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MASTER´S FINAL WORK

DISSERTATION

PENSION EXPENDITURE, POVERTY AND ECONOMIC GROWTH: THE EU CASE

ADRIANA MARIA FERNANDES FERREIRA

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GDP – Gross Domestic Product.

GCF – Gross Capital Formation.

EU – European Union.

2SLS – Two Stage Least Squares.

OLS – Ordinary Least Squares.

ABSTRACT, KEYWORDS AND JEL CODES

In this dissertation we study the impact that pension expenditure has on both poverty and economic growth, using annual panel data from 24 European Union Member States, for years between 2007 and 2018. We do so through Pooled OLS and Fixed Effects econometric estimations. In addition, the 2SLS method is also considered to address a possible endogeneity problem. Our results show that pension expenditure seems not relevant to diminish poverty and suggest that it has no impact on GDP growth.

KEYWORDS: Pension expenditure, public pensions, poverty, economic growth, European Union.

JEL CODES: H55; I32.

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PENSION EXPENDITURE, POVERTY AND ECONOMIC GROWTH: THE EU CASE

By Adriana M. Fernandes Ferreira

In this dissertation we study the impact that pension expenditure has on both poverty and economic growth, using annual panel data from 24 European Union Member States, for years between 2007 and 2018. We do so through Pooled OLS and Fixed Effects econometric estimations. In addition, the 2SLS method is also considered to address a possible endogeneity problem. Our results show that pension expenditure seems not relevant to diminish poverty and suggest that it has no impact on GDP growth.

1. INTRODUCTION

The debate on whether public pension systems are able or not to provide the retired people with an adequate income, as a way of assuring living standards, and to prevent poverty, especially among the elderly, continues in the 21st century.

In the European Union, the demographic tendencies – the ageing population inevitably leading to an increasing number of beneficiaries – will naturally cause an impact in the future of those public schemes (EU statistics, 2020), but surely that public pension systems succeeded to address the social risks of European economies during the 1950s and 1960,s of the 20th century, being considered a major pillar of the European socio-economic identity (Bova and Stetter, 2018). Nowadays, and according to the European Commission (2020), pensions represent "the main source of income for about a quarter of the population" thus, naturally, one cannot completely discredit their role on redistributing income and assuring those who do not work that they have a means of living and surviving.

There has been, however, a period when public pension systems seem to have been overshadowed and under attack, starting with the Thatcher-Reagan era in the 1980s. In order for private systems to shine and profit, even if they do not guarantee no risks, several reforms have been implemented, including the introduction of individual accounts and pension privatisation (Ortiz, 2018). Despite all the controversy that arose, with promises of a better economic and social performance, in the early 1980's, thirty countries from all around the world went through the process of pension privatisation, either fully or partially. Though, the consequences of shortening the government's costs did not turn out to be as expected. Not only did the promises of economic prosperity fail to be concretized but the social side was jeopardized as the coverage rates either stagnated or dropped and

gender inequality rose. More than a half of these countries, though, have since taken a step back and opted for public systems instead (Ortiz *et al*., 2018).

Public pension systems are not consensual either and must address the criticism of those who claim that they reduce incentives, stimulate a dependency mentality, and is not financially sustainable. Although a negative relationship between pensions and poverty is usually found (Cammeraat, 2020), and reducing poverty is one of pensions' goals, the at-risk-of-poverty rate among the retired is 14.2%, despite the percentage of GDP that goes towards these social systems (EU Statistics, 2019). Caminada and Goudswaard (2009) argue that the EU's plans for the reduction of poverty have possibly not shown their true effects yet, as well as the fact that the government's support and dedication play an important role in the outcome of this spending.

Additionally, public pensions tend to cause disagreement particularly because of the potential negative effects on the economy. According to the literature, it should be expected that the more the government is present in the economy, the less economic performance benefits from it (Scully, 1989). Although some studies obtain these same results, others simply reach the conclusion that public social expenditure only affects the economic performance when different types of social expenditure are considered (Cammeraat, 2020) and some argue that social security expenditure may lead to growth through an increase in investment in human capital (Belletini and Ceroni, 2000). More recently, Stiglitz (2018) considers that arguments against the welfare state are erroneous, and the importance of the system has increased with the successive changes in the world, contributing to increasing economic performance. He emphasises that pervasive market failures show that markets are frequently inefficient and that consequently governments are required to carry out a more active role, guaranteeing a strong competition, ensuring that firms do not exploit workers, and providing an insurance against important risks, such as unemployment, disability, and insufficient retirement income.

Because of how complex these relationships show to be, the aim of this thesis is to review and study the effect that social expenditure has on both social and economic variables. With this study we supply additional evidence regarding poverty and Gross Domestic Product's relationship with public pension expenditure. We start by reviewing existing literature that helps understand what has already been done in the matter and we

then move on to our own estimations – we start with Pooled OLS and Fixed Effects regressions with robust standard errors, but later on we consider regressions using the 2SLS method to correct for a possible problem of endogeneity which is followed by a repeat of the first estimations but where we consider a different poverty line, in order to compare results on different depths of poverty. The independent variable is always used lagged one period because of the simultaneity situation. To do this, we use a panel data set from the European Union Member States for the period between 1990 to 2018. The sources of the data are Eurostat, AMECO, World Bank and OECD databases.

With this objective in mind, in the following sections these relationships will be discussed starting next chapter with literature review, where some previous works on this matter are presented and considered, which is followed by data and methodology description. Afterwards the results are presented and discussed for the Pooled OLS and Fixed Effects regressions as well as for the 2SLS estimations. We then analyse the outcomes on poverty when we change the poverty line and conclude.

2. LITERATURE REVIEW

2.1 Poverty and Pension Expenditure

The Welfare State is often depreciated although it has already proved its worth (ILO, 2011). For social schemes that have the reduction of poverty as an objective, it is sometimes argued that, because of economic growth, poverty eventually diminishes and so they should not be the first priority in developing countries. Poverty, though, is highly triggered by the inequality patterns in income distribution and so economic growth seems not to be enough to diminish poverty (Ortiz, 2007). Given this, it is important to take income inequality into account when studying poverty (ISSA, 2016).

According to the EU statistics, unemployed people are the ones more at risk of poverty and so unemployment indicators are also relevant in this analysis. Cammeraat, (2020) also finds that spending directed at those who are unemployed is one of the measures most successful in reducing poverty, right after expenditure in housing.

Regarding pensions distribution, the majority (over 85%) of the pensions goes to old-age-pension beneficiaries, according to EU statistics, but it has also been found that these pensions are not statistically relevant in determining poverty (Cammeraat, 2020).

On their work on the effect pension expenditure has on poverty, Cammeraat, (2020) and Caminada and Goudswaard (2009) found, as expected, that an increase in total public pension expenditure results in a decrease in poverty. Their work is more complex because it considers, apart from the total expenditure, the spending of different programmes that are a part of the pension schemes which also results in different effects on poverty – our works differ on that aspect.

The analysis, though, is done in a similar way to Cammeraat (2020) and so, still in line with that work, the intention with this work is to regress the effect the total pension expenditure in relation to GDP has on the poverty rate using, apart from those variables, demographic and economic controls. The expected results are that an increase in total pension expenditure demonstrates significance in determining a reduction in poverty but the delicate time period we study for could be responsible for different results.

2.2 Economic Growth and Pension Expenditure

Taking a closer look at history, one can find that some catastrophic events were followed by periods of prosperity. Clear examples of so are Roosevelt's Administration's post-Great Depression New Deal, full of social measures, and the post-WWII Welfare State, which included social assistance to work (Ortiz, 2007). Even so, strong political commitment and excellence in administration has been devoted to strength social security systems in the world, contributing to transforming lives and shaping societies (ISSA, 2016). The debate about the objectives and challenges of social security has frequently included the impact of pension expenditure on economic growth.

If for poverty the expected results are somewhat intuitive, for economic growth the literature and previous works do not all show a general agreement on the effect of pension expenditure on economic growth. A part of the literature, as is the example of Barro (1996), as cited in Cammeraat (2020), insist that an increase in public expenditure will push economic growth down.

This, however, does not exactly coincide with the results obtained by Bellettini and Ceroni (2000), who found, through an empirical analysis, that social security and economic growth are indeed positively related – social security spending generates growth through the incentive of investment in human capital, and not of physical capital investment, and through the increase in inclusion and in political stability. Additionally, an increase in savings could be expected, as is argued by Bellettini and Ceroni, (2000) and Garcia *et al.* (2019). Cammeraat (2020), whose work we followed closely, found that the relationship between total public social expenditure and growth is non-existent, but for some specific types of pensions the results were positive – a greater social expenditure on housing has a positive effect on growth which is an important result since this type of expenditure is the most successful in overcome poverty.

In terms of productivity, it is positively affected by pension expenditure since an increased income induces investment and assures the pensioners have overall better living conditions than before and consequently more productive (Cammeraat, 2020). It is also argued by Sala-i-Martin (1992) that pensions could lead to greater growth since they work as a way of taking those that are not as productive out of the work force. Some worries about a fall in labour supply may persist because pension schemes may work as a disincentive to work on groups that would be eligible to have a job (Cammeraat, 2020).

Therefore, the expectations for our results are that of a positive influence of pension expenditure on economic growth although the relationship may not be statistically significant.

3. DATA & METHODOLOGY

In order to further study pension expenditure's relationship with poverty and economic growth we use a panel dataset that covers the time period from 1990 to 2018. Due to data limitations from European Union Member States, only 24 countries are considered – Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Our indicator for economic growth is Gross Domestic Product growth (annual growth per head, constant prices, in percentage)[1]. Concerning poverty, we consider poverty rate after taxes and transfers (poverty line 50%)[2]. Finally, the explanatory variable is the total pension expenditure in percentage of GDP[3]. The control variables used for poverty are the unemployment rate in percentage of active population[4], GDP per head (constant prices, constant PPPS[5], OECD base year (2015), measured in US Dollars)[6], population with ages between 15 and 64 in percentage of total population[7], population with more than 65 years in percentage of total population[8] and the Gini coefficient (disposable income, post taxes and transfers)[9] to measure inequality. As for GDP growth, the control variables considered are the following: population with ages between 15 and 64 in percentage of total population, population with more than 65 years in percentage of total population, percentage of population withupper secondary, post-secondary non-tertiary and tertiary education[10], Gross Capital Formation (annual growth in percentage)[11], exports of goods and services in percentage of GDP[12] and the inflation rate (consumer prices, annual percentage)[13]. In the table that follows, descriptive statistics of the dependent and independent variables are displayed.

TABLE I

DESCRIPTIVE STATISTICS FOR POVERTY RATIO, GDP GROWTH AND PENSION EXPENDITURE, YEARS BETWEEN 1990 AND 2018 FOR EU MEMBER STATES

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Poverty Rate	392	10.2	4.4	3.2	36.8
GDP growth	660	2.4	3.6	-14.3	24

[1] Data source: OECD Productivity Database.
[2] Data source: OECD Income Distribution Database (IDD).
[3] Data source: Eurostat.
[4] Data source: AMECO.
[5] Purchasing Power Parities.
[6] Data source: OECD.
[7] Own calculations using data from AMECO.
[8] Own calculations using data from AMECO.
[9] Data source: OECD Income Distribution Database (IDD).
[10] Data source: Eurostat.
[11] Data source: World Bank.
[12] Data source: World Bank.
[13] Data source: World Bank.

Pension Expenditure	565	10.6	2.7	3.7	17.9

Source: Own calculations.

Between 1990 and 2018, on average, in the EU Member States we are considering, 10.2% of the population's disposable income was less than 50% of the median income but there was a period in which that percentage reached 36.8%. The average for GDP growth is 2.4%, and for pension expenditure relative to GDP 10.6%.

Naturally, some problems are bound to come up with our analysis and even before we start any estimation, the unavailability of data must be addressed. The dataset for the period we initially wanted to study is highly unbalanced – there are years for which there is no available information – so, to prevent bias in our results because of this, we found it necessary to select a sample given the assumption that the reason for the lack of some data is exogenous and consequently our decision has no negative outcomes (Wooldridge, 2001). Thus, the period covered in this analysis is from 2007 to 2018, covering the period during and after the 2008 Crisis (FCIC, 2011), which recommends some caution in the results analysis. The descriptive statistics for the variables Poverty Rate, GDP growth and Pension Expenditure for that period are in the following table.

TABLE II

DESCRIPTIVE STATISTICS FOR POVERTY RATIO, GDP GROWTH AND PENSION
EXPENDITURE, YEARS BETWEEN 2007 AND 2018 FOR EU MEMBER STATES

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Poverty Rate	266	11.2	4.5	5.2	36.8
GDP growth	288	1.5	3.9	-14.3	24
Pension Expenditure	288	10.9	2.9	4.9	17.9

Source: Own calculations.

Between 2007 and 2018, in the EU Member States subject to our study, on average, the poverty rate for a poverty line of 50% is 11.2% and the annual GDP growth is 1.5%. Almost 11% of total GDP was spent on pensions, on average, also in this period.[14]

A problem we also needed to deal with is the heterogeneity among countries. Although all countries used in this analysis are EU Member States, there are differences among them – economic and demographic – that lead to singular methods in handling pension expenditure. Greece, for instance, has the maximum pension expenditure in percentage of GDP value, 17.9%, while for Ireland, Czech Republic, Slovakia, Lithuania, Estonia and Malta it has not surpassed 10% between 2007 and 2018. In Ireland's case, it's maximum pension expenditure in percentage of GDP is of 8.1% which is surpassed by most countries' minimum values – 13.9% of GDP spent in pensions is Italy's lowest value, for example.[15] We address these differences through the addition of control variables that were chosen based on past works[16], year dummy variables and Fixed Effects regressions.

The presence of endogeneity is also something to be aware of as the relationship between poverty, GDP growth and pension expenditure is believed to be simultaneous. Apart from resorting to the usual approach of the instrumental variables to address this problem, and in line with Cammeraat (2020), the independent variable we use is lagged one period so that it is assured that the dependent variables for poverty and economic growth are not affecting pension expenditure of that same period.

Regarding robustness, we always regress with robust standard errors in all regressions.

Throughout this analysis, we performed various regressions, discussing, and comparing their results. Our first specification consists in the Pooled OLS regression to model pension expenditure's effect on poverty and economic growth which assumes that parameters α and β are the same for all individuals and it goes as follows:

$$(1) \ Y_{it} = \alpha + \beta X_{it\text{-}1} + \cdots + u_{it}, (i = 1, 2, \ldots, 24; t = 1, 2, \ldots, 12)$$

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[14] Descriptive Statistics for the control variables available in the appendix (Table A.I).
[15] Pension expenditure by country available in the appendix (Table A.II).
[16] Cammeraat (2020) and Leroux *et al.* (2020).

First, we regress the regression equation (1) using only the independent variable lagged one period to which we then add control variables for the second specification. Still regressing in Pooled OLS, the third specification includes year dummies.

We then move to a Fixed Effects estimation in which the heterogeneity among individuals is captured by the constant that differs between individuals and that accounts for our fourth specification. We do so through the regression of the following equation:

$$(2) \; Y_{it} = \alpha_i + \beta_1 X_{1,it\text{-}1} + \cdots + u_{it} \, , (i = 1, 2, \dots, 24; t = 1, 2, \dots, 12)$$

4. RESULTS

We start by presenting and discussing the results for poverty which are available in the following table.

TABLE III

RESULTS OF THE ESTIMATION FOR POVERTY

	(1)	(2)	(3)	(4)
Pension Expenditure (t-1)	-0.311 (0.093)***	-0.245 (0.079)**	-0.168 (0.074)**	-0.012 (0.148)
Unemployment Rate (t-1)	-	0.07 (0.036)*	0.045 (0.038)	-0.059 (0.047)
Pop. 15-64 (t-1)	-	1.109 (0.253)***	1.202 (0.257)***	-0.081 (0.198)
Pop.65+ (t-1)	-	0.749 (0.177)***	0.641 (0.163)***	-0.778 (0.209)***
Income Inequality (t-1)	-	95.465 (6.857)***	98.928 (7.382)***	22.625 (7.556)***

GDP per head (t-1)	-	0.0002 (0.0001)**	0.0001 (0.00005) ***	-0.00004 (0.00005)
Control Variables	-	X	X	X
Year Dummies	-	-	X	X
Standard Errors	Robust	Robust	Robust	Robust
R²	0.04	0.71	0.72	0.28
Estimation Method	Pooled OLS	Pooled OLS	Pooled OLS	Fixed Effects
Observations	245	210	210	210

Notes: Dependent variable: Poverty Rate. Standard errors are in parenthesis. * stands for significant at the 10% level, ** stands for significant at the 5% level and *** stands for significant at the 1% level.

Source: Own calculations.

For our first specification where we use the Pooled OLS regression, the results show that when no other variables are considered, nor is the heterogeneity among EU Member States, an increase in the pension expenditure variable lagged one period causes a fall in the poverty rate (-0.311) and this coefficient shows statistical significance at the 1% level. Interpreting this result, we get that an increase in pension expenditure of 1 percentage point leads to a fall in poverty in 0.311 percentage points in the following year.

In the next step we include control variables and the coefficient for pension expenditure goes down to 0.245 and even lower to 0.168 when we add year dummies. This means that as we keep controlling for more differences, pensions expenditure's impact on poverty is going lower and lower. If instead we use a Fixed Effects regression where we fix for unobserved heterogeneity among countries, the coefficient for the independent variable shows an inferior result compared to those of the previous estimations (-0.012) but no statistical significance meaning that pension expenditure would have no effect on poverty.

Regarding the results for the control variables, the coefficient for the unemployment rate is positive and statistically significant only in specification (2) and the percentage of population aged between 15 and 64 and GDP per head show to be positively correlated

to poverty in specifications (2) and (3). The percentage of population aged 65 plus shows to be positively related to poverty in specifications (2) and (3) but the signal is negative in Fixed Effects. Regarding inequality, the coefficient has the same signal throughout all the estimations and so it is expected that an increase in inequality – and in the Gini index – results in a higher poverty rate.

In the following table the results for the relationship between pension expenditure and economic growth are presented.

TABLE IV

RESULTS OF THE ESTIMATION FOR ECONOMIC GROWTH

	(1)	(2)	(3)	(4)
Pension Expenditure (t-1)	-0.2366 (0.0981)**	-0.4258 (0.0821)***	-0.3821 (0.0731)***	0.3409 (0.2232)
Pop. 15-64 (t-1)	-	0.1442 (0.1615)	0.1674 (0.1469)	-0.9784 (0.4767)*
Pop.65+ (t-1)	-	0.1144 (0.1675)	-0.0405 (0.1664)	-0.9902 (0.6094)
Inflation (t-1)	-	-1.0299 (0.1248)***	-0.5393 (0.1491)***	-0.5907 (0.1762)***
GCF growth (t-1)	-	0.0636 (0.0203)***	0.0883 (0.0242)***	0.0741 (0.0132)***
Exports (t-1)	-	-0.0128 (0.0059)**	-0.0173 (0.0051)***	0.0664 (0.0201)***
Education (t-1)	-	0.0435 (0.0142)***	0.0176 (0.0137)	0.3044 (0.1177)**
Control Variables	-	X	X	X
Year Dummies	-	-	X	X
Standard Errors	Robust	Robust	Robust	Robust

R²	0.03	0.44	0.61	0.66
Estimation Method	Pooled OLS	Pooled OLS	Pooled OLS	Fixed Effects
Observations	264	264	264	264

Notes: Dependent variable: GDP growth. Standard errors are in parenthesis. * stands for significant at the 10% level, ** stands for significant at the 5% level and *** stands for significant at the 1% level.

Source: Own calculations.

As mentioned before, the relationship between pension expenditure and economic growth is controversial and not an obvious one. Though, in most of the results we obtained through the estimation trials, it seems clear that more pension expenditure is detrimental for GDP growth. On the first Pooled OLS estimation, where we do not control for other variables, the coefficient of the variable for pension expenditure lagged one period is of -0.2366 which means that a 1 percentage point increase in pension expenditure would lead to a 0.2366 percentage points fall in GDP growth in the following year but when we add control variables this value goes up to 0.4258. It falls to 0.3821 after dummy variables are included, and, later on, when we regress using the 2SLS method a similar coefficient will be found. Before that, though, in our Fixed Effects estimation, a coefficient of 0.3409 appears but it is not statistically significant. The truth is that estimating through Fixed Effects on this kind of data seems to be more appropriate than our previous Pooled OLS regressions because the heterogeneity among the countries we are considering is undeniable and so, when a model controls for these unobserved differences, one should not ignore those results.

Regardless, and because there is still a possible endogeneity problem being discussed, we will regress again using the 2SLS method.

As for the control variables and their impact on GDP growth, an increase in the percentage of population aged between 15 and 64 show to be negatively related to GDP growth in specification (4), where it has statistical significance, while the percentage of population aged 65 plus is expected to have no effect on economic growth. Inflation has always negative coefficients and so an increase in that variable leads to a fall in GDP growth whilst Growth Capital Formation growth is expected to increase GDP growth. An

increase in exports in relation to GDP suggests a negative effects on economic growth, according to specifications (2) and (3), but in specification (4) this relationship shows to be positive. The coefficient for education is positive when it shows to be statistically significant.

5. ENDOGENEITY

These are the results for our 2SLS approach because of the possible endogeneity problem where the pension expenditure variable lagged two periods is used as one of the instrumental variables.

TABLE V

RESULTS OF THE ESTIMATION FOR POVERTY AND ECONOMIC GROWTH WITH 2SLS METHOD

	Poverty	GDP growth
Pension Expenditure (t-1)	-0.216 (0.082)***	-0.374 (0.095)***
Unemployment Rate (t-1)	0.056 (0.044)	-
Pop. 15-64 (t-1)	1.11 (0.1379***	0.006 (0.146)
Pop.65+ (t-1)	0.705 (0.132)***	0.036 (0.132)
Inequality (t-1)	97.347 (5.721)***	-
GDP per head (t-1)	0.0002 (0.00002)***	-
Inflation (t-1)	-	-0.984 (0.096)***
GCF growth (t-1)	-	0.05 (0.016)***
Exports (t-1)	-	-0.005 (0.009)
Education (t-1)	-	0.042 (0.0196)**
Control Variables	X	X
Year Dummies	X	X
R^2	0.71	0.47

Estimation Method	2SLS	2SLS
Observations	195	196

Notes: Standard errors are in parenthesis. * stands for significant at the 10% level, ** stands for significant at the 5% level and *** stands for significant at the 1% level.

Source: Own calculations.

In this estimation we use the control variables and year dummies and pension expenditure lagged two periods as one of the instruments since we expect it not to be correlated to poverty and GDP growth but still affect pension expenditure in period (t-1).

In fact, the results are very similar to those obtained in the Pooled OLS estimations. The coefficient for pension expenditure has a value of -0.216 meaning that a 1 percentage point increase in pension expenditure would diminish poverty by 0.216 percentage. As for the outcome in economic growth, the coefficient for pension expenditure is, again, close to those obtained through Pooled OLS regressions, and is of -0.374 and so a fall in GDP growth of 0.374 percentage points would be the consequence of the 1 percentage points increase in pension spending. Both coefficients are statistically significant at the 1% level. One cannot say that poverty and GDP growth do not affect the expenditure on pensions but even if that relationship exists, the results obtained do not change drastically relatively to those of the Pooled OLS estimations and allow us to take some preliminary conclusions from this analysis.

6.   MODIFYING THE POVERTY LINE

To further investigate pension expenditure's role on diminishing poverty, we will repeat the poverty regressions above but with a new indicator for poverty which is poverty rate after taxes and transfers, poverty line 60%[17]. This indicator tells us the percentage of the population whose disposable income is less than 60% of the median income and so, a different depth of poverty will be comprised than with the indicator used previously that accounted for the individuals whose disposable income is less than 50% of the median income. The comparison of the results make it possible to examine how different depths

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[17] Data source: OECD Income Distribution Database (IDD).

of poverty react to an increase in a type of expenditure that has the reduction of poverty as one of its goals. The results for the regressions are in the following table.

TABLE VI

RESULTS OF THE ESTIMATION FOR POVERTY FOR 60% POVERTY LINE

	(1)	(2)	(3)	(4)
Pension Expenditure (t-1)	-0.201 (0.093)**	-0.173 (0.052)***	-0.154 (0.053)***	-0.093 (0.225)
Unemployment Rate (t-1)	-	0.04 (0.028)	0.034 (0.03)	-0.1 (0.047)**
Pop. 15-64 (t-1)	-	0.071 (0.0.083)	0.093 (0.08)	-0.158 (0.2497)
Pop.65+ (t-1)	-	0.214 (0.076)***	0.19 (0.082)**	-0.727 (0.284)**
Income Inequality (t-1)	-	81.009 (4.136)***	81.658 (4.337)***	25.7798 (7.356)***
GDP per head (t-1)	-	-9.96e-06 (9.62e-06)***	-0.00001 (0.00005)	-0.00003 (0.00006)
Control Variables	-	X	X	X
Year Dummies	-	-	X	X
Standard Errors	Robust	Robust	Robust	Robust
R^2	0.02	0.83	0.83	0.31
Estimation Method	Pooled OLS	Pooled OLS	Pooled OLS	Fixed Effects
Observations	229	194	194	194

Notes: Dependent variable: Poverty Rate. Standard errors are in parenthesis. * stands for significant at the 10% level, ** stands for significant at the 5% level and *** stands for significant at the 1% level.

Source: Own calculations.

The results for pension expenditure's coefficients are close to those obtained when considering the 50% poverty line which increase confidence in our results' robustness.

Our goal, though, was to, in some way, try to understand if the effect of pension expenditure on poverty is different depending on its severity. If we compare these results with those of the 50% poverty line, the independent variable's coefficient in this case is always slightly smaller in the Pooled OLS regressions but higher in the Fixed Effects estimation though it is not statistically significant. If we take these differences into account, we can say that in cases where poverty is more severe (50% poverty line), expenditure in pensions reduces poverty by more than in cases where the poverty line is higher. Naturally, this is an important finding since it proves that pensions are indeed even more relevant to control and diminish scarcity among those that are poorer. This happens, as long as we control for economic and demographic heterogeneity and use year dummies, because when we used the Fixed Effects regression in order to control for unobserved differences among countries, pension expenditure's effect on poverty seems to be nonexistent since this relationship is not statistically significant.

Comparing the several regressions, considering two different poverty lines, there is one thing in common, though, that is the fact that the more we control for heterogeneity, the more the coefficient's value falls.

7. CONCLUSION

Our findings on pension expenditure's effect on poverty, considering several estimations, are mixed. The results of the estimation we find more fitting, the Fixed Effects regression, though, show that there is apparently no effect of pension expenditure on poverty since the coefficient for the independent variable has no statistical significance. As for the effect an increase in pension expenditure has on economic growth, our results are again mixed, but, when we use the Fixed Effects regression, we consider the most appropriate, the coefficient is also not statistically significant, meaning that pension expenditure has no impact on economic performance.

Regarding the possible effect poverty and GDP growth both have on pension expenditure, which would make the relationship simultaneous, we considered the 2SLS method, and the results were similar to the ones obtained through the Pooled OLS

regressions. Thus, even in case of endogeneity, the results do not show significant differences to some of the results obtained previously.

Concerning the results for poverty, when considering different poverty lines, we find that they do not change drastically between the poverty line at 50% and 60%, but change enough for us to observe that, if we do not fix for unobserved heterogeneity among countries, pensions expenditure's effect on reducing poverty is greater when there is more scarcity than when more people are comprised. The Fixed Effects results, though, show no statistical significance.

Finally, we conclude that our results mismatch what was expected. In this context, it is important to highlight that this study is particularly important because, unlike others, it uses panel data and, importantly, it comprises the first decade after the crisis. This fact may be responsible for the results obtained, mainly those for poverty. Therefore, there is no doubt that further empirical research is needed in this area, and a comparative study on the decade before and after the crisis, comprising less countries due data limitations, would be our suggestion for future works.

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TABLE A.I

DESCRIPTIVE STATISTICS FOR THE CONTROL VARIABLES, YEARS BETWEEN 2007 AND 2018 FOR EU MEMBER STATES

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Unemployment	288	8.982	4.57	2.2	27.5
GDP per head	288	38767.81	17481.2	15272.95	107736.9
Population 15-64	288	66.637	2.059	61.907	71.91
Population 65+	288	17.604	2.416	10.786	22.683
Education	288	73.275	11.242	28.6	88.3
Inequality	237	0.304	0.04	0.22	0.408
GCF growth	288	1.534	12.493	-54.327	49.883
Exports	288	62.367	35.548	18.982	221.197
Inflation	288	1.974	2.216	-4.478	15.402

Source: Own calculations.

DESCRIPTIVE STATISTICS FOR PENSION EXPENDITURE IN TERMS OF TOTAL GDP

Country	Obs.	Mean	Std. Dev.	Min.	Max.
Germany	12	11.958	0.3	11.7	12.7
Belgium	12	11.958	0.636	10.4	12.6
France	12	14.55	0.692	13.1	15.1
Italy	12	15.608	0.808	13.9	16.5
Luxembourg	12	9.208	0.396	8.3	9.6
Netherlands	12	12.442	0.654	11.2	13.2
Denmark	12	12.75	0.718	11.7	14
Ireland	12	6.9	1.158	5.3	8.1
Greece	12	15.975	1.893	12.3	17.9
Spain	12	11.483	1.397	9	12.8
Portugal	12	14.148	1.044	12.2	15.7
Austria	12	14.208	0.487	13.2	14.8
Finland	12	12.375	1.121	10.3	13.4
Sweden	12	11.392	0.408	10.8	12.2
Czech Republic	12	8.542	0.563	7.5	9.3
Slovakia	12	8.142	0.545	7	8.7
Slovenia	12	10.608	0.699	9.5	11.5
Estonia	12	7.608	0.786	5.7	8.8
Hungary	12	9.433	1.148	7.6	10.8
Latvia	12	7.65	1.341	4.9	10.1
Lithuania	12	7.367	0.846	6.5	9.5

Poland	12	11.542	0.368	10.9	12.2
Bulgaria	12	8.042	0.729	6.5	8.8
Romania	12	8.183	0.844	6.3	9.4

Source: Own calculations.