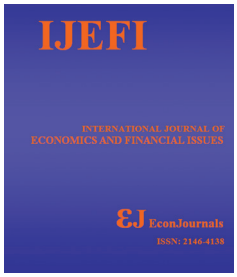

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# Externalities from Private Pensions in the Spanish Income Tax

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**ABSTRACT**

Fiscal incentives of pension plans in the Spanish Income tax consist of tax credits on contributions of the taxpayer, although the incomes obtained are taxed at the individual's marginal rate. Nowadays, occupational and personal private pensions (the second and third pillar of social insurance) are differentiated. Since 2009, the latest reform of the Financing System of the Autonomous Communities of common regime and Cities with Statute of Autonomy (AFS), the Income tax collection has been transferred to regional governments, up to 50%, with the state and regional tax base remaining the same, while the regional tax rates differ across Autonomous Communities. Subsequently, savings from tax credits on contributions to pension plans and taxation of pension payments differ across communities. This work aims to study the relationship between the regional Income tax (RIT) yield and the tax credit variable in RIT from contributions to private pensions (TBD). Estimates are obtained from Dynamic Panel Data for the fifteen Autonomous Communities of the common regime for 2003-2022, using the Instrumental Variables (IV) estimator and its generalization, the Generalized Method of Moments (GMM). The main result is that the elasticity of RIT to TBD is negative at 0.19; also, fiscal incentives generated vertical and horizontal externalities in reference to Income tax.

**Keywords:** Fiscal Decentralization, Income Tax, Private Pensions, Externalities
**JEL Classification:** H23, H24, H71

## 1. INTRODUCTION

Most OECD countries provide financial incentives to encourage individuals to save for retirement, which are indirect subsidies when retirement savings deviate from the tax treatment of traditional forms of savings; others are direct government payments into the pension account of eligible individuals (OECD, 2024). In recent years, in both international and national contexts, the differences between occupational and personal products have been highlighted[1].

In Spain, Law 1/2002, of November 29, regulated private pensions, which are occupational pension plans (the second pillar of social insurance) and personal pension plans (the third pillar)[2]. Law 35/2006, on Income tax, set incentives that consist of tax credits in the Income tax; consequently, employees or their employers make contributions to private pensions. The limit on tax credits applies to both employment income and economic activities income, as well as the absolute contributions allowed for deferrals. Otherwise, payments from pension plans are taxed as employment income at the individual's marginal income tax rate. Moreover, according to the corporate Income tax, employers' contributions are tax-deductible from company expenses. Law 12/2022, of June 30, to promote occupational plans, sets a bonus in social insurance by contributions to private pensions.

In the Netherlands, the EET system (exempt contributions and investment, but taxes pension payments); pension income is

1 In the EU, the Directive (EU) 2016/2341 of the European Parliament and of the Council of 14 December 2016 is on the activities and supervision of institutions for occupational retirement provision, and Regulation (EU) 2019/1238 of the European Parliament and of the Council of 20 June 2019 on a pan-European Personal Pension Product.

2 Law 1/2002, of November 29, on Pensions and Funds Plans, derogates Law 8/1987, of March 8, on Pensions and Funds Plans.

taxed at the individual's marginal income tax rate; also, a general personal tax credit is available to all taxpayers, depending on the individual's age and income. Besides, contributions to a defined-contribution occupational pension plan (DC) depend on age and state pension[3]. In the EET system, social contributions are not levied on pension contributions. If total income exceeds 137.800€ (in 2024), the TEE system can be applied (contributions are made of taxed income, but income from occupational and personal pensions plans is not taxed). In the TEE system, individuals must pay tax and social contributions on taxable income (normally by the employer).

In Germany, there are subsidized pensions, namely Riester pensions, whose benefits are usually in the form of tax credits and exemption from social security contributions, and an unsubsidized private pension (Börsch-Supan et al., 2008). Contributions to Riester pensions can be deducted from Income tax up to 2.100€/2.160€; meanwhile, contributions to basic pensions can be partly deducted from taxable income up to a maximum of 27.566€ in 2024[4]. Employer and employee contributions are tax-exempt, up to 8% of the social security contribution ceiling (90.600€ per year in 2024), and contributions higher than that limit are taxed at the individual's marginal rate of Income tax. Also, they do not have to pay social insurance contributions until they reach 4% of the social security contribution ceiling. Benefits of tax-deducted contributions are taxed at the individual's marginal rate of Income tax. For private pension insurance, contributions are not tax-favored; special rules apply to lifetime annuities, and only the returns on investments are taxed at the individual's marginal Income tax rate.

In Spain, the latest reform of the Financing System of the Autonomous Communities of common regime and Cities with Statute of Autonomy (AFS), set by Law 22/2009, of December 18, transferred Income tax collection to regional governments up to 50%, which set regional tax rates approved by each autonomous government (RIT)[5]. Previously, the RIT was studied through payments on account to the settlement of the AFS (Arner, 2021 and 2022). These works show that there are both vertical and horizontal externalities in reference to RIT. Subsequently, transfers and revenue sharing must internalize them. In addition, efficiency concerns mainly focused on taxation for entrepreneurs. Arner (2024) analyzes inefficiencies related to indirect taxation in the AFS.

This work aims to study the relationship between the regional Income Tax yield (RIT) and tax credits on contributions to private pensions (TBD). Also, externalities arise because regional tax rates differ across regional governments, even though the tax base is the same. The methodology consists of estimating a Dynamic Panel Data of the fifteen Autonomous Communities of the common regime for 2003-2022 using the Instrumental Variables (IV) estimator and its generalization, the Generalized Method of Moments (GMM). According to the results, the elasticity of RIT to tax TBD is negative at 0.19. Still, important variables such as the regional unemployment rate (RUR) and the regional debt-to-GDP ratio (RD) are considered. Besides, vertical and horizontal externalities are shown.

In addition to this introduction, this work consists of the following sections. Section 2 refers to the regional Income tax in Spain and fiscal incentives for private pensions. Section 3 reviews the economic literature on fiscal decentralization. Section 4 treats methodology, and section 5 presents the results. Main conclusions are in section 6.

## 2. THE INCOME TAX AND PRIVATE PENSIONS

### 2.1. The AFS

The AFS, set in 2009, increased the assignment of liquid collection from the RIT to 50% of the VAT and 58% of the Harmonized Excise Duties. Other incomes from regional tax capacity include the collection of traditional taxes transferred, 100% of the liquid collection of the Electricity tax, the complete collection of the Tax on deposits in credit institutions, and the Tax on landfilling, incineration, and co-incineration of waste[6]. In addition to basic financing, the AFS resources include the Guarantee Fund for Fundamental Public Services (GFFPS) and the Global Sufficiency Fund (GSF). New proposals, in 2026, increasing the assignments of RIT up to 55% and VAT up to 56.5%; besides modifying the GFFPS and GSF (De La Fuente, 2026). Another proposal is to partially forgive the debt of regional governments, which provide extraordinary resources by reducing interest payments. Forgiveness has been justified as compensation to regional governments because of inadequate aid from 2010 to 2013 (De la Fuente, 2025b).

Regional governments receive resources subject to settlement through monthly payments on account (POA), and 2 years later, the system is settled for the difference between the final values and the POA perceived[7]. RIT is the most important of the AFS subject resources to be settled (Table 1). The RIT's evolution is mainly due to Law 22/2009, which increased the RIT share from 33% to 50%, the tax rate approved by each Autonomous Community, because the 2008 financial recession negatively influenced it (Figure 1)[8].

3 It ranges from 3,9% to 4,6% (for employees aged 15-19 years old) to 27% to 27,5% (for employees aged 65-67 years old) of the salary, minus the state pension threshold.

4 That limit applies to the mandatory state pension, collective retirement schemes for selective professions, and basic pensions.

5 In this work, the terms Autonomous Community, Community, or Regional Government are used interchangeably.

6 Traditional taxes transferred are the Tax on patrimonial transmissions (TPT); the Tax on heritage (TH); Taxes on gambling and services affected by the services transferred; and the special Tax on transport registration (TTR).

7 Article 11 of Law 22/2009, of 18 December, establishes that each year, the Autonomous Communities will receive the financing corresponding to the POA concerning the resources subject to liquidation, which are the RIT, the assigned percentage of VAT, and special duties, the transfer of the GFFPS, and the GSF. The POA for the RIT, by Article 12 of Law 22/2009, determines based on the budgetary forecast of income from withholdings, payments on account of no declarants, and fractional payments from entrepreneurs.

8 According to the AFS set in 2001, the tax capacity of each Autonomous Community is defined by the Regional Income tax, corresponding to 33% of Income tax yield, the transfer of the liquid collection of 35% of the VAT, and 40% of the Harmonized Excise Duties (Law 21/2001, of December 27, which regulates the fiscal and administrative measures of the new financing system of the Autonomous Communities of the common regime and Cities with a Statute of Autonomy).

**Table 1: Total normative tax resources subject to settlement in 2023 (thousands €)**

| Tax | Total |
|---|---|
| RTR (1) | 62.547.316,30 (53.39%) |
| VAT (2) | 41.954.572,69 (35.81%) |
| Harmonized Excise Duties (3) | 12.648.672,26 (10.79%) |
| Total tax resources subject to settlement (4)=(1)+(2)+(3) | 117.150.561,25 |

Source: Ministry of Finance (2025a)

**Table 2: Final settlement of the AFS in 2023**

| Tax/Fund | Total |
|---|---|
| Final settlement of RIT (1) | 4.824.204,47 |
| VAT (2) | -230.997,31 |
| Harmonized Excise Duties (3) | -1.379.061,45 |
| Guarantee Fund for Fundamental Public Services (GFFPS) (4) | 405.972,00 |
| Global Sufficiency Fund (GSF) (5) | 75.870,94 |
| Final Settlement of the AFS resources (6)=(1)+….+(5) | 3.695.988,65 |
| Competitive Fund (7) | 4.978.594,22 |
| Cooperation Fund (8) | 2.941.565,75 |
| Final Settlement of the AFS resources and Convergence Funds (9)=(6)+(7)+(8) | 11.616.148,62 |

Source: Ministry of Finance (2025a)

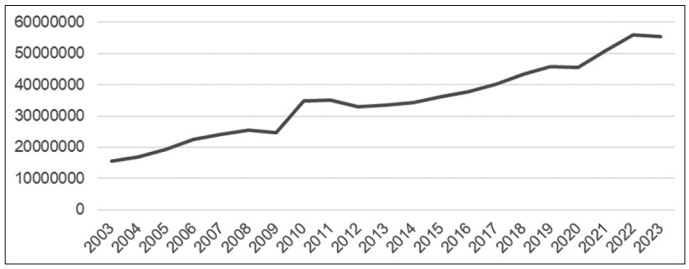
Other AFS resources include the Convergence Fund (CF), which aims to promote convergence in per capita income among Autonomous Communities, and the Competitiveness Fund, which adjusts per capita financing (Table 2)[9].

The AFS resources in the last years are a result the Covid-19 pandemic recession supposed to have increased spending and decreased regional governments' revenues; as in the 2008 recession, the State kept payments on account based on the forecast before the recession (De la Fuente, 2025a). Moreover, the State has assumed the cost of the COVID shock by providing additional resources outside the funding system through non-returnable transfers such as the Covid-19 Fund, special transfers, and the EU Recovery and Resilience Mechanism (RRM). Otherwise, those funds were mainly in 2021 and 2022. In 2023, most of them disappeared or were reduced by half in the RRM case (from 8.476 to 4.156 € million). Besides, in 2022, other income disappeared, including compensation due to the Immediate Information Supply System (ISS), forgiven negative settlements of 2020, and REACT EU funds, which Autonomous Communities received in 2021 and 2022[10].

## 2.2. Fiscal Incentives for Private Pensions in Income Tax

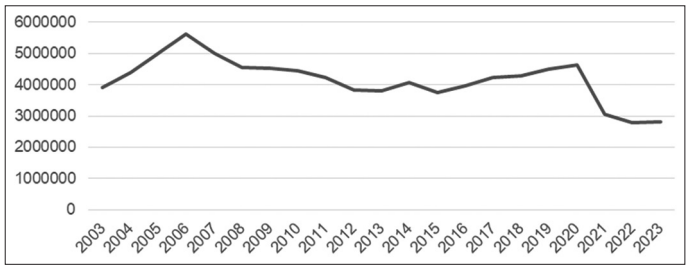
According to Law 35/2006, on Income tax, fiscal incentives for private pensions consist of tax credits in tax base; consequently, taxpayers or their employers make contributions to pension plans. The limit on tax credits applies in reference to employment and

**Figure 1:** Final yield of the regional income tax with regulatory capacity




Source: Ministry of Finance (2025a)

**Figure 2:** Tax credits in the income tax base




Source: AEAT (2025)

economic activities income (earnings), as well as the absolute contributions allowed for deferrals. Law 35/2006 eliminated the incentive that pension income, which is taxed as employment income, could be reduced by 40% under Law 40/1998, of December 9, on Income tax[11]. Subsequently, contributions and tax credits decreased from 2006. In 2015, due to the 2008 financial recession, contingencies for long-term illness or unemployment were introduced; consequently, tax credits on contributions to pension plans in RIT recovered until 2019[12]. However, the COVID-19 recession has affected this evolution to date, tax credits in 2023 lower than in 2003 (Figure 2).

Law 35/2006 increased the limit of tax credits to a minimum of 30% earnings or 10.000€, and taxpayers aged 50 years or older increased this limit to 12.500€[13]. Taxpayers can apply the excess contributions up to the following 5 years. Also, tax credits are for occupational plans called Insured Social Security Plans,

9 According to the new proposals from AFS, convergence funds are changed to the climate fund, VAT is moved from the small companies' fund, and the status quo fund (De La Fuente, 2026).

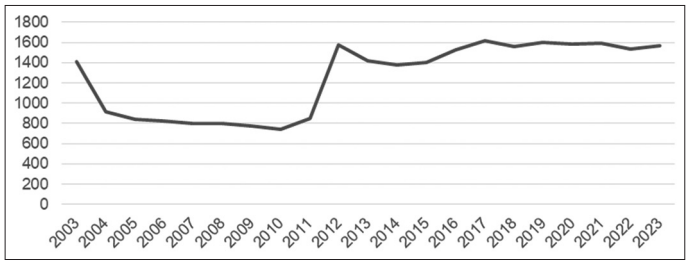
10 Because only eleven payments from VAT taxpayers were made in 2017.

11 A transitory regime was established for contingencies that occurred until 2006 or later (Transitional provision 12 of Law 35/2006 on Income tax).

12 Law 26/2014, of November 27, modifies Law 35/2006 and Law 1/2002 on pension plans. Transitional provision 12ª Law 35/2006 on Income tax set that for contingencies occurred from 2011 to 2014, the transitional regimen will be applied to income received until the eighth year from the contingency occurred, and for contingencies occurred in 2010 or previously, to income received until December 31, 2018.

13 In 1987, tax credits were with the limit of the minor between 15% (employment income and economic activities) or 3005,06€; also de excess (with the limit 4.507,59€) have a 15% deduction of the tax quote; from Law 18/1991 of June 6, on the Income tax such limits are 15% or 4.507,59€; Law 40/1998 of December 9, on the Income tax set such limits of 20% or 6.611,13€. Law 46/2002 of December 18 on partial reform of Income tax, modified the absolute limit to 8.000€ (increased for those 52 years old in 1.250€/year). Also, from that year, tax credits are on contributions to Mutual Societies, and the insurance is called Insured Pension Plans.

**Figure 3:** Contributions to mutual insurances, occupational pension plans and insured social security plans




Source: AEAT (2025)

which are defined-contribution (DC) plans. From January 01, 2013, introduced by Law 27/2011 of August 01, the limit of tax credits for employers' contributions to Private Dependency Insurance increased to 5.000€. From January 01, 2015, the spouse contributions increased to 2.500.

Law 26/2014 reduced State Income taxation; consequently, to promote equity for taxpayers financing public spending, the limit of tax credits decreased to a minimum of 30% earnings or 8.000€. Besides, under Law 26/2014, from January 01, 2025, participants in private pension plans can refund all rights accumulated, referred to as the 10-year contributions, which confer liquidity to pension plans. Nonetheless, payments from pension plans are taxed as employment income at the individual's marginal income tax rate, including lump-sum and annuity payments. Therefore, another employer, different from the main employer, pays such employment income, which is not subject to withholding until 15.876€.

In Spain, the evolution of contributions to occupational pension plans reached 30.430 million € in 2007 and, from 2020, remained constant at 35.681 million € (Figure 3)[14]. Otherwise, in the late 1990s, they accounted for 50% of total supplementary insurance and now account for around 25% of total private pensions. Furthermore, in the employed UE population, pension supplements range from 25% to 90%, whereas in Spain they are less than 10%. Subsequently, Law 12/2022, of June 30, introduced various measures to promote occupational pension plans, including a bonus in social insurance for contributions to private pensions. Employer's contributions are not subject to social security contributions, for common contingencies, up to the increase in the employer's quota, which corresponds to the employer's contributions to occupational pension plans.

Since 2021, Law 35/2006 on Income tax has sought to incentivize contributions to occupational pension plans by employers and employees. Meanwhile, the limit of tax credits decreased to a minimum of 30% earnings or 2.000€; it increased to 8.000€ for employers' contributions. Otherwise, spouse contributions decreased until 1.000€. From January 01, 2023, the limit of tax credits is the minimum of 30% earnings or 1.500€; if contributions are to employment plans, the absolute limit increases to 8.500€, and the employee's contribution depends on the employee's contributions[15]. Moreover, employers' contributions to occupational pension plans are tax-deductible company expenses; they can also deduct from corporate income tax 10% of their contributions to an occupational pension plan in favor of employees with an annual gross remuneration of less than 27.000€. Sectoral pension plans and simplified pension plans for individual entrepreneurs are developed.

## 3. LITERATURE REVIEW

The traditional theory of fiscal federalism established a general normative framework for assigning functions to different levels of government and for appropriate fiscal instruments to carry them out (Oates, 1999). Seminal works are from Olson (1956), Musgrave (1959), or Oates (1972). This review refers to the following topics: Tiebout's model, spillover benefits, labor mobility, and mobile capital. Finally, empirical assessments quantify externalities; also, the development of the local economy.

### 3.1. Tiebout's Model

Tiebout's model setting is that the decentralized provision of a public good, through households voting with one foot, is efficient (Tiebout, 1956). Tiebout's model assumes that there are no spillover benefits across jurisdictions, that consumers have location-independent incomes, and that consumers are perfectly mobile. In this model, the consumer-voter may be viewed as choosing the community that best satisfies his preference pattern for public goods. Subsequently, the greater the number of communities and the variance between them, the closer the consumer will come to fully realizing his preference position. However, if the cost of registering a community's demand should be recognized, it would imply introducing space into the economy.

The Tiebout model has been reconsidered when the utility an individual derives from a specific good or service depends on the size of the consumption group; in such cases, a club organization will supply the service efficiently, whereas the market will not (Buchanan, 1965). Berglas (1976) showed that, with both consumption externalities and increasing returns to scale, efficient equilibria require developers to know consumers' preferences when individuals with different tastes use facilities that provide the same quality of service. According to Scotchmer and Wooders (1987), competitive equilibrium may be mixed in clubs because of different tastes and different intensities of use, and every consumer achieves the utility he would achieve in a type-optimal segregated club.

### 3.2. Spillovers Benefits

Gordon (1983) described the types of externalities that a unit of government can create for nonresidents through both its public good and taxation decisions. It occurs, in particular, when the output and factor prices change in favor of residents, or when distributional

14 Also, contributions mainly occurred because individual contributions to such a system, public sector contributions to occupational pension plans, were forbidden from 2012 to 2018 because of the excess deficit procedure in Spain from 2009.

15 Employee's contribution does not exceed employer's contribution, which applies a coefficient that ranges from 2,5 (if employer´s contributions are less than 500€) to 1 (if employer´s contributions exceed 1.500€).

effects among non-residents are ignored. As a solution, the central government could coordinate local tax and expenditure policies, such as through revenue sharing and matching grants. Also, the Federal government would give relatively more in revenue sharing to communities where the efficiency (equity) gain would be largest. Wildasin (1991) proposed a system of matching grants from the federal government to state governments that neutralized the effect of migration on state redistribution policies.

In addition, Keen (1997) noted that federal structures raise the possibility of vertical tax externalities arising from concurrent taxation of the same tax base by state and federal governments. Subsequently, vertical transfers aim to avoid inefficiencies arising from tax base overlaps and externalities in horizontal relations between states, driven by efficiency concerns. Otherwise, high taxes on the same bases will lead to low taxes or possibly to subsidies on the same bases by the federal or State governments (Hoyt, 2001). Boadway et al. (1998) state that both federal and State potential bases are dependent on the extent of private sector activity; they also point out that regional governments compete away from redistributive objectives, known as horizontal externalities.

According to Oates (1999), in a system in which a set of unconditional grants serves revenue-sharing and perhaps equalization purposes, the grant's matching rates reflect the extent of benefit spillovers across jurisdictional boundaries. Dahlby and Wilson (2003) demonstrated that transfers, matching revenue grants, from the State to the federal government, or the opposite, would eliminate this vertical externality, given the marginal cost of public funds and its marginal social cost. Besides equalization grants, direct income transfers to or from lower levels of government are designed to equalize social marginal costs of funds across jurisdictions.

### 3.3. Labor Mobility

According to Eberts and Gronberg (1981), Tiebout's stratification hypothesis suggests a positive correlation between jurisdictional income homogeneity across the labor market and the degree of community fragmentation. Meanwhile, the empirical test of Rhode and Strumpf (2003) finds that, because of the secular decline in mobility costs, there should be a trend towards greater stratification; however, they find little evidence of it, and that, for voting with one's feet, communities became more alike.

Boadway and Tremblay (2010) discuss how to design a federal tax and transfer system to achieve an efficient allocation of resources in the presence of migration. Horizontal fiscal externalities arise to the extent that capital mobility or cross-border purchases of products can drive tax rates below their efficient levels as regions compete to attract scarce tax bases. They conclude that labor mobility increases transfers to achieve the second-best optimum; subsequently, it mitigates fiscal imbalance by reducing regions' tendency to overspend.

### 3.4. Mobile Capital

Mieszkowski and Zodrow (1989) conclude that the national system of property taxes is distortionary and decreases the overall return to capital by approximately the amount of taxes collected. Nowadays, there is evidence of consumer migration in response to different traditional public goods, such as exposure to pollution (Banzhaf and Walsh, 2008). Ogawa and Wildasin (2009) demonstrate in a tax-competition model that capital, the mobile taxed factor, generates harmful products, such as pollution, that spill across community borders. If spillover is imperfect, the community benefits from raising its tax, which drives capital away and reduces consumption of the harmful by product. Consequently, decentralized taxation is essential because competitive allocation of capital would equalize capital productivity across locations.

Opposite, Agrawal et al. (2022) proposed a centralized provision of the public good if jurisdictions attempt to avoid a loss of mobile capital, which confers a positive horizontal fiscal externality on neighbors by keeping the capital tax low, an outcome that leads to inefficient under-provision of the public good. Agrawal et al. (2024) argued that, in many countries, addressing economic inequality may best be left to national governments in the presence of mobility, but redistributive policy may also be viewed as a local public good. Besides, multilayered governance allows lower-level governments to foster citizen engagement and better set policies that align with voter preferences, but it also creates interjurisdictional externalities and spillovers.

### 3.5. Empirical Assessments

Empirical assessments have examined externalities in the tax policy design of income and sales taxes. Baltagi and Levin (1986) found that cigarette taxation will generate revenues even though there may be spillover effects to neighboring states where bootlegging is significant. As well, Besley and Rosen (1998) studied federal and State taxes on gasoline and cigarettes in the United States. Moreover, Devereux et al. (2007) studied vertical and horizontal competition in the US over excise taxes. Goodspeed (2000) examines vertical and horizontal externalities from local income taxes across 13 OECD countries. Esteller-Moré and Solé Ollé (2001 and 2002) referred to federal and State taxes for the Income tax and Sales tax. Finally, Hayashi and Boadway (2001) referred to the federal and provincial corporate taxes.

A review of journal articles examining the relationship between fiscal decentralization and economic growth for 2000-2023 concludes that effects differ across regions and are shaped by governance and institutional quality (Neupane, 2024). Positive effects are observed in Africa and OECD nations, especially from expenditure decentralization; meanwhile, in other regions, the effects are mixed and depend mainly on governance and institutional factors, as well as on resource inequality. Otherwise, Sen and Guangying (2024) quantify, in China, the degree of self-interest through the bias in expenditure structures, alternatively, through corruption. The main conclusion is that when local governments compete for self-interest, a biased structure of fiscal expenditure is created, skewed toward productive sectors and under-provisioning of people's livelihoods, such as science, education, culture, or health.

Few applied studies in developing countries showed that income tax decentralization is growth-promoting. Shahid and Kalim

(2020) in Pakistan; Suhyanto et al. (2021) in West Java Province; and Priyadi et al. (2021) in Yogyakarta Province. Finally, Maryanti et al. (2024) explore the impact of regional financial management on employment dynamics in Indonesia. This work concludes that regional finance plays an important role in driving economic growth and development, especially in creating jobs. Besides, the authors highlight the importance of moving to effective regional financial management to achieve employment goals. Aswan et al. (2025) suggest that regions with higher financial autonomy and effective asset management are more likely to attract productive financing, while heavy reliance on unconditional fiscal transfers may reduce perceived creditworthiness.

## 4. METHODOLOGY

### 4.1. Data and Methods

This work aims to examine the relationship between regional income tax yield (RIT) and tax credits in RIT from contributions to pension plans (TBD) through the fifteen Autonomous Communities of common regimen for 2003-2022. The variables used in the estimates and statistical sources are shown in Table 3.

In Spain, the Economics Ministry mandates that the Income tax collection corresponding to the t period is in July of the t+1 period, the final settlement of Income tax. Subsequently, it is in t+1 when tax credits are applied to the tax base, which is taxed at State and regional rates. Estimates from an autoregressive model can capture such circumstances. Besides, panel data estimation allows for controlling individual, unobservable effects correlated with other variables in the specification of an equation. The individual study of each cross-section does not allow for identifying these individual effects (Hausman and Taylor, 1981). According to Baltagi (2021), many economic relationships are dynamic in nature, and one of the advantages of panel data is that they allow the researcher to better understand the dynamics of adjustment.

However, Dynamic Panel Data regression is characterized by two sources of persistence over time. Autocorrelation is due to the presence of a lagged dependent variable among the regressors and individual effects characterizing the heterogeneity among the individuals. The LS estimators' inconsistency is because the orthogonality condition between the error term and the regressors is broken. Arellano and Bond (1991) proposed a Generalized Method of the Moments (GMM) procedure based on additional instruments obtained from the orthogonality conditions between lagged values of independent variables and disturbances. The introduction of instrumental variables (IV), uncorrelated with the perturbation and highly correlated with the explanatory variables, constitutes a reasonable solution to this problem. The GMM estimator is consistent, although it cannot be guaranteed to be efficient (Angulo and Mur, 2004).

**Table 3: Data definition and statistical sources**

| Variable | Definition | Statistical sources |
|---|---|---|
| EMP | Employment income in RIT | AEAT (2025) |
| ECON | Income from Economic Activities in RIT | AEAT (2025) |
| RD | The rate of regional debt and GDP | FEDEA (2025) |
| RIT | Regional Income tax with regulation | Ministry of Finance (2025a) |
| TBD | Tax credits from contributions to pension plans in RIT per taxpayer | AEAT (2025) |
| RUR | Regional Unemployment Rate | INE (2025) |
| RTR | Regional income tax rate (marginal rate to the regional income tax base average) | Ministry of Finance (2025b) |

### 4.2. Unit Roots Test and Cointegration

This section analyzes whether the variables used in the estimates are stationary, i.e., do not contain a unit root. The unit root test is first developed using the Levin-Lin-Chu t-statistic (LLC), with the null hypothesis, Ho, of a common unit root in the panel data, assuming cross-sections are independent (Levin et al., 2002). According to Baltagi (2021), if the variables are not stationary, panel data regression provides consistent parameter estimates as N and T→∞. Unit root tests assume the condition that N and T→∞. However, T increases faster than N, with N/T →0. Otherwise, LLC statistics should be used. Under the LLC test, if the AR(1) process is considered for a data panel, $Y_{it} = p_i Y_{it-1} + X_{it}\delta_i + \in_{it}$ where i = 1,2.,N and t = 1,2.,Ti, being pi = p common to all individuals, and $\in_{it}$ a white noise idiosyncratic process. If |pi.<1|, Yi is a weakly stationary process, if |pi.=1|, Yi contains a unit root.

Table 4 presents the unit root tests results, in first and second differences, considering an independent term and, therefore, the existence of individual effects for the variables RIT, TBD, ECON, and RTR. There are 15 individual sections. The maximum number of delays is selected automatically by the Akaike Information Criterion (AIC). Also, the null hypothesis, Ho, that the data panel has an individual unit root, assuming cross-sections are independent, is tested using the Im, Pesaran, and Shin W-stat (IPS), ADF-Fisher (ADF), and PP-Fisher (PP) tests. In these tests, the AR(1) process pi varies across individuals. According to Table 4, the existence of an individual unit root (IPS, ADF, and PP) is rejected for all the variables, in first and second differences, and considering an independent term.

However, the null hypothesis, Ho, of a common unit root in the panel, assuming cross-sections are independent, is accepted for all variables in the panel in first- and second-differences. Consistent with the Pedroni test, variables are cointegrated (Table 5). Nevertheless, the Ho hypothesis of no cointegration is rejected according to the Kao test (Table 6). It allows confirmation of the Pedroni cointegration test between dimension, because the Kao cointegration test assumes common AR coefficients. Consequently, there are no definitive conclusions about the cointegration of the variables, and panel estimates may be merely spurious.

### 4.3. Model Specification

The Dynamic Panel Data model, for the relationship between regional Income tax yield (RIT) and tax credits in RIT from contributions to private pensions (TBD), is proposed as follows,

$$RIT_{it} = \eta i + \alpha RIT_{it-1} + x_{it}^{'}\beta + v_{it} \quad (1)$$

$$v_{it} \sim iidN\left(0, \sigma_V^2\right)$$

**Table 4: Unit root tests**

| Variable/Test | LLC | IPS | ADF | PP |
|---|---|---|---|---|
| ECON | | | | |
| FD/ie (prob.) | −6.21933 (0.0000) | −3.16860 (0.0000) | 66.1511 (0.0000) | 155.122 (0.0000) |
| SD/ie (prob.) | −26.1234 (0.0000) | −22.3401 (0.0000) | 320.912 (0.0000) | 1182.75 (0.0000) |
| RIT | | | | |
| FD/ie (prob.) | −14.5396 (0.0000) | −11.4193 (0.0000) | 164.202 (0.0000) | 163.679 (0.0000) |
| SD/ie (prob.) | −24.5212 (0.0000) | −19.6480 (0.0000) | 279.542 (0.0000) | 1240.95 (0.0000) |
| RTR | | | | |
| FD/ie (prob.) | −14.5241 (0.0000) | −10.9015 (0.0000) | 147.669 (0.0000) | 182.081 (0.0000) |
| SD/ie (prob.) | −26.0190 (0.0000) | −22.2618 (0.0000) | 318.639 (0.0000) | 3306.03 (0.0000) |
| TBD | | | | |
| FD/ie (prob.) | −11.3699 (0.0000) | −7.70628 (0.0000) | 116.996 (0.0000) | 157.713 (0.0000) |
| SD/ie (prob.) | −23.0398 (0.0000) | −20.7408 (0.0000) | 332.952 (0.0000) | 685.099 (0.0000) |

FDie/SDie (Prob.): First/Second differences individual effects (probability)

**Table 5: Cointegration Pedroni test**

Pedroni cointegration test
Null hypothesis: No cointegration
No deterministic trend, automatic lag length based on AIC with a max lag of 2. Use d.f. corrected Dickey-Fuller residual variances
Alternative hypothesis: Common AR coefficients (within-dimension)

| Test | Statistic | P-value | Weighted stat. | p-value |
|---|---|---|---|---|
| Panel PP-statistic | −16.94748 | 0.0000 | −12.03151 | 0.0000 |
| Panel ADF-statistic | −9.974692 | 0.0000 | −8.821923 | 0.0000 |

Alternative hypothesis: Individual AR coefficients (between-dimension)

| Test | Statistic | p-value |
|---|---|---|
| Group PP- statistic | −26.24373 | 0.0000 |
| Group ADF-statistic | −10.18490 | 0.0000 |

**Table 6: Cointegration Kao test**

Null hypothesis: No cointegration
No deterministic trend, automatic lag length based on AIC with a max lag of 4

| Test | t-statistic | p-value |
|---|---|---|
| ADF | −18.56105 | 0.0000 |

Being a 3×1 vector of observations of the explanatory variables (TBD, ECON, RTR) in the individual *i*, and time *t,* and a white noise error term, being i = 1, 2...,15, the number of individuals considered in the period t = 1, 2...,20. The term $\eta i$ is the term for individual fixed effects.

Subsequently, the equation to be estimated is,

$$RIT_{it} = \eta i + \alpha RIT_{it-1} + \beta_1 TBD_{it} + \beta_2 ECON_{it} + \beta_3 LRTR_{it} + v_{it} \quad (2)$$

$$v_{it} \sim iidN\left(0,\sigma_V^2\right)$$

Table 7 presents a priori expectations for the signs of the estimated coefficients in equation (2). Table 8 shows estimates.

Moreover, variables used as potential instruments in RIT estimates are:

$RIT_{it-2}$: The variable $RIT_{it-2}$ is used as an instrument for the periods.

$EMP_{it}$: The taxpayer must obtain an EMP or ECON for tax credits in RIT due to contributions to a private pension. Consequently, both types of income -salaried or from self-employment- allow for tax credits. Subsequently, the variable employment income in RIT (EMP) is highly correlated with the variable TDB.

$RUR_{it}$: Decentralization consists of fiscal institutional arrangements that allow local governments to promote economic reforms and develop their local economies. It assumes that the regional unemployment rate (RUR) is highly correlated with ECON or EI under fiscal decentralization.

$RD_{it}$: If RTR is correlated with the error term, it can be because RTR is correlated between regions. Also, the regional debt-to-GDP (RD) ratio can influence the RTR set by the regional government to increase its fiscal capacity, and the two variables are highly correlated.

**Table 7: The a priori expectation sign**

| Variable | Coefficient | Sign |
|---|---|---|
| TBD | $\beta_1$ | Negative (−) |
| ECON | $\beta_2$ | Positive (+) |
| RTR | $\beta_3$ | Positive (+) |

**Table 8: Panel estimates 2003-2022**

| Variable | Coefficient | t-statistic | p-value |
|---|---|---|---|
| LRIT(−1) | 0.360433 | 11.83261 | 0.0000 |
| LTBD | −0.193966 | −10.75108 | 0.0000 |
| LECON | 0.313343 | 18.93941 | 0.0000 |
| LRTR | 1.015863 | 17.83017 | 0.0000 |

J-statistic: 14.71178, Prob (J-statistic): 0.196075, Instrument rank: 15

## 5. RESULTS

### 5.1. Estimates for RIT Panel

Table 8 shows the estimates from Dynamic Panel Data of the fifteen Autonomous Communities of common regimen for 2003-2022, using the Instrumental Variables (IV) estimator and its generalization, the Generalized Method of Moments (GMM). Furthermore, first differences are used to correct for fixed effects. The weighting matrix used is a white period matrix. The estimated panel includes 270 standard observations. Data are annual. All variables are defined in logarithmic terms, L constituting the logarithmic notation.

The main result is that all explanatory variables are significant at 5% significance level. Also, the sign of the coefficient $\beta_1$ is, as

expected a priori, negative, −0.1939; meanwhile, the sign of the coefficient $\beta_2$ and $\beta_3$, as expected, are positive, respectively, of 0.3133 and 1.0158. Consequently, the RIT is negatively influenced by tax credits, although RIT yield is inelastic to TBD, and highly elastic to RTR.

Accordingly, the RIT yield is 0.19% lower than it would be due to tax credits on contributions to pension plans, although they are an incentive to develop private pensions. Besides, the elasticity of RIT to the variable RTR join TBD is inelastic at 0.82. RIT is less elastic to RTR because the credit tax on contributions to pension plans are applied on the same central and regional base. Therefore, it implies vertical externality. Moreover, as the variable EMP, employment income, is used as an instrumental variable for TBD, the elasticity of −0.19 is an opportunity cost of taxation of payments from private pensions, equal to financial capital income.

In addition, the joint elasticity of RIT to ECON and TBD, at 11.94% (around 12%), reveals that entrepreneurs face inefficiencies, because of which regional governments have fewer resources to promote local development. Entrepreneurs bear over-taxation in Income tax; in addition, tax rates differ across communities. Moreover, horizontal externalities arise because tax credits are applied in t+1 to the tax base, which is taxed at State and regional rates. Consequently, taxpayers get different savings across communities on contributions to pension plans. Furthermore, pension plan payments, which are not subject to withholding until 15.876€, are taxed in t+1; subsequently, participants in pensions find tax different across communities.

### 5.2. Arellano-Bond Serial Correlation Test

Subsequently, in estimating GMM by IV, it is essential to assess the validity of the instrumental variables using the Arellano-Bond test for serial correlation (Arellano and Bond, 1991). The simplest model is an autoregressive specification of the form $y_{it} = \alpha_i y_{it-1} + \eta_i + v_{it}$ $|\alpha| < 1$; a random sample of $N$ individuals' time series is available; also, $T$ is small, and $N$ is large. It is assumed that there is a lack of serial correlation, but not necessarily independence over time. These assumptions allow for values of $y$ lagged two periods or more to be valid instruments in the equations in first differences. If $T \geq 3$ the model implies $m = (T-2)(T-1)/2$ linear moment restrictions $E\left(\bar{y}_{it} - \alpha \bar{y}_{i(t-1)}\right) y_{i(t-j)} = 0$ $(j = 2,\ldots\ldots,(t-1); t = 3,\ldots,T)$ where $\bar{y}_{it} = y_{it} - y_{i(t-1)}$. The aim is to obtain the optimal estimator of $\alpha$ as $N \to \infty$ for fixed $T$ based on these moment restrictions alone.

The test consists of two separate statistics: one for first-order correlation ($m_1$) and one for second-order correlation ($m_2$). The $m_2$ statistics test for the lack of second-order serial correlation in the first difference residuals. This will certainly be the case if the model errors are not serially correlated and if the errors in levels follow a random walk. Subsequently, the first-order statistics must be expected to be significant (with a negative autocorrelation coefficient) and the second-order statistics to be insignificant. Table 9 shows that the first-order statistic $m_1$ is significant at the 5% confidence level, while the second-order statistic $m_2$ is not. Therefore, the hypothesis of non-correlation in the first-order autoregressive AR(1) is accepted.

**Table 9: Arellano-Bond serial correlation test**

| AR | m-statistic | rho | p-value |
|---|---|---|---|
| AR (1) | -3.274509 | -1.570977 | 0.0011 |
| AR (2) | -1.777539 | -0.296627 | 0.0755 |

Moreover, the results indicate that the number of instruments (15) exceeds the number of estimated coefficients (Table 8). Following, the J-statistic, or value of the objective function GMM in the value of the estimated parameters, is used to contrast the null hypothesis of over-identification of the restrictions or the Sargan Test. The null hypothesis of over identification of restrictions is rejected based on statistic J of 14.71178 (**p-value:** 0.196075). Consequently, the validity of the instrumental variables in the RPIT panel estimates is contrasted enough. Subsequently, estimates for 2003-2022[16].

## 6. CONCLUSION

In Spain, Law 35/2006 on Income tax intensified incentives to make contributions to private pensions; however, it eliminated the 40% reduction in income from private pension payments, in force since 1998. Subsequently, tax credits on contributions to private pensions decreased; being less in 2023 than in 2003. The AFS set in 2009 establishes a Regional Income tax (RIT). Although tax credits equalize the tax base across State and regional governments, regional tax rates differ; therefore, savings from tax credits on contributions to pension plans and taxation of pension payments differ for taxpayers across communities.

This work aims to study the relationship between the regional Income Tax (RIT) yield and tax credits on contributions to pension plans (TBD). Estimates are based on Dynamic Panel Data of the fifteen Autonomous Communities of common regimen, using the instrumental variables (IV) estimator and its generalization, GMM, for 2003-2022. The main result is that the elasticity of RIT with respect to TBD is −0.1939. Consequently, the RIT yield is 0.19% lower than it would be due to tax credits on contributions to pension plans. Besides, the elasticity of RIT to the variable RTR join TBD is inelastic at 0.82. Therefore, RIT is less elastic to RTR; vertical externality exists because the credit tax on contributions to pension plans are applied on the same central and regional base.

In addition, the joint elasticity of RIT to ECON and TBD at 0.12 indicates that tax credits on contributions to private pensions increased inefficiencies supported by entrepreneurs. Horizontal externalities result in entrepreneurs bearing over-taxation in Income tax; also, because taxation differs across communities. Otherwise, more income for the regional government, they could use to promote economic growth. Moreover, horizontal externalities occur due to distributional effects generated by tax credits on contributions to pension plans for their taxpayers across communities.

16 Estimates, for 2003-2023, do not include using the same instrumental variables, but for the RD instrumental variable, a structural change occurs because atypical yields by regional governments disappeared. Consequently, the validity of the instrumental variables in the RIT panel estimates is not contrasted, nor are the panel estimates.

In Spain, the withholdings on employment income or fractional payments for economic activities income, set by the State, are the first issue that serves to eliminate distributional effects across communities. However, the final settlement of Income tax, when tax credits are applied to the tax base, occurs the following year at State and regional rates, which may be unknown and would generate distributional effects across communities. Besides, savings from tax credits on contributions to pension plans differ across communities. A new proposal by the AFS to provide more income to regional governments increases RIT assignments by 55% and VAT by 56.5%. As well as central transfers to regional governments are modified.

In addition, horizontal externalities occur due to distributional effects generated by payments from pension plans across communities. From January 01, 2025, participants in private pension plans can also refund all their rights accumulated, referred to as contributions 10 years old. An employer, different from the main employer, pays such employment income, which is not subject to withholding until 15.876€ and taxation differs through communities. Another proposal for the AFS is to partially forgive the debt of regional governments, which provides extraordinary resources by reducing interest payments. In Thibaut's model, interest payments might be included because they are payments for services currently used. Nonetheless, regional governments assume income, unlike RIT, which promotes economic activity in their regions.

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