748)
Low education	.7407*** (.0475849)	.0010*** (.0000661)
Medium education	-.4277*** (.0475849)	-.0006*** (.0000672)
High education	-2.0070*** (.0640855)	-.0028*** (.0000759)
Age	.0684*** (.0026593)	.0001*** (3.93e-06)
β	-8.2389*** (.1333418)	-

****, ** and * refer to signicance level at 1%, 5% and 10%, respectively. Standard error in brackets.*

The table 8 then shows the results of the logistic regression and, more importantly, the changes in probability for each individual explanatory variable taken into account in our model. In column (4) we got the change in probability for each one-step change in X for all variables in our model, with the other set at their mean. This can also be illustrated graphically with the following graph.

Graph 1 – Change in probability for a one-step change in X



Source: Our elaboration from conditional marginal effects results

This graph shows the cause-effect of each variable in our model on the probability of Spanish women receiving a contract in the caregiving sector.

We can observe that the Spanish law had no significant positive effect on any reversal in the female (caregiving) labour market. At the same time, it had no positive impact on high-skill women with a medium-high level of education. The only social aspects that had a positive effect concerned the country of birth, i.e. immigrant women were more likely than Spanish-born women to receive caregiving contracts and women with no or minimal education.

From these first results, which will be subject to new future research steps, we can understand that the Dependency Law did not succeed in obtaining significant positive effects on the structure of the caregiving labour market. It would be helpful to analyse further aspects, such as tax, social security and income, to understand the presence of socio-economic inequalities within the Spanish territory and to provide policymakers with hints for improvement on future policies.

3.6 Discussion and Conclusions

Studying informal caregiving is interesting for economists because of its prevalence as a source of long-term care across the developed and developing world. In making long-term care decisions about a parent, adult children engage in an intra-household optimization problem that may include negotiations between siblings or transfers of time or money across generations. Informal care also has implications for long-term care and health care markets, which are of great policy interest in an era of increasing concern over public financing of long-term care for ageing societies. In this chapter we summarize and review the recent economic literature on informal care. Ranging from efforts to understand how the generosity of public long-term programmes affect informal care supply to efforts to understand the effect of informal care on an adult child's own labour market productivity, economists have illustrated that the economic implications of informal care reach caregivers, care recipients and the public purse.

Most existing economic analysis of informal care focuses on adult children caring for elderly parents who have experienced a loss of independence. Emerging work will surely be extended to consider the economic effects of non-traditional informal care arrangements - care of disabled children; the mentally ill non-elderly; or newly injured veterans of war. By continuing to evaluate existing and emerging policies that influence informal care supply and demand, economists can help us understand more fully the net benefits to society of the informal care market.

Our descriptive results show that the effect of the Ley de Dependencia (Dependency Law) is positive after the second year of implementation by the Spanish government.

Our regressions, on the other hand, show us in detail some important socio-economic aspects of our panel of individuals extracted from the MCVL dataset and above all provide important insights for future research.

The main idea underlying the research work is that public policies are not neutral but explicitly or implicitly play a decisive role in the transmission of inequality between women and men. In this sense, economic policies aimed at individuals are currently inspired by the patriarchal model of society. Of course, in this system, women receive benefits, but these are generally for their role as carers, as care management is considered "theirs". Therefore, the fundamental problem we face is that so-called "equality policies" have not been aimed at eliminating the sexual division of labour but rather at applying minor corrections that make inequality more bearable.

The Dependency Law has emerged in the context of increasing demands for care and parallel to the proliferation of equality policies. Like the rest of public policies, under the guise of equality, they have entrenched the patriarchal model in crisis, especially concerning the economic benefit of care in the family environment. The strategy of compensation for care, through measures aimed at counteracting the lack of income and social rights caused by women's withdrawal from the labour market due to their dedication to caring during certain periods of their lives, is laudable. Still, experience shows that it is impossible to compensate for the inequality produced, in terms of economic and social rights, due to the unequal assumption of care.

It should be noted that care work represents a key and indispensable activity in the functioning and development of any society, as it involves maintaining the physical and emotional well-being of both dependent and healthy adults (sons, daughters or spouses).

In conclusion, the Dependency Law presented as the fourth pillar of the welfare state has failed to meet the expectations generated since the measures it provides for care do not guarantee the right of all people to receive the care they need in dignified conditions. The recognition of the care work that women carry out has a significant symbolic value. It reinforces the continuity of care management for women. Still, if this recognition is not accompanied by concrete measures to end existing gender inequalities, it will not have any transformative capacity.

There is an unquestionable need to regulate and tackle the management of care, but this must be done based on the co-responsibility of all people, with the consequent involvement of public administrations. We cannot ignore that caring for dependent persons is a priority social responsibility that must be assumed fairly, equitably and non-discriminatory manner.

3.7 References

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