
Relationships between Pension Spending, Poverty Reduction, and Economic Growth: Evidence from the European Union Countries

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Maria Teresa Medeiros Garcia¹, Adriana Maria Fernandes Ferreira²

Abstract:

Purpose: The purpose of this paper is to examine the impact of pension spending on both poverty and economic growth.

Design/Methodology/Approach: The paper considers pooled ordinary least squares and fixed effects regression models as well as two-stage least squares (2SLS) regression analysis, and uses annual panel data from 24 European Union Member States, from 2007 to 2018.

Findings: The results show that pension spending is relevant for reducing poverty and suggest that pension spending has no impact on gross domestic product growth.

Practical implications: The results in this paper should advance our understanding of the fundamental role of public pension systems in alleviating poverty and in contributing to inclusive growth.

Originality value: To our knowledge, our study is the first that utilises pension expenditure and its impact on both poverty and economic growth using data from European Union countries.

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

JEL classification: H55, I32.

Paper type: Research article.

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¹Assoc. Prof., ISEG Universidade de Lisboa, Economics, Portugal,
e-mail: mtgarcia@iseg.ulisboa.pt;

²M.Sc. degree, ISEG Universidade de Lisboa, Economics, Portugal,
e-mail: l53020@aln.iseg.ulisboa.pt

1. Introduction

The debate continues on into the 21st century as to whether public pension systems can or cannot provide retirees with an adequate income to ensure their living standards and prevent poverty, especially among the elderly.

With regards the European Union (EU), the demographic tendencies – an ageing population, which inevitably results in an increasing number of beneficiaries – will naturally cause an impact on the future of public pension schemes (EU statistics, 2020), however undoubtedly public pension systems succeeded in addressing the social risks of European economies during the 1950s and 1960s and they can be considered to be a major pillar of the European socio-economic identity (Bova and Stetter, 2018).

According to the European Commission (2020), pensions nowadays represent “the main source of income for about a quarter of the population” and thus, naturally, one cannot completely discredit their role on redistributing income and assuring that those who do not work have a means of living and surviving.

However, there was a period during the 1980s when public pension systems seem to have been overshadowed and under attack, starting with the Thatcher-Reagan era. In order for private systems to be a success and profit, even if they incur risk, several reforms have been implemented, including the introduction of individual accounts and pension privatisation (Ortiz, 2018).

Despite all the controversy that arose in the early 1980s, with promises of a better economic and social performance, 30 countries from all around the world went through the process of pension privatisation, either fully, or partially. Nevertheless, the consequences of reducing governments’ costs did not turn out to be as expected. Not only did the promises of economic prosperity fail to occur, but also the social side was jeopardized as the coverage rates either stagnated or were reduced and gender inequality rose. As a consequence, more than a half of these 30 countries have since taken a step back and have reverted to public systems (Ortiz *et al.*, 2018).

Public pension systems are not consensual either, and the criticism of those who claim that they reduce incentives to save need to be addressed in order to counteract a dependency mentality and that they are not financially sustainable.

Although a negative relationship between social expenditure and poverty is usually found in the literature (Cammeraat, 2020) and reducing poverty is one of pension systems’ goals, the at-risk-of-poverty rate among the retired is 14.2%, despite the high percentage of the gross domestic product (GDP) that is invested in 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, and add that governments' support and dedication play an important role in the outcome of this spending.

Additionally, public pensions tend to cause disagreement, particularly due to 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 reach the conclusion that public social expenditure only affects the economic performance when different types of social expenditure are considered (Cammeraat, 2020), and some even argue that social security expenditure can 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 that the importance of the system has increased with the successive changes that have occurred in the world, contributing to an increase in economic performance. The author emphasises that pervasive market failures confirm that markets are frequently inefficient and that governments are consequently required to carry out a more active role, thus guaranteeing strong competition and ensuring that firms do not exploit workers, which in turn provides an insurance against important risks – such as unemployment, disability, and insufficient retirement income.

As these relationships are complex, the objective of this paper is to review and study the effect of pension expenditure on both social and economic variables. In addition, in our study we supply additional evidence regarding poverty and GDP's relationship with public pension spending.

We start by reviewing the existing literature in order to understand what has already been carried out in this respect and then we proceed to present our own estimations – starting with Pooled OLS and Fixed Effects regressions with robust standard errors, although 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 this time we consider a different poverty line, in order to compare results on different degrees of poverty.

The independent variable is always lagged by one period, owing to the simultaneity situation. We use a panel data set from the European Union Member States for the period from 1990 to 2018. The sources of the data are Eurostat, AMECO, the World Bank, and OECD databases.

With this objective in mind, these relationships are discussed in the following sections, starting with the literature review in the next chapter, where some previous works on this matter are presented and considered. This is followed by a description

of the data and methodology and next the results are presented and discussed for the Pooled OLS and Fixed Effects regressions and also for the 2SLS estimations. Finally, we analyse the outcomes on poverty when the poverty line is changed and then we conclude.

2. Literature Review

2.1 Poverty and Pension Spending

The Welfare State is often underappreciated, although it has already proved its worth (ILO, 2011) by achieving one of its most important objectives – poverty reduction. Indeed, it is sometimes argued that poverty eventually diminishes with economic growth, and therefore the first priority in developing countries should be to achieve economic growth.

Nevertheless, poverty is highly susceptible to the inequality patterns in income distribution and accordingly economic growth is insufficient to diminish poverty (Ortiz, 2007). Bearing this in mind, it is important to take income inequality into account when studying poverty (ISSA, 2016). For example, Berg et al. (2018) find that lower net inequality is robustly correlated with faster and more durable growth, after controlling for the level of redistribution

According to EU statistics, unemployed people are those at most risk of poverty. Consequently, unemployment indicators are most relevant for the analysis of poverty. Cammeraat (2020) finds that spending directed at the unemployed is one of the most successful measures for reducing poverty, followed by expenditure in housing.

On the other hand, the empirical evidence of this study suggests that social expenditure on the elderly and survivors is not statistically relevant in reducing poverty, but rather is negatively related to inequality. Indeed, these authors find substantial differences between the effects of various types of social expenditure, which could be considered by policy-makers to achieve better targeting and thereby increase the effectiveness of reducing poverty and inequality, without having a detrimental effect on GDP growth.

Corroborating Caminada and Goudswaard (2009), Cammeraat (2020) also found a negative significant coefficient of total public social expenditure on poverty, that is to say, an increase in total public social expenditure results in a decrease in poverty. He also proved that total public social expenditure is negatively related to inequality, but is not related to GDP growth.

Following Cammeraat (2020), albeit in a different way, our research focusses on GDP growth and also on the impact of pension spending on poverty, as the majority

(over 85%) of pension benefits are for the elderly and survivors, according to EU statistics.

This work firstly regresses the total pension expenditure on the poverty rate by using demographic and economic controls, in addition to those two variables. The expected result is that an increase in total pension spending significantly reduces poverty.

2.2 Economic Growth and Pension Expenditure

Taking a closer look at history, one can find that periods of prosperity often follow catastrophic events. One relevant example is Roosevelt's Administration's post-Great Depression New Deal which was full of social measures, and also the post-World War II Welfare State, which included social assistance for work (Ortiz, 2007).

Nevertheless, strong political commitment and administrative excellence has been devoted to strengthening 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 the expected results are somewhat intuitive for poverty, then in the case of economic growth the literature and previous works fail agree about the effect of pension expenditure on economic growth. A part of the literature, such as in the example of Barro (1996), insist that an increase in public expenditure will reduce economic growth.

However, this does not exactly coincide with the results obtained by Bellettini and Ceroni (2000), who found in an empirical analysis that social security and economic growth are indeed positively related – where social security spending generates growth through the incentive of investment in human capital, rather than physical capital investment, and also through an increase of inclusion and political stability.

In addition, an increase in savings could be expected, as argued by Bellettini and Ceroni (2000) and Garcia *et al.* (2019). The OECD (2019) identifies a number of theoretical positive and negative effects of social protection on inclusive growth, although assessing their role in inclusive growth remains an empirical question.

The findings of Cammeraat (2020) suggest that the relationship between total public social expenditure and growth is non-existent, however for certain specific types of expenditure the results were positive, where the resultant increase in social expenditure on housing has a positive effect on growth, which in turn is an important result, as this type of expenditure is the most successful in terms of overcoming poverty. In addition, productivity is positively affected by social expenditure, because social protection increases risk-taking behaviour and reduces poverty.

Therefore, reducing poverty increases the capacities of poor people and subsequently increases productivity and economic growth. When considering the size of the different types of social expenditure, considerable effects of expenditure on “old age and survivors” are expected, as this category is the largest one (Cammeraat, 2020).

Sala-i-Martin (1992) suggests that pensions can lead to greater growth, as they are a mean of taking those who are less productive out of the work force, although studies show that the impact of welfare state programmes (i.e., retirement schemes) on labour supply can be explained in large part by the specific features of the social security system.

For example, the largest expected negative effect on labour supply is from the “unemployment and ALMPs” type of social expenditure, as such expenditure targets the working-age population, rather than children, the elderly, or the disabled (Cammeraat, 2020).

Within this context, our research goes on to analyse the impact of total pension expenditure on economic growth. The expected findings are of the positive and significant effect of pension expenditure on economic growth.

3. Data and Methodology

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

Our indicator for economic growth is GDP growth (annual growth per head, constant prices, in percentage)³. With regards poverty, we consider the poverty rate after taxes and transfers (with a poverty line of 50%)⁴. Finally, the explanatory variable is total pension expenditure expressed as a percentage of GDP⁵. The control variables used for poverty are the following: unemployment rate as a percentage of active population⁶; GDP per head (constant prices, constant PPPS⁷; OECD base year (2015), measured in US Dollars)⁸; population aged between 15 and 64, as a

³ Data source: *OECD Productivity Database*.

⁴ Data source: *OECD Income Distribution Database (IDD)*.

⁵ Data source: *Eurostat*.

⁶ Data source: *AMECO*.

⁷ *Purchasing Power Parities*.

⁸ Data source: *OECD*.

percentage of total population⁹, population aged over 65, as a percentage of total population¹⁰; and also the Gini coefficient¹¹, in order to measure inequality.

With regards GDP growth, the following control variables are considered: population aged between 15 and 64, as a percentage of the total population; population aged over 65 years, as a percentage of total population; percentage of population with a secondary, post-secondary, non-tertiary, and tertiary education¹²; Gross Capital Formation (annual growth in percentage)¹³; exports of goods and services, as a percentage of GDP¹⁴; and inflation rate (consumer prices and annual percentage)¹⁵. Table 1 shows the descriptive statistics of the dependent and independent variables.

Table 1. *Descriptive Statistics for Poverty Ratio, GDP growth, and Pension Expenditure for EU Member States, from 1990 to 2018.*

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
Pension Expenditure	565	10.6	2.7	3.7	17.9

Source: Authors' own calculations.

In the selected EU Member States, from 1990 to 2018, on average, 10.2% of the population's disposable income was less than 50% of the median income, although the maximum percentage was 36.8%. The average GDP growth for the same period is 2.4%, with for pension expenditure relative to GDP being 10.6%.

The dataset for the period that we initially set out to study is highly unbalanced – with years for which no information is available – and thus in order to prevent a bias in our results, we were obliged to select a sample based on the assumption that the reason for the lack of data was exogenous, and subsequently no negative outcomes arose from our decision (Wooldridge, 2001).

Accordingly, the period covered in our analysis is from 2007 to 2018. As this period covers the period during and after the 2008 Crisis (FCIC, 2011), a certain degree of caution is required when analysing the results. The descriptive statistics for the variables of Poverty Rate, GDP growth, and Pension Expenditure for the period are shown in Table 2.

⁹ *Own calculations using data from AMECO.*

¹⁰ *Own calculations using data from AMECO.*

¹¹ *Data source: OECD Income Distribution Database (IDD).*

¹² *Data source: Eurostat.*

¹³ *Data source: World Bank.*

¹⁴ *Data source: World Bank.*

¹⁵ *Data source: World Bank.*

Table 2. Descriptive Statistics for Poverty Ratio, GDP growth, and Pension Expenditure for EU Member States, from 2007 to 2018.

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: Authors' own calculations.

Between 2007 and 2018, for the selected EU Member States, the poverty rate for a poverty line of 50% is 11.2% on average, and the annual GDP growth is 1.5%. Furthermore, during this period, almost 11% of total GDP was spent on pensions. Descriptive Statistics for the control variables are shown in Table 3.

Table 3. Descriptive Statistics for the control variables for EU Member States, from 2007 to 2018.

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Unemployment	288	8.982	4.57	2.2	27.5
GDP per head	288	38,767.81	17,481.2	15,272.95	107,736.9
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: Authors' own calculations.

Another problem that we also needed to deal with is the heterogeneity among countries. Although all the countries used in this analysis are EU Member States, economic and demographic differences exist among them which lead to the need for singular methods in handling pension expenditure.

For instance, Greece has the maximum pension expenditure as a percentage of GDP value of 17.9%, while Ireland, the Czech Republic, Slovakia, Lithuania, Estonia, and Malta have never surpassed 10% from 2007 to 2018. Ireland's case is even lower, with a maximum pension expenditure of 8.1% as a percentage of GDP, which is lower than most countries' minimum values. In turn, Italy has the highest minimum value of 13.9% of GDP spent on pensions. Pension expenditure by country is presented in Table 4.

We address these differences by adding two extra control variables that were chosen from previous studies¹⁶, namely year dummy variables, and Fixed Effects regressions.

¹⁶ Cammeraat (2020) and Jacques et al. (2021).

Table 4. *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
The 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 study.

The presence of endogeneity also needs to be taken into consideration, as the relationship between poverty, GDP growth, and pension expenditure is believed to be simultaneous. Apart from resorting to the usual approach of instrumental variables to address this problem, the independent variable we use is lagged by one period, in line with Cammeraat (2020), in order to ensure that the dependent variables for poverty and economic growth do not affect pension expenditure for that same period.

Regarding robustness, we always regress with robust standard errors for all regressions. We performed various regressions throughout our analysis, and then compare their results. Our first specification consists of the Pooled OLS regression to model pension expenditure's effect on poverty and economic growth, which assumes that the parameters α and β are the same for all countries, as follows:

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

First, we regress Equation (1), using only the independent variable lagged by one period (a), to which we then add control variables for the second specification (b). While still regressing in Pooled OLS, the third specification includes year dummies (c).

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

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

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

4. Results and Discussion

We start by presenting and discussing the results for poverty rate as the dependent variable, which are shown in the following Table 5.

Table 5. Results of the estimation for poverty rate

	(a)	(b)	(c)	(d)
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 brackets. * stands for significant at the 10% level, ** stands for significant at the 5% level, and *** stands for significant at the 1% level.

Source: Authors' own calculations.

For our first specification, where we use the Pooled OLS regression, the results show that when no other variables are considered, there is no heterogeneity among EU Member States, and that an increase in the pension expenditure variable lagged by one period causes a fall in the poverty rate of -0.311, with this coefficient showing statistical significance at the 1% level. From interpreting this result, it can be seen that an increase in pension expenditure of 1% leads to a fall in poverty of -0.311% in the following year.

In the next step we include control variables, which results in the coefficient for pension expenditure increasing to -0.245, and even to -0.168 when we add year dummies. This means that as we constantly control for further differences, the impact of pension expenditure on poverty becomes less and less. However, if we use a Fixed Effects regression instead, where unobserved heterogeneity is fixed among countries, the coefficient for the independent variable shows no statistical significance and is almost null when compared with the coefficients of the previous estimations (-0.012).

With regards the coefficients of the control variables, the unemployment rate, the percentage of population aged between 15 and 64, the percentage of population aged 65 or more, and GDP per head, following Table 5, are shown to have a significant positive impact on poverty rate in Estimations (b) and (c).

In addition, the coefficient for inequality also has a significant positive effect throughout all the estimations, and an increase in both inequality and the Gini index is thus expected – which results in a higher poverty rate. In contrast, in Estimation (d), an increase in all control variables except for inequality is likely to cause a negative effect on the poverty rate, albeit this is only significant for the variable of the percentage of population aged 65 or more. Table 6 displays the results for the relationship between pension expenditure and economic growth.

Table 6. Results of the estimation for economic growth

	(a)	(b)	(c)	(d)
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	0.0883	0.0741

		(0.0203)***	(0.0242)***	(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 brackets. * stands for significant at the 10% level, ** stands for significant at the 5% level, and *** stands for significant at the 1% level.

Source: Authors' own calculations.

As mentioned above, the relationship between pension expenditure and economic growth has been controversial as a variety of findings have been obtained. In our first Pooled OLS estimation, where we do not control for other variables, the coefficient of the variable for pension expenditure lagged by one period is -0.2366 (a), which means that a 1% increase in pension expenditure leads to a 0.2366% reduction in GDP growth in the following year, however this value decreases to -0.4258 (b) when we add control variables.

This coefficient increases to -0.3821 after dummy variables are included (c), and, later on, a similar coefficient is obtained when we regress using the 2SLS method (Table 7). Nevertheless, a positive coefficient of 0.3409 is obtained, albeit it is not statistically significant (d).

It became obvious that estimating through Fixed Effects on this kind of data is more appropriate than Pooled OLS regressions that we carried out previously, as the heterogeneity among the countries is undeniable and therefore these results should not be ignored when a model controls for these unobserved differences.

With regards the control variables and their impact on GDP growth, on the one hand we found that an increase in the percentage of population aged between 15 and 64 is positively correlated with GDP growth in Specifications (b) and (c), although not statistically significant.

On the other hand, an increase in the percentage of population aged between 15 and 64 in Specification (d) is expected to have a negative effect on economic growth. Inflation always has negative coefficients and accordingly an increase in that variable leads to a decrease in GDP growth. Growth Capital Formation growth and education both show a positive impact on GDP growth, whereas an increase in exports as a percentage of GDP appears to have a negative effects on economic

growth, according to Specifications (2) and (3), although in Specification (4) this relationship is positive.

Table 7 presents the results for the 2SLS estimation used to address the possible endogeneity problem, where the pension expenditure variable lagged by two periods is used as one of the instrumental variables.

Table 7. Results of the estimation for poverty and economic growth 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
R²	0.71	0.47
Estimation Method	2SLS	2SLS
Observations	195	196

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

Source: Authors' own calculations.

In fact, the results for the 2SLS estimation are very similar to those obtained in the Pooled OLS estimations, where the coefficient for pension expenditure has a value of -0.216, meaning that a 1% increase in pension expenditure diminishes poverty by 0.216%.

With regards the finding for economic growth, the coefficient for pension expenditure is, once again, close to those obtained through Pooled OLS regressions, with a value of -0.374, and thus a decrease in GDP growth of 0.374% results in a 1% increase in pension spending. Both these coefficients are statistically significant at the 1% level. The results obtained enable us to take some preliminary conclusions from this above-described analysis.

5. Modifying the Poverty Line

To further investigate pension expenditure's role in diminishing poverty, we next repeat the poverty regressions described above, but this time with a new indicator for

poverty – poverty rate after taxes and transfers, with a poverty line of 60%¹⁷. This indicator calculates the percentage of the population whose disposable income is less than 60% of the median income, and accordingly a different degree of poverty is obtained in comparison with the previously-used indicator that accounted for those individuals whose disposable income is less than 50% of the median income.

The comparison of these results make it possible to examine how different degrees of poverty react to an increase in types of expenditure designed to reduce poverty. The results for these regressions are shown in the following Table 8.

Table 8. Results of the estimation for poverty rate (with a 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
R²	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 brackets. * stands for significant at the 10% level, ** stands for significant at the 5% level, and *** stands for significant at the 1% level.

Source: Authors' own calculations.

The results for pension expenditure's coefficients are close to those obtained when considering a 50% poverty line, which increase confidence regarding the robustness of our results. However, we need to be reminded that our goal was to attempt to understand whether the effect of pension expenditure on poverty differs, depending on its severity. When we compare the results of the 60% poverty line with those of the 50% poverty line, although the independent variable's coefficient is always slightly higher in the Pooled OLS regressions, it is smaller in the Fixed Effects estimation. This is obviously an important finding, as it proves that pensions are

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

indeed even more relevant to control and diminish the lack of resources among the poor.

Indeed, the results of the Fixed Effects regression that was used to control for unobserved differences among countries suggest that pension expenditure's negative effect on poverty seems to be greater when poverty is less severe (with a 60% poverty line). When comparing the various regressions for both the two different poverty lines (50% and 60%), the common denominator is the fact that the more one controls for heterogeneity, the lower becomes the coefficient's value.

6. Conclusion

Our findings on the effect of pension expenditure on poverty suggest that an increase in pension spending relative to GDP leads to a lesser degree of poverty when considering various estimations. Our results are mixed with regards the effect of an increase in pension expenditure on economic growth, however, when we use the Fixed Effects regression – which is the most appropriate regression – the coefficient is not statistically significant, which implies that pension expenditure has no impact on economic performance.

We adopt the 2SLS method to analyse the possible effect of both poverty and GDP growth on pension expenditure – which would make the relationship simultaneous – with the results being similar to those obtained through the Pooled OLS regressions. Accordingly, the results do not show significant differences, even when endogeneity is present.

Regarding the results for poverty, when considering two different poverty lines (50% and 60%), we find that the results are similar, where the Fixed Effects regressions suggest that pension expenditure has a greater impact in diminishing poverty on average for the section of the population that has a larger income in relation to the median income.

Finally, the results mostly equate with our original expectations. It should be highlighted that this study is particularly important, because, unlike all the others, it uses panel data, which interestingly is for the first decade after the crisis. Further empirical research is undoubtedly needed in this research area of the relationships between pension spending, poverty reduction, and economic growth, and it is suggested that a comparative study using less countries be carried out for the decades both before and after the crisis, which would accordingly compensate for data limitations.

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