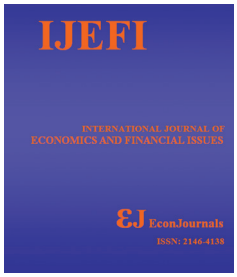

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# Subcentral Taxation in Spain

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**ABSTRACT**

The latest reform of the Financing System of the Autonomous Communities of the common regime (AFS) has deepened Spain's fiscal co-responsibility and financial autonomy. In the Personal Income Tax, the income transfer has been accompanied by a growing regulatory capacity, creating a regional personal income tax (RPIT). Subsequently, Autonomous Communities must approve yearly an autonomous rate. Regional governments get the RPIT income by monthly payments on account (POA) based on the budget forecast for the following year on fractional payments and withholdings. Subsequently, there is the corresponding final settlement two years later. This work aims to study the RPIT from the POA, considering the potential and current taxation to evaluate possible inefficiencies. The methodology consists of estimating a Dynamic Panel Data of the fifteen Autonomous Communities for 2003-2019, using Generalized Estimator of Moments (GMM). Results show that there was some degree of tax base overlap between levels of government in the Personal Income Tax. Besides, there was some type of reaction of the tax rate in one region to the tax rate of others. Consequently, the State transfers internalized vertical and horizontal externalities. In addition, efficiency concerns mainly were about taxation for entrepreneurs.

**Keywords:** Fiscal Decentralization, Transfers, Taxation, Externalities
**JEL Classifications:** H23, H24, H71

## 1. INTRODUCTION

According to Keen (1997), federal structures raise the possibility of vertical tax externalities between state and federal governments arising from the concurrent taxation of the same tax base by both governments. Concurrent taxation means that the tax rate set by one level of government is liable to affect the revenues of the other. To the extent that decision-makers do not internalize these effects, inefficiencies can arise. In addition, high taxes on the same bases at the local or state levels of government will lead to low taxes or possibly to subsidies on the same bases by the federal or state governments if they pursue coordinated policies (Hoyt, 2001). Moreover, both federal and state potential bases are dependent on the extent of activity of the private sector, which seems to make some degree of tax base overlap between levels of government and almost inevitable consequence of endowing both with real tax powers (Boodway et al., 1998). Besides, those authors point out that regional governments compete away regarding redistributive objectives, known as horizontal externalities.

In Spain, decentralization has its origin in a unitary state and was initially driven by spending needs. Currently, Spain is a leader in effective tax decentralization in the European Union, with regional revenues on which subcentral governments can modify tax rates and deductions discretionally behind Canada, Switzerland, the US, and Australia (Lago-Peñas and Martínez Vázquez, 2020). The latest reform of the Financing System of the Autonomous Communities of common regime and Cities with Statute of Autonomy (AFS) has been to deepen the fiscal co-responsibility and financial autonomy[1]. To the taxes initially assigned (traditional resources), sharing in the central taxes of the state, namely, personal income tax, VAT, and excise duties, have been added[2]. In the case of the personal income tax, the transfer

1 In Spain, Autonomous Communities or regional governments refer to a sub-national government. Meanwhile, the State is used as a federal government.

2 Traditional tax transferred are the Tax on Patrimonial Transmissions (TPT); Tax on Heritage (TH); Taxes on gambling and taxes affected by the services transferred; Tax on Retail Sales of Certain Hydrocarbons (TRSCH), and the Special Tax on Transport Registration (TTR).

has been accompanied by a growing regulatory capacity, creating a regional personal income tax (RPIT).

In 2001, by Law 21/2001, of 27 December, the Personal Income Tax was partially transferred to the regional governments, with the maximum limit of 33% of the total rate of the tax[3]. In this AFS, the autonomous communities have the regulatory power to establish the rate with the only progressive requirement and having the same number of sections as the State. The current AFS, approved in 2009, by Law 22/2009, of 18 December, establishes the assignment of 50% of the personal income taxation, and the Autonomous Communities must approve an autonomous rate (RTR), which must only comply with the requirement of being progressive[4]. The tax base is the same for the state personal income tax (SPIT) and RPIT; personal income taxation is the aggregate of the taxation for SPIT and RPIT.

Regional governments get resources from RPIT by monthly payments (POA) based on the budget forecast, for the following year *t*, on fractional payments (FP) of income of economic activities (IEA) and withholdings (WITH), from employment income (EI), IEA, and capital[5]. Subsequently, there is the corresponding final settlement for the difference between the amount of the final values of RPIT and POA. Economics Ministry mandates that the RPIT collection corresponding *t* is on July 25 of t+1. Consequently, in *t* should attend the collection of RPIT, corresponding to the settlement of RPIT in year t-1, namely CRP, and monthly POA to the yield of RPIT in *t*.

After the 2001 AFS reform, employment income (EI), the essential yield to the Personal Income Tax, presents different taxation in each Autonomous Community. In 2003, EI increased up to 0.04%, being 79,89% of the tax base, with an average income of €17,624. Besides, employment taxpayers increased up to 7.53%, being 89.02% of the Personal Income Tax taxpayers. However, in 2009, the employment taxpayers decreased to -0.6%, although EI reached 80.5% of the base tax. This trend kept going until 2016. Undoubtedly, this reduction is mainly attributable to the reduction in business income due to the great crisis that in 2008 affected the Spanish economy. In 2018, employees were 82.8% of the Personal Income Tax taxpayers, and the tax base from EI was 80.2% of the total, being the average income of €21,161. Withholdings from EI were 80% of total in 2002 and increased to 85.25% in 2018.

3 Law 21/2001, of 27 December, regulating the fiscal and administrative measures of the new financing system of the Autonomous Communities of common regime and Cities with Statute of Autonomy (B.O.E., of 31 December 2001, no. 313).

4 Law 22/2009, of 18 December, regulates the financing system of the Autonomous Communities of common regime and Cities with Statute of Autonomy (B.O.E., of 12 December 2009, no. 299).

5 Law 35/2006, on Personal Income Tax (B.O.E. of 29 November 2006, no. 285) establishes (Article 99.7) the obligation to make fractional payments (FP) to the Treasury for taxpayers who exercise economic activities. The quarterly FP of 20% of net yield is to Personal Income Tax. Besides, the effective rate of the FP is lower than the regulatory rate because taxpayers whose income has been subject to withholding or deposit on account of at least 70% in the previous year are excluded from this obligation. The payment for the first three quarters will be made between the 1st and 20th of April, July, and October. That of the fourth quarter, the 1st and 30th of January.

In addition, the income of individual entrepreneurs and professionals constitutes IEA in the Personal Income Tax, which is taxed differently in each Autonomous Community; meanwhile, corporate taxation is uniform throughout the national territory at the tax rate of 25%[6]. The reform of the AFS in 2001 meant a reduction of the IEA declared in the Personal Income Tax of 5.88%. In 2009, IEA subject to taxation decreased by 12.7 % compared to 2008, and the cumulative reduction is 39% to 2002. Besides, taxpayers decreased from 20% of the total in 2002 to 15.1% in 2018. Meanwhile, the tax base per taxpayer increased from €9,393.3 in 2002 to €10.709 in 2018.

This work aims to study the RPIT, the leading tax with regulatory power transferred to regional governments in Spain, from the POA. It is considering the potential and current tax power to evaluate possible inefficiencies. Concerning individual effects on the behavior of the autonomous community, geography or institutional features are noted. The methodology estimates a dynamic panel data of the fifteen autonomous communities from 2003 to 2019 by the Generalized Estimator of Moments (GMM). The transformation in first differences is applied to eliminate the individual fixed effects. Results show that in the actual AFS there were vertical and horizontal externalities because tax base is the same for the State and regional personal income taxation; also, RPIT linked with private sector activity. Besides, there was some type of reaction of the tax rate in one region to the tax rate of others. In addition, efficiency concerns mainly were about taxation for entrepreneurs.

The work consists of the following sections, in addition to this introduction. Section 2 refers to the review of economic literature. The RPIT is shown in Section 3. Methods and data are addressed in Section 4. The last section constitutes a discussion of the main conclusions of this work.

## 2. REVIEW OF ECONOMIC LITERATURE

### 2.1. Economic Features

The study of fiscal decentralization, defined as the sharing of economic responsibilities between a country's central government and regional and local governments, is carried out from the seminal works of Tiebout (1961), Olson (1956), and Oates (1972). According to the allocation of taxes in conventional theory, sub-central governments have mainly transferred revenues. Moreover, conventional theory considers the inefficiencies that arise since a local government ignores the effects of its decisions on the utility levels of nonresidents (Gordon, 1983). Inefficiencies are if nonresidents pay some taxes or receive some benefits, competition between local governments changes resource costs for public services; factor and output prices change to favor residents over nonresidents or because of spillovers. Finally, inefficiencies are if distributed effects among nonresidents are ignored.

6 In 2019, of 3,197,935 economic activities, they were business activities, 43.26%; professional activities, 26.59%; artistic, sports, and others, 1.06%; and agricultural and livestock, 29.07%. The attributable effective rate, defined as the ratio between the total full share and the total taxable base, is 21.74% for business activities. The effective rate for professional and artistic activities is slightly higher than 24%. The effective rate for agricultural and livestock activities is 11% (AEAT, 2022a).

A vertical fiscal externality occurs in a federation when the taxes or expenditures of one level of government affect the budget constraint of another level of government (Dahlby and Wilson, 2003). Transfers from the state to the federal government would eliminate that vertical externality by making the marginal cost of public funds to the state equal to its marginal social cost. The transfer direction depends on whether the state tax rate increases or decreases federal tax revenue. According to Keen (1997), eliminating this externality is to allocate all tax powers to just one level of government and finance the other by a vertical transfer. In this view, vertical transfers aim to avoid inefficiencies from tax base overlap. Besides, federal governments internalize fiscal externalities that may arise in horizontal relations between the states because of efficiency concerns.

Equalization grants to or from lower levels of governments are designed to equate social marginal costs of funds across jurisdictions (Keen, 1997; Dahlby and Wilson, 2003). Boadway et al. (1998) show that if one state increases its tax rate on a given base, its tax base will fall because of elasticity in the base supply and cross-border mobility. This loss in the tax base to neighboring states can be thought of as a horizontal fiscal externality. Moreover, those authors point out that vertical externalities may induce states to undertake too much redistribution, perceiving part of the revenue cost to be passed to the federal governments and thereby to other states, and it induces the states to set a lower tax.

Consistent with Zabalza (2020), essential features of fiscal decentralization processes in Spain are the degree of tax autonomy allocated to sub-central governments and the adequacy of the resources of the financing system. The main drawbacks are that tax competition and the export of the tax burden can lead to less than optimal public spending and higher compliance costs by taxpayers of different tax systems simultaneously. Transfers require a precise definition of fiscal effort and tax capacity of subcentral governments to avoid the resources received by subcentral administrations penalizing those who demand higher taxes (Granell and Fuenmayor, 2020). According to Pérez García (2020), resources always reach regional governments as transfers from the central government and, consequently, it is challenging to differentiate vertical and horizontal imbalances.

## 2.2. Applied Studies

Fiscal decentralization applied studies are regarding public investment, efficiency, and economic growth; they also relate to income decentralization and fiscal inefficiencies. Castells and Solé Ollé (2005) use a Dynamic Panel Data to analyze the main determinants of public investment in Spain (NUTS3) in transport infrastructures from 1987 to 1996. Moreover, the effect of fiscal decentralization of public revenues on infrastructure investment at the sub-national level is studied by Kappeler et al. (2013), estimating a panel of 20 European countries from 1990 to 2009.

Srithongrung and Sánchez-Juárez (2015) investigate the effects of taxes and public investment on the economic growth of 32 Mexican states for the period 1993 to 2011, using an Error Correction Model. According to the results, the taxing system at the subnational levels in Mexico is unlikely to be optimal, and the taxes' positive or negative net effect is likely the case. In turn, it depends on the pre-existing condition of the taxing system. If it is efficient in terms of having a broad base and being non-discriminatory, then there is no incentive for economic agents to change their behavior in terms of labor supply or consumption demands to avoid increased taxes. In the case of a sub-optimal taxing system, some groups have an incentive to avoid a tax burden by withdrawing labor supply or substituting the highly taxed goods with lower-taxed.

Consistent with Shahid and Kalim (2020), fiscal decentralization is one of the significant policy variables to attain economic efficiency. This study examines the impact of decentralized taxes on the economic growth of Pakistan from 1976 to 2018, addressed by an autoregressive distributive lag approach, after defining the problem of a unit root. The empirical results illustrate that income tax decentralization is growth-promoting in Pakistan. Also, the positive sign of interaction in tax decentralization and political institutions shows that these complement each other.

In addition, Suhuyanto et al. (2021) analyze the effect of intergovernmental transfer funds on district/municipality development performance in West Java Province by a panel data regression analysis for the period 2010 to 2016. It is based on regional autonomy and is intended to enhance the level of community involvement in the development process and the distribution of development outcomes relatively; in turn, transfer reaches most levels of government, achieving a fiscal balance. Besides, general block grants have the most significant impact on regional performance. Also, the the most significant indirect effect of transfer funds is education spending, followed by spending on goods and services.

Besides, Priyady et al. (2021) analyze the efficiency of local income of cities in Yogyakarta Province. Regional local income is considered an input in the local economic development that produces several outputs or public services and achieves prosperity and economic growth. Based on the results of data analysis using Data Envelopment Analysis on the level of efficiency of district/city revenue, the achievement of the level of efficiency of 100% is with privileged funds, namely funds whose object is correct efficiency deviation.

In the view of income taxation and inefficiencies produced by fiscal decentralization, Hewett et al. (1983) point out that the tax policies of jurisdictions between which there is tax competition affect the collection of state tax. This work also suggests that the best results for studies of tax competition between jurisdictions should be carried out through the game theory approach. Otherwise, Panda (2016) examines the economic and political determinants of transfers from central government to states through a panel for 22 States of India, from 1980-81 to 2010-11.

Goodspeed (2000) analyzes the impact of local governments' vertical and horizontal externalities of tax rates on a federation. The estimate is for 1975-1985 with a sample of 13 OECD countries. According to this work, an increase of 1% in the National Income

Tax tax rate implies a fall of 0.17% in the tax rate of the local Income Tax, which corresponds to elasticity of -0.5. The work of Hayashi and Boadway (2000) confirms the existence of vertical and horizontal externalities in corporate taxes established by provincial governments and the federal government in Canada. According to this work, while provincial tax rates respond negatively to the federal tax rate, at least some provinces increase their tax rates in response to increases in the tax rates of other provinces.

However, Esteller-Moré and Solé Ollé (2001, 2002) found positive reactions of regional tax to increases in the federal tax rate, also between competing provinces. They analyzed 2001 vertical externalities in the design of tax policy in the Personal Income Tax and the General Sales Tax in the United States in 1987-1996. The results show that the increase of 1% in the effective federal tax represents an increase of 0.10% in collecting the state income tax. This increase is 0.22% for the income tax and sales tax. In States where the deductibility of taxes at one level and another is reciprocal, the reaction is somewhat lower than the average. In 2002, those authors found, with data on Canadian personal income taxation for the period 1982-1996, that an increase of around 0.20% follows a 1% increase in the federal tax burden in the regional tax rates and a 1% change in the tax rates of competing provinces forces a change in the tax rate of one province of 0.3%.

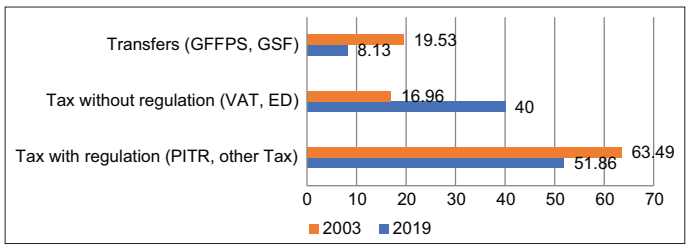
## 3. THE REGIONAL PERSONAL INCOME TAX

### 3.1. The AFS in 2009

The current AFS is characterized by the significant increase in State tax assignments concerning State taxes and regulation over assigned taxes, detriment of vertical transfers (Figure 1). Article 8 of Law 22/2009, of 18 December, defines tax capacity as the set of tax resources of each Autonomous Community in the base year. The collection by the regional government in 2007, without regulation, besides traditional tax transferred, are the RPIT, corresponding to 50% of said yield; the transfer of the liquid collection of 50% of the value added tax (VAT); the transfer of the liquid collection of 58% of the Harmonized Excise Duties (Tax on beer, wine, and fermented beverages; intermediate products, alcohol, and derived beverages; hydrocarbons and tobacco products); 100% of the liquid collection of the Electricity Tax, and the complete collection of the Tax on Deposits in Credit Institutions (IDEC).

The basic financing of the AFS since 2009, besides tax capacity, is constituted by the Guarantee Fund for Fundamental Public Services (GFFPS) and the Global Sufficiency Fund (GSF). The evolution of the basic financing of the AFS in 2019 is shown in Table 1[7]. Besides, other resources of the AFS Convergence funds (CF), which aim to promote convergence between autonomous communities in terms of per capita income, are the Cooperation Fund and, to adjust per capita financing, the competitiveness Fund.

**Figure 1:** AFS resources evolution (%)




Own source

The GFFPS is constituted by 75% of the theorist tax revenues of the autonomous communities, distributed each year in proportion to their spending needs (SN). The operation of the GFFPS generates horizontal flows of transfers between regions. The transfer of guarantee, which each community pays or receives, is the difference between its contribution to the GFFPS (75% of regional theorist collection for assigned taxes) and participation in the Fund by the adjusted population[8]. Consequently, also Autonomous Communities have 25% of the theorist regional tax revenues that are not integrated into the GFFPS. The GSF, or vertical core funding for each region in the base year, is the total net funding of the difference between actual and theorist collection for assigned taxes prior to the Convergence Funds and the Global Financing Needs (GFNs) for 2009. In the base year, the FS ($FS_{i0}$) is established and evolves according to the so-called ITEn, defined as the State tax revenues corresponding to the no transferred tranches of Personal Income Tax, VAT, and Excise Duties[9].

Different topics of the current AFS are noted should be objected to reform. Zabalza (2020) points out that the great recession of 2008 and the current mechanism of updating the model have generated significant levels of under-financing, with the consequent increase in the indebtedness of the communities. Consistent with Herrero (2021), the stock of public debt of the autonomous communities reached 23.7% of GDP in 2019, far exceeding the limit of 13% established in the Budget Stability Law, highlighting the greater vulnerability of the autonomous communities to face the crisis of 2020, than that of 2008[10]. Moreover, according to López Laborda and Zabalza (2011), the horizontal equity of the model, based on the principle of equalization of fiscal capacity, is not maintained over time with the established updating mechanism. In addition, De la Fuente (2021) proposed the creation of a complementary leveling fund financed entirely with state resources, which would be intended to supplement the income of those Autonomous Communities that are below the average in terms of financing per adjusted inhabitant.

### 3.2. The POA

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 RPIT, the assigned percentage of VAT,

7 Last year for which final settlement data are available.

8 The adjusted population of each region considers demographic and geographical variables that affect the demand and unit costs of providing the essential public services of autonomous ownership. In addition, each exercise is applied with updated values of the population and the other distribution variables.

9 GITEnt is the variable's cumulative gross growth rate of ITEn in the base year and t.

10 Law 2/2012, of 27 April, of Budgetary Stability and Financial Sustainability.

**Table 1: The basic funding in 2019 (Million euros)**

| | Tax capacity [1] | GFFPS [2] | GSF [3] | Theorist core funding [4]=[1]+[2]+[3] |
|---|---|---|---|---|
| Cataluña | 23,484 | −1,468 | 782 | 22,798 |
| Galicia | 6,256 | 1,540 | 602 | 8,398 |
| Andalucía | 17,057 | 4,842 | 506 | 22,405 |
| Asturias | 2,610 | 371 | 188 | 3,169 |
| Cantabria | 1,603 | 61 | 495 | 2,159 |
| La Rioja | 813 | 88 | 215 | 1,116 |
| Murcia | 3,156 | 773 | −203 | 3,726 |
| Valencia | 12,334 | 1,196 | −1,459 | 12,072 |
| Aragón | 3,731 | 219 | 280 | 4,230 |
| C.-La Mancha | 4,339 | 1,292 | 80 | 5,710 |
| Canarias | 2,316 | 2,952 | 450 | 5,243 |
| Extremadura | 1,985 | 914 | −706 | 3,350 |
| Baleares | 3,744 | −364 | −683 | 2,673 |
| Madrid | 24,242 | −4,344 | −763 | 19,135 |
| Cast. y León | 6,105 | 1,018 | 437 | 7,560 |
| Total 2019 | 113,775 | 9,090 | 979 | 123,844 |
| Total 2018 | 108,509 | 8,972 | 947 | 118,248 |
| Variación % | 7.61% | 1.31% | 3.37% | 4.51% |

Source: MH (2022b)

and special duties, the transfer of the GFFPS and the GSF. The corresponding final settlement is for the difference between the final values and the POA perceived (Table 2).

The POA for the RPIT, by Article 12 of Law 22/2009, determines based on the budgetary forecast of income from WITH, payments on account of no declarants (ND), and FP by the equation,

$$POAi\ (t) = BFT\ (t) * Uc_{RTRi}(t/ly) * 0.98 \quad (1)$$

Being,
POAi (t): the annual amount of the State's advance must pay to the Autonomous Community *i* in the concept of payment on account of the yield in year *t* of the RPIT.
BFT (t): the amount of the Personal Income Tax budget forecast for year *t* for WITH, ND, and FP.
$Uc_{RTRi}$ (t/ly): the coefficient of update or expected increase for the autonomous rate of the tax of the Autonomous Community *i*, between the last year (*ly*) with final settlement practiced and year *t*.

The update index, $Uc_{RTRi}$(t/ly), is used to distribute the amount of BFT (t) among the Autonomous Communities and is the result of applying three reasons. The first reason is defined as the ratio of the regional and State liquid quotas (plus ND) of the community *i* on the total of Autonomous Communities. The second reason measures the effect of the regulatory measures adopted by each Autonomous Community. The third reason weighs the discrepancy between the total liquid contributions (plus ND) and the net recognized rights for FP, WITH, and ND settled both last year.

The amount of the POA is made effective for each Autonomous Community monthly. The final settlement is determined in t+2; it is for the difference between the final value of the RPIT and the POA received. By Article 26.2 of Law 22/2009, of 18 December, the definitive settlement of the RPIT is determined by the amount of the liquid quotas of the residents in the territory of the Autonomous Community (Table 3). Criticisms of the functioning of the POA (CERRFM, 2017, Manzano, 2020) refer to the temporary gap between the time in which the regulatory decisions in the regional personal income tax are approved by the autonomous communities (t) and those that the economic effect is perceived by the regional finances and the citizens (t+2). In addition, they refer to the divergences between the estimates of the yield transferred and the final yield received by the autonomous communities. According to Cuenca (2016), that system destabilized the income stream of the autonomous communities.

**Table 2: Tax resources subject to settlement in theorist terms in 2019 (Million euros)**

| | RPIT [1] | VAT [2] | ED [3] | [4]=[1]+[2]+[3] |
|---|---|---|---|---|
| Cataluña | 10,211.26 | 7,109.44 | 2,683.15 | 20,003.85 |
| Galicia | 2,344.22 | 2,108.84 | 923.66 | 5,376.73 |
| Andalucía | 5,578.49 | 6,135.36 | 2,424.62 | 14,138.48 |
| Asturias | 1,014.74 | 843.00 | 336.60 | 2,194.34 |
| Cantabria | 550.96 | 506.09 | 210.62 | 1,267.67 |
| La Rioja | 322.86 | 257.13 | 102.43 | 682.38 |
| Murcia | 1,029.13 | 1,068.24 | 548.49 | 2,645.96 |
| Valencia | 4,229.66 | 4,100.53 | 1,605.42 | 9,955.61 |
| Aragón | 1,365.63 | 1,144.80 | 549.60 | 3,070.04 |
| C.-La Mancha | 1,381.24 | 1,471.95 | 785.66 | 3,638.86 |
| Canarias | 1,592.32 | | 78.31 | 1,670.63 |
| Extremadura | 595.92 | 705.84 | 384.97 | 1,686.73 |
| Baleares | 1,295.51 | 1,410.90 | 447.62 | 3,154.04 |
| Madrid | 12,300.32 | 6,892.80 | 1,683.19 | 20,876.32 |
| Cast. y León | 2,160.20 | 2,014.01 | 1,007.92 | 5,182.14 |
| Total 2019 | 46,002.43 | 35,768.96 | 13,772.39 | 9,5543.78 |

Source: MH (2022b)

## 4. METHODS AND RESULTS

This work evaluates the RPIT based on the POA. First, POA estimates are from potential income tax by considering the regional GDP (RGDP) and RTR. Second, POA estimates are from current income tax in *t* using the variables FP, WITH, and CRP. Estimates in both models are by a Dynamic Panel Data of

the fifteen Autonomous Communities for 2003-2019, using the estimator of instrumental variables (IV) and its generalization by the generalized estimator of moments (GMM). Data are annual. The transformation in first differences is used to correct fixed effects. The definition of the variables used in GMM estimations and statistical sources are shown in Table 4.

One of the main advantages of panel data estimation is 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). The inclusion of dynamic structures in a standard panel equation reinforces the persistence of this type of model since the unobservable individual effect, random or fixed in nature (ηi), is added to the inertia induced by the autoregressive mechanism of the equation (Angulo and Mur, 2004). The LS estimators' inconsistency is because the orthogonality condition between the error term and the regressors is broken. 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.

## 4.1. Unit Roots and Cointegration

Working with time series panel data, suppose that the endogeneity characteristic of the regressors, as well as correlation and heteroscedasticity of the residues, are joined with fixed and random effects. According to Baltagi (2021), if variables are not stationary, panel data regression provides a consistent estimate of the parameters when N and T→∞. Unit root tests assume the condition that N and T →∞. However, T increases faster than N, with N/T →0. Table 5 presents the unit root test results, in first and second differences, considering an independent term and, therefore, the existence of individual effects for the variables POA, RGDP, RTR, FP, WITH, and CRP (Table 5). The number of individual sections is 15. The maximum number of delays is selected automatically by Akaike Information Criterion (AIC).

The null hypothesis, Ho, of a common unit root in the data panel considering cross-section are independent (Levin statistic, Lin & Chu t-statistical) are accepted for all the variables in the panel, in first and second differences, at the significance level of 5%[11]. Meanwhile, the existence of an individual unit root (Im, Pesaran, Shin W-stat, ADF-Fisher Chi-square, and PP-Fisher Chi-square) is rejected for all the variables, except for RGDP and FP in first differences, at the significance level of 5%. Nevertheless, there are no definitive conclusions about cointegration between variables; meanwhile, variables are cointegrated consistent with the Pedroni test, and that hypothesis is rejected according to the Kao test (Tables 6 and 7). It allows confirmation for -between dimension- of the Pedroni cointegration test because the Kao cointegration test considers common AR coefficients.

11 If the AR(1) process is considered for a data panel, $Y_{it} = p_{i\,Yit\text{-}1} + X_{it}\,\delta_i + \varepsilon_{it}$, where i = 1,2,….,N and t = 1,2,….,Ti. If |pi.<1|, Yi is a weakly stationary process, if |pi.=1|, $Y_i$ contains a unit root. The Levin, Lin, and Chu test considers pi = p common to all individuals. This test is recommended when N and T are reduced. In the Im, Pesaran, Shin W, Fisher-ADF, and Fisher-PP tests, pi varies between individuals.

## 4.2. Panel Data Estimation

### *4.2.1. The POA from potential income tax*

POA constitutes monthly payments on account of the yield of RPIT in *t* and is first explained from potential regional income taxation considering RGDP and RTR.

The econometric model defined is,

$$POA_{it} = \eta i + \alpha POA_{it-1} + x_{it}^{'}\beta + v_{it} \quad (2)$$

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

Being $x_{it}^{'}$ a 3 × 1 vector of observations of the explanatory variables (RGDP, RTR) in the individual *i* and time *t* and a white

**Table 3: Final settlement of the RPIT in 2019 (Million euros)**

| | RPIT [1] | POA [2] | Final Settlement [3]=[1]–[2] |
|---|---|---|---|
| Cataluña | 10,573 | 9,690 | 883 |
| Galicia | 2,368 | 2,198 | 170 |
| Andalucía | 5,685 | 5,204 | 481 |
| Asturias | 1,021 | 1,012 | 9 |
| Cantabria | 549 | 583 | 16 |
| La Rioja | 315 | 302 | 13 |
| Murcia | 1,048 | 948 | 100 |
| Valencia | 4,315 | 3,944 | 371 |
| Aragón | 1,427 | 1,356 | 72 |
| C.-La Mancha | 1,372 | 1,286 | 86 |
| Canarias | 1,508 | 1,391 | 117 |
| Extremadura | 625 | 604 | 21 |
| Baleares | 1,319 | 1,166 | 153 |
| Madrid | 11,664 | 10,604 | 1,060 |
| Cast. y León | 2,077 | 1,998 | 79 |
| Total | 45,867 | 42,236 | 3,631 |

Fuente: MH (2022b)

**Table 4: Data definition and statistical sources**

| Variable | Definition | Statistical sources |
|---|---|---|
| EI | Employment income | AEAT (2022b) |
| IEA | Income from economic activities | AEAT (2022b) |
| ETR | The effective tax rate is defined as the rate between total FP and an average IEA | AEAT (2021c) |
| FP | Fractional payments by entrepreneurs | AEAT (2021c) |
| RGDP | GDP regional in market prices | INE (2021) |
| CRP | Collection of RPIT | AEAT (2022b) |
| CRPwr | Collection of RPIT without regulation | FEDEA (2021) |
| POA | Monthly payments on account to RPIT | MH (2021b) |
| RTR | Regional tax rate (marginal rate to the regional average of IE+IEA) | MH (2021c) |
| STR | State tax rate (marginal rate to the average of IE+IEA) | Personal Income Tax Law |
| WITH | Withholding on EI, IEA, and capital | AEAT (2022c) |

**Table 5: Unit root test**

| Test | First diferencies statistic | Probability | Second differences statistic | Probability |
|---|---|---|---|---|
| POA | | | | |
| Ho: assumes common unit root process | −18.8311 | 0.0000 | −6.6302 | 0.0000 |
| Levin, Lin & Chu | | | | |
| Ho: assumes individual unit root | −19.8182 | 0.0000 | −13.5859 | 0.0000 |
| process | 269.997 | 0.0000 | 193.287 | 0.0000 |
| Im, Pesaran, Shin W-st | 272.797 | 0.0000 | 276.310 | 0.0000 |
| ADF-Fisher Chi-square | | | | |
| PP-Fisher Chi-square | | | | |
| RGDP | | | | |
| Ho: assumes common unit root process | −2.1294 | 0.0166 | −13.7610 | 0.0000 |
| Levin, Lin & Chu | | | | |
| Ho: individual unit root | −1.2154 | 0.1121 | −9.7129 | 0.0000 |
| Im, Pesaran, Shin W-st | 30.9570 | 0.4175 | 135.604 | 0.0000 |
| ADF-Fisher Chi-square | 29.1778 | 0.5083 | 136.908 | 0.0000 |
| PP-Fisher Chi-square | | | | |
| RTR | | | | |
| Ho: common unit root | −11.6588 | 0.0000 | −21.8748 | 0.0000 |
| Levin, Lin & Chu | | | | |
| Ho: individual unit root | −8.4427 | 0.0000 | −16.8314 | 0.0000 |
| Im, Pesaran, Shin W-st | 110.329 | 0.0000 | 229.670 | 0.0000 |
| ADF-Fisher Chi-square | 110.430 | 0.0000 | 376.998 | 0.0000 |
| PP-Fisher Chi-square | | | | |
| FP | | | | |
| Ho: common unit root | −5.8059 | 0.0000 | −12.7347 | 0.0000 |
| Levin, Lin & Chu | | | | |
| Ho: individual unit root | −2.4841 | 0.0000 | −8.6861 | 0.0000 |
| Im, Pesaran, Shin W-st | 44.0608 | 0.0471 | 126.375 | 0.0000 |
| ADF-Fisher Chi-square | 41.7175 | 0.0757 | 203.313 | 0.0000 |
| PP-Fisher Chi-square | | | | |
| WITH | | | | |
| Ho: common unit root | −6.8790 | 0.0000 | −17.9431 | 0.0000 |
| Levin, Lin & Chu | | | | |
| Ho: individual unit root | −5.5096 | 0.0000 | −14.4377 | 0.0000 |
| Im, Pesaran, Shin W-st | 81.6647 | 0.0000 | 195.133 | 0.0000 |
| ADF-Fisher Chi-square | 79.2056 | 0.0000 | 256.298 | 0.0000 |
| PP-Fisher Chi-square | | | | |
| CRP | | | | |
| Ho: common unit root | −15.6071 | 0.0000 | −14.2250 | 0.0000 |
| Levin, Lin & Chu | | | | |
| Ho: individual unit root | −11.2536 | 0.0000 | −11.2640 | 0.0000 |
| Im, Pesaran, Shin W-st | 157.753 | 0.0000 | 162.479 | 0.0000 |
| ADF-Fisher Chi-square | 229.757 | 0.0000 | 387.853 | 0.0000 |
| PP-Fisher Chi-square | | | | |

noise error term, being i = 1, 2,…,15, the number of individuals considered in the period t = 1, 2,…,15. The term ηi is the term for individual fixed effects.

The estimates of the Dynamic Panel Data are for the period 2003-2019, being the endogenous variable the POA of the fifteen Autonomous Communities, using the IV estimator and its generalization by GMM. Data are annual. The transformation in first differences is applied to eliminate the individual fixed effects. The weighting matrix used is a white period matrix. The estimated panel includes 225 standard observations. In addition, to the autoregressive of the endogenous variable, *POA (-1)*, the variables *RGDP* and *RTR* are used. All variables are defined in logarithmic terms, L constituting the logarithmic notation.

Instruments: The autoregressive of the endogenous variable, *LPOA (-2)*, *LCRPwr, LEI, LSTR,* and *LIEA* are considered potential instruments for GMM estimates. L constituting the logarithmic notation in estimates. In Dynamic Panel Data estimates, LPOA (−2) constitutes an instrument for LPOA (−1) in the right hand of the equation. Besides, because the RPIT varies with the total regional income, the variable LRGDP should be correlated with the error term. Consequently, the variable LCRPwr is used as an instrument because POA is payments on account considering such regulatory capacity. Also, the primary sources of income, but individually considered; namely, LEI and LIEA, are used as an instrument. However, the order of instruments is essential for estimates, and previously to LIEA, estimates used LSTR. If the variable LRTR is correlated with the error term, it should be because LRTR is correlated between regions. Moreover, using LSTR as an instrument should be justified because, in the Personal Income Tax, the base tax is the same for SPIT and RPIT. Subsequently, estimates consider the overlap in the base tax

**Table 6: Cointegration test (POA, RGDP, RTR)**

| Pedroni Cointegration test | | | | |
|---|---|---|---|---|
| Null: No cointegration | | | | |
| No deterministic trend, automatic lag length based on AIC with a max lag of 2 | | | | |
| Alternative hypothesis: Common AR coefficients (within-dimension) | | | | |
| | Statistic | P-value | Weighted statistic | P-value |
| Panel PP-statistic | −13.6628 | 0.0000 | −9.9712 | 0.0000 |
| Panel ADF-statistic | −13.9581 | 0.000 | −10.1893 | 0.0000 |
| Alternative hypothesis: Individual AR coefficients (between-dimension) | | | | |
| | Statistic | P-value | | |
| Group PP- statistic | −15.5167 | 0.0000 | | |
| Group ADF- statistic | −15.2202 | 0.0000 | | |
| Kao Cointegration test | | | | |
| Null hypothesis: No cointegration | | | | |
| No deterministic trend, automatic lag length based on AIC with a max lag of 3 | | | | |
| Hypothesis | t- statistic | | P-value | |
| ADF | −2.7644 | | 0.0029 | |

**Table 7: Cointegration test (POA, FP, WITH, CRP)**

| Pedroni Cointegration test | | | | |
|---|---|---|---|---|
| Null: No cointegration | | | | |
| No deterministic trend, automatic lag length based on AIC with a max lag of 3 | | | | |
| Alternative hypothesis: Common AR coefficients (within-dimension) | | | | |
| | Statistic | P-value | Weighted statistic | P-value |
| Panel PP-statistic | −22.8357 | 0.0000 | -20.7995 | 0.0000 |
| Panel ADF-statistic | −5.2917 | 0.0000 | -4.8304 | 0.0000 |
| Alternative hypothesis: Individual AR coefficients (between-dimension) | | | | |
| | Statistic | P-value | | |
| Group PP- statistic | −33.4924 | 0.0000 | | |
| Group ADF- statistic | −5.7905 | 0.0000 | | |
| Kao Cointegration test | | | | |
| Null hypothesis: No cointegration | | | | |
| No deterministic trend, automatic lag length based on AIC with a max lag of 3 | | | | |
| Hypothesis | t-statistic | | P-value | |
| ADF | −9.9986 | | 0.0000 | |

in personal income tax; also, there is some type of response in the tax rate of one region to the others.

According to Arellano and Bond (1991), in the estimation of GMM by IV, it is essential to contrast the validity of the instrumental variables; this is the null hypothesis of no correlation with the error term. The $m_2$ statistic contrasts the absence of second-order serial correlation, AR (2), in the residues, from the equation in the first difference. It occurs if the error term in the level model is not correlated but also if the error term has a unit root. According to Table 8, at the confidence level of 10%, the first-order statistic is significant and, therefore, the hypothesis of non-correlation in the first-order autoregressive AR(1) is accepted, while the $m_2$ statistic is not significant. Moreover, according to the results, the number of instruments (16) is greater than the number of estimated coefficients. Therefore, 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. Finally, the null hypothesis of overidentification of restrictions is rejected according to statistic J.

Subsequently, the equation to be estimated is,

$$LPOA_{it}=\eta i+\alpha LPOA_{it-1}+\beta_1 LRGDP_{it}+\beta_2 LRTR_{it}+v_{it} \quad (3)$$

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

Being *i* the notation of the autonomous community *i* and *t* the year.

The relationship between the variables LPOA and LPOA (−1) is expected to be direct because POA is calculated from the budget prevision, for the following year (t), on FP and WITH, and taking into account the update coefficient $Uc_{RTRi}$ (t/ly). The expected sign of the $\beta_1$ coefficient is positive because LRGDP positively affects taxation, consequently, LPOA. Besides, the expected sign of the $\beta_2$ is positive because it is supposed to be a direct relationship between LRTR and LPOA.

The results show that all the explanatory variables in the data panel are significant, according to the t-statistic at the significance level of 5% (Table 8). In turn, the sign is expected regarding the coefficient

**Table 8: Panel generalized method of moments (transformation: First differences)**

| Dependent variable: $LPOA_{it}$ | | | |
|---|---|---|---|
| Sample adjusted: 2005-2019 | | | |
| Periods included: 15 | | | |
| Cross-sections included: 15 | | | |
| Total panel (unbalanced) observations: 225 | | | |
| White period-instrument weighting matrix | | | |
| White period (cross-section cluster) standard errors & covariance (d.f. corrected) | | | |
| Instrument specification: @DYN LPOA(-2), LCRPwr, LEI, LSTR, LIEA | | | |
| Constant added to instrumental list | | | |
| **Variable** | **Coefficient** | **t-statistic** | **P-value** |
| LPOA(−1) | 0.4589 | 253.2860 | 0.0000 |
| LRGDP | 1.0918 | 77.8374 | 0.0000 |
| LRTR | 0.5798 | 6.9536 | 0.0000 |
| **Effects specification** | | | |
| **Cross-section fixes (first diferences)** | | | |
| Instrument rank: 16 | | P-value: 0.4572 | |
| J-estadístico: 12.8781 | | | |
| **Arellano-Bond Serial Correlación Test** | | | |
| **Test order** | **m-statistic** | **Rho** | **P-value** |
| AR (1) | −1.8329 | −4.4816 | 0.0668 |
| AR (2) | 0.8488 | 2.1565 | 0.3960 |

of the autoregressive LPOA (−1). The sign of $\beta_1$, as expected, is positive up to 1.09. Consequently, the POA for the settlement of RPIT is linked directly to the economic activity; a 1% increase in LRGDP suppose a 1.09% increase in LPOA. The sign of $\beta_2$ is the expected positive; the elasticity of LPOA to LRTR is up to 0.5798.

The results, consistent with Boodway et al. (2001), show some degree of tax base overlap between levels of government, State and regional governments, which endow both with real tax power. In addition, regarding RTR, regional governments undertake too much redistribution, which induces them to set a lower tax. Besides, possible inefficiencies will arise if vertical transfers do not internalize them. Acording to Keen (1997), State transfers should internalize fiscal externalities that arise in horizontal relations because of efficiency concerns.

### *4.2.2. The POA from income tax power*

Subsequently, POA is explained considering current resources for the Treasury from the Personal Income Tax in *t*, that is, the payments on account to budget forecasting to determine POA, namely FP and WITH on EI, IEA, and capital, which is the most important EI. Besides, CRP completes current income in *t* from RPIT.

Moreover, being ETR, the effective tax rate for FP,

$$FP=IEA*ETR \quad (4)$$

If T is the taxation for the Personal Income Tax,

T = SPIT + RPIT

Consequently, ETR is an estimate of the T tax rate of the IEA taxpayer,

$$FP=IEA*(STR+RTR) \quad (5)$$

Therefore, all fiscal variables, *ETR*, *RTR*, and *STR*, are considered to estimate POA from current taxation.

The econometric model defined to explain POA from real is,

$$POA_{it} = \eta i + \alpha POA_{it-1} + x_{it}^{'}\beta + v_{it} \quad (8)$$

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

Being $x_{it}^{'}$ a 3 × 1 vector of observations of the explanatory variables (FP, WITH, and CRP) in the individual *i* and time *t* and $v_{it}$ a white noise error term, being i = 1, 2,…,15, the number of individuals considered in the period t = 1, 2,…,15. The term ηi is the term for individual fixed effects.

Estimates use the IV estimator and its generalization by GMM for 2003-2019. Data are annual. The transformation in first differences is applied to eliminate the individual fixed effects. The weighting matrix used is a white period matrix. The estimated panel includes 15 periods and 15 individual sections, with 225 standard observations. In addition, to the autoregressive of the endogenous variable, POA (-1), the variables FP, WITH and CRP are used. All variables are defined in logarithmic terms, and L constitutes the logarithmic notation.

Subsequently, the equation to be estimated is,

$$LPOA_{it}=\eta i+\alpha LPOA_{it-1}+\beta_1 LFP_{it}+\beta_2 LWITH_{it}+\beta_3 LCRP_{it}+v_{it} \quad (6)$$

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

Being *i* the notation of the autonomous community i and *t* the time.

The relationship between the variables LPOA and the autoregressive LPOA (−1) is expected to be direct because POA is calculated from the budget prevision, for the following year (t), on FP and WITH, and taking into account the update coefficient $Uc_{RTRi}$ (t/ly). The expected sign of the $\beta_1$ is negative because is supposed LFP negatively affected POA, being a payment on account of the settlement of the Personal Income Tax. However, the expected sign is positive for $\beta_2$, considering LWITH positively affects LPOA. The expected sign of the $\beta_3$ is positive because it is supposed to be a direct relationship between LPOA and LCRP.

Instruments: The variables used as an instrument are *LPOA (-2), LIEA*, *LETR*, *LRTR*, and *LSTR*. L constituting the logarithmic notation in estimates. In the Dynamic Panel Estimates, LPOA (−2) constitutes an instrument for LPOA (−1) in the right hand of the equation. LFP and LWITH variables should be correlated with the error term because they are payments on account of budget forecasting to determine POA. The variables used as instruments for LFP are LIEA also LETR. Besides, LCRP should be correlated with the error term because LPOA (−1) is used on the right side of the equation. Instruments for LWITH, and LCRP, are all tax

**Table 9: Panel generalized method of moments (transformation: First differences)**

| Dependent variable: LPOA | | | |
|---|---|---|---|
| Sample adjusted: 2005-2019 | | | |
| Periods included: 15 | | | |
| Cross-sections included: 15 | | | |
| Total panel (unbalanced) observations: 225 | | | |
| White period-instrument weighting matrix | | | |
| White period (cross-section cluster) standard errors & covariance (d.f. corrected) | | | |
| Instrument specification: @DYN (POA, -2), LIEA, LETR, LRTR, LSTR | | | |
| Constant added to instrumental list | | | |
| **Variable** | **Coeficient** | **t-statistc** | **P-value** |
| LPOA (−1) | 0.5602 | 53.5497 | 0.0000 |
| LFP | −0.1712 | −9.6283 | 0.0000 |
| LWITH | 0.5151 | 25.5767 | 0.0000 |
| LCRP | 0.2365 | 13.7968 | 0.0000 |
| **Effects specification** | | | |
| **Cross-section fixes (first differences)** | | | |
| Instrument rank: 17 | | P-value: 0.2680 | |
| J-statistic: 15.6595 | | | |
| **Arellano-bond serial correlación test** | | | |
| **Test order** | **m-statistic** | **rho** | **P-value** |
| AR (1) | −2.1117 | −5.7234 | 0.0347 |
| AR (2) | 1.1843 | 2.5715 | 0.2363 |

rates applied in the Personal Income Tax, namely, LRTR and LSTR. Using LSTR as an instrument should be justified because, in the Personal Income Tax, the base tax is the same for SPIT and RPIT. Subsequently, estimates consider the overlap in the base tax in Personal Income Tax. Also, using LRTR as an instrument is justified because there is some type of response in the tax rate of one region to the others.

Consistent with Table 9, at the confidence level of 5%, the first-order statistic is significant and, therefore, the hypothesis of non-correlation in the first-order autoregressive AR(1) is accepted, while the $m_2$ statistic is not significant. Moreover, according to the results, the number of instruments (17) is greater than the number of estimated coefficients. Therefore, 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 Sargan test. Finally, the null hypothesis of overidentification of restrictions is rejected according to statistic J.

The results show that all the explanatory variables in the data panel are significant, according to the t-statistic at the significance level of 5% (Table 8). In addition, the sign is expected regarding the coefficient of the autoregressive LPOA (−1) up to 0.5602. The coefficient $\beta_1$, negative at -0.1712, supposed that LFP negatively affects LPOA. Agree with Hoyt (2001), a coordinated policy pursued by different levels of government will lead to low taxes or possible subsidies. Besides, the sign of $\beta_2$ is the expected, positive up to 0.51; therefore, LWITH positively affects LPOA. Moreover, the sign of the $\beta_3$, is the expected positive, up to 0.2365. Otherwise, the net effect of LFP and LCRP on POA is 0.065.

The results, consistent with Boodway et al. (1998), show that State and regional bases are dependent on the extent of activity of the private sector, which seems to make some degree of tax base overlap between levels of government and almost inevitable consequence of endowing both with real tax powers. Besides, as those authors point out, regional governments are competing away regarding redistributive objectives, known as horizontal externalities.

## 5. CONCLUSIONS

The reforms of the AFS in 2001 and 2009, which established a regional rate of taxation for the Personal Income Tax, is the leading tax with regulatory capacity assigned to the Autonomous Communities. The reform of the AFS has meant that taxation for employment income is different through communities. Besides, taxation of the IEA is by a progressive tariff; it is also established by the sub-central government each year, unlike the corporate taxation that taxes with a proportional tax rate and equals throughout the national territory the companies' income. The Autonomous Community gets regional personal income taxation through the monthly regional payments on account (POA). They are calculating from the budget prevision, for the following year (t), on fractional payments (FP) by entrepreneurs and withholdings on EI, IEA, and capital (WITH) and taking into account the index of update $Uc_{RTRi}$ (t/ly). Subsequently, in the year when all the outstanding values of the regional personal income taxation are known, regional governments receive the corresponding final settlement (t+2). The main drawbacks of this system are the time lag between the moment regional governments use their regulatory capacity in the Personal Income Tax (RPIT) and the moment in which governments and citizens notice these effects. Moreover, the gap between the resources of the POA and the final settlement of the RPIT.

The study of the RPIT is carried out by estimating a Dynamic Panel Data of the POA of the fifteen Autonomous Communities, taking first differences to correct the fixed effects. First, it considers the potential taxation from GDP (LRGDP) and the regional tax (LRTR). The overall significance of the model makes it possible to affirm the existence of fixed effects in Autonomous Communities. The main results were that the POA is linked to the economic activity, the elasticity of LPOA to LRGDP, up to 1.09. Also, the elasticity of LPOA to LRTR was 0.58. According to the results, there was some degree of tax base overlap between levels of government in the Personal Income Tax. Besides, there was some type of reaction of the tax rate in one region to the tax rate of others. Consequently, State transfers internalized vertical and horizontal externalities. However, it should be noted that the null hypothesis of no correlation of instrumental variables with the error term is accepted at the confidence level of 10%.

Secondly, the LPOA is explained from tax power in t using LFP, LWITH, and the collection of RPIT in t (LCRP). The main results are LFP negatively affect LPOA, being the elasticity of LPOA to LFP negative up to -0.17; meanwhile, it is positive to LWITH up to 0.51. Finally, the elasticity of LPOA to LCRP is up to 0.2365. Nevertheless, the net effect of LFP and LCRP is 0.06. Consequently, real tax power is mainly from withholdings; negative efficiency concerns mainly concern taxation for entrepreneurs. In addition, there is some tax base overlap and the reaction of the tax rate in

one region to the tax rate of others. Thar results are accepted being the null hypothesis of no correlation of instrumental variables with the error term accepted at the confidence level of 5%. In the current AFS, the GFFPS and GSF internalize vertical and horizontal externalities; however, some weak points, indeed the increase of the indebtedness of regional governments or the POA, have been taken into account reform AFS.

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