

TECHNICAL DOCUMENT ON VARIABILITY OF TAX REVENUE

TECHNICAL DOCUMENT 2/23

June 7th, 2023



Independent Authority
for Fiscal Responsibility



Independent Authority
for Fiscal Responsibility

The mission of the Independent Authority for Fiscal Responsibility, AAI (AIReF) is to ensure strict compliance with the principles of budgetary stability and financial sustainability enshrined in Article 135 of the Spanish Constitution.

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1. INTRODUCTION

In 2022, tax revenue¹ hit an all-time high, exceeding €255bn, a 14.4% rise on the figure for 2021, despite the regulatory measures taken to mitigate escalating prices, which it is estimated had a negative impact of €8.24bn on revenue².

In terms of the different taxes, Personal Income Tax (PIT) contributed almost half of this increase, Corporate Income Tax (CIT) 17% and Value Added Tax (VAT) a little over 30%, despite the reduction in the rate introduced for energy products. For their part, Special Taxes and Other tax revenue barely account for an increase of 5% of total revenue, affected by the reduction in the rate of the Special Tax on Electricity and the suspension of the Tax on the Value of Electricity Production.

AIReF has performed an exercise in the breakdown of the variability of the main taxes with a view to quantifying the different factors that have led to the increase in revenue to serve as the basis to analyse the structural and contextual nature of this increase.

The method used for this analysis is based on the premise that tax revenue is determined by the existing relationship between the tax base, the effective rate and the cash-accrual adjustments. Relevant variables in the macro-

¹ Tax revenue managed by the State Tax Administration Agency (AEAT) before transfer to the ARs.

² Relating to the reduction of the VAT rates on electricity and gas, on the Special Tax on Electricity and the suspension of the Tax on the Value of Electricity Production (TVEP) in cash terms.

economic scenario are also considered when their evolution is related to that of the tax bases associated with the main taxes and the impact of the regulatory measures approved on taxation are taken into account.

The evolution of tax collection is thus determined by:

- The relationship between the macroeconomic scenario and the tax bases, both in terms of their real component and their price component.
- The average effective rate.
- The regulatory measures approved on taxation in each of the years analysed.
- The collection structure inherent to each tax, taking into account cash-accrual adjustments from the collection mechanics.

Consequently, the variability factors are classified in six categories: (i) real, (ii) prices, (iii) tax rates, (iv) regulatory measures, (v) other and (vi) unexplained variability.

The study is carried out in a detailed and independent fashion for each of the main taxes: PIT, VAT, CIT, Special Taxes as a whole and Other tax revenue.

The time scope of the analysis refers to tax collection recorded in the period 2019-2022 and AIRcF's forecasts for 2023 contained in its Report on the Stability Programme Update 2023-2026.

The main results of this technical document have been published in Box 4 of the Report on the Stability Programme Update 2023-2026³, published by AIRcF on May 11th, 2023.

The document is structured in three sections. Section One sets out the breakdown between the real component and the price component obtained for the tax bases. Section Two analyses the elasticities of the bases in relation to the macroeconomic variables that affect their evolution. Section Three sets out the breakdown of the variability of the revenue, including the six categories described above, breaking down the results by tax. The annex provides more detail of the results and of the breakdown performed.

³ [Report on the Stability Programme Update 2023-2026](#)

2. RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND TAX BASES

The core analysis focuses on the breakdown of the variability of the tax bases relating to the main taxes in regard to the underlying macroeconomic variables. By means of these relations, the real evolution component or volume of the price component is broken down, using earner data and earnings from the Tax Agency for PIT while AIReF's forecasting models are used for VAT and CIT on their respective tax bases.

2.1. Wage and pension bases of PIT

In the case of PIT, the breakdown is based on the existing relationship between the tax bases, the number of earners and average earnings. Given that the base can be deducted by means of the multiplicative relationship between the number of earners and average wages⁴ (1), their variation can be defined by means of the sum of the variations of these two components (2), such that the real variability is established between the variation in the number of

⁴ The average wage variable is taken from the series of "Average earnings" published by the AEAT in its statistics on Sales, Employment and Wages at Large Companies and SMEs (Spanish acronym: VESGEP).

earners and the variability due to prices through the variation of average earnings.

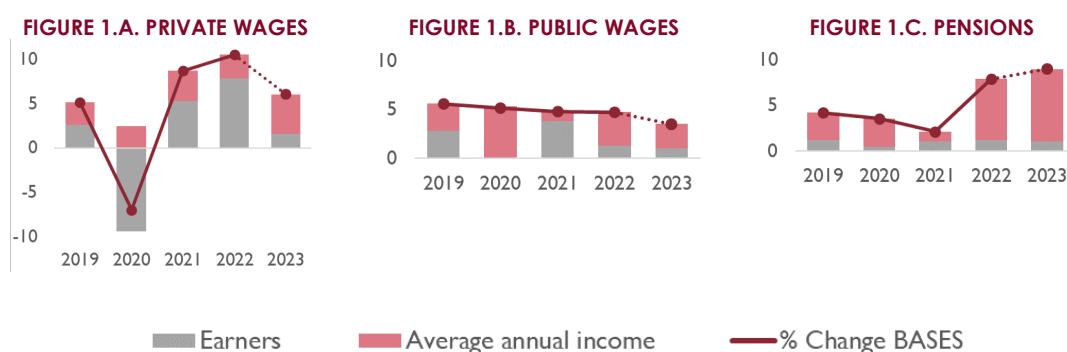
$$BASE = \text{Perceptores} \times \text{Salarios medios} \quad (1)$$

$$\Rightarrow \Delta BASE = \Delta \text{Perceptores} + \Delta \text{Salarios medios} = \Delta \text{Real} + \Delta \text{Precio} \quad (2)$$

Accordingly, the tax bases of PIT associated with public and private wages and pensions are broken down in terms of volume and prices. In particular, the real variability is obtained by means of the evolution of public and private employment and the number of pensioners respectively, while the variability of prices includes the effects of the increase in average wages of public and private workers and of the average pension for the respective bases under consideration. This information is available from the Tax Agency. The following results can be deduced from the foregoing:

- For the **private wage base**, the growth in the number of earners has been the main factor in the variation up to 2022, while the main contribution to growth in the forecasts for 2023 shall be determined by the increase in average wages.
- The variation in the **tax base relating to public wages** shows that it was the public sector that sustained revenue under PIT for 2020; in 2021, growth was mainly recorded from the increase in employment, while in 2022 the increase was due to the wage rise of civil servants, which will also be reflected in 2023.
- For its part, the **pension base** in 2022 and 2023 reflects the effect of the pension increase through growth in the average pension, including in 2022 the additional effect of the compensation payment in 2021.

Figure 1. TAX BASES IRPF (%VAR)



Source: AEAT, estimates and prepared by AIRcF

2.2. Consolidated tax base of Corporate Income Tax

The consolidated tax base of Corporate Income Tax is modelled according to the Gross Operating Surplus. The breakdown is based on an error correction model (ECM) for the annual tax base of Corporate Income Tax that uses the gross operating surplus (GOS) as an explanatory variable (3). The difference between the variability observed for the base and the variability of the estimate of the base itself by means of this model is considered to be unexplained variability (4). The part of the variability explained by the model (3) is broken down between the real component and the price component by means of the breakdown of the GOS (5). To obtain this, the GOS is the difference between GDP net of taxes and production and import subsidies and the compensation of employees (see ANNEX III). Accordingly, the base of Corporate Income Tax is broken down as the sum of these three variability components that reflect the real variation due to volume, the variation due to prices and the unexplained variation for the model (6).

$$d\log(BI) = c1 * d\log(EBE) + c2 * error_correction \quad (3)$$

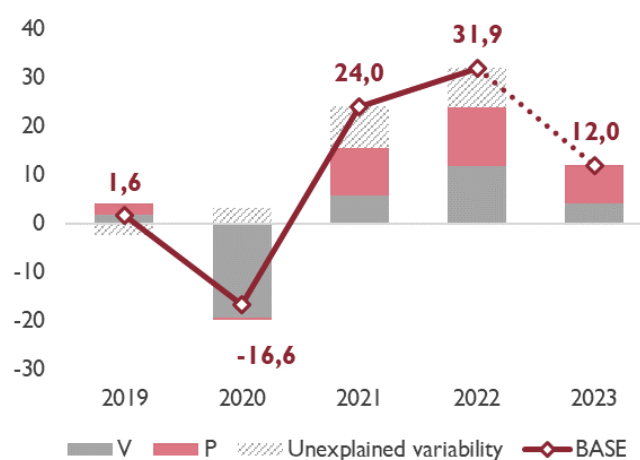
$$\Delta Not_explained = \Delta BI - \Delta \hat{BI} \quad (4)$$

$$\Delta \hat{BI} = \Delta REAL + \Delta PRECIOS \quad (5)$$

$$\Delta BI = \Delta REAL + \Delta PRECIOS + \Delta Not_explained \quad (6)$$

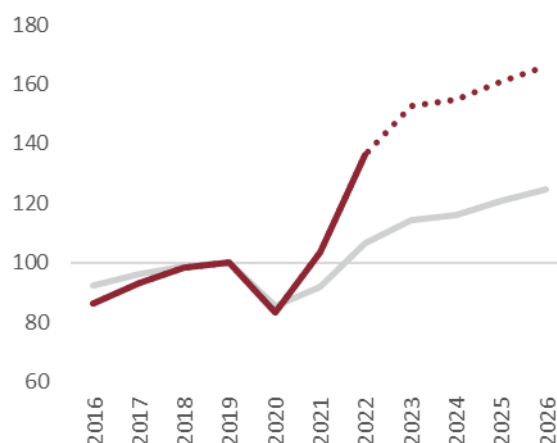
From this breakdown, it can be deduced that the drop-in activity in volume terms in 2020 explains the variation in the tax base of Corporate Income Tax for that year, while as from 2021 price growth becomes more significant. In fact, a higher price increase is observed in 2021 in economic activity than in wages, which would justify higher business profits due to the price rise. In 2021 and 2022, the tax base records a more intense rise than the GOS, which increases the unexplained variability component. In 2023, lower growth and a greater weight of the price component is estimated.

Figure 2. CORPORATE INCOME TAX BASE (% CHANGE)



Source: AEAT, estimates and prepared by AIReF

Figure 3. EVOLUTION OF CORPORATE INCOME TAX BASE VS. GROSS OPERATING SURPLUS (2019=100)



2.3. Final Expenditure Subject to VAT

The breakdown of the tax base of VAT, or Final Expenditure Subject to VAT (Spanish acronym: GFSI), is based on a predictive model according to national demand. By means of an error correction model, the quarterly variation of the tax base is modelled using the real component of national demand (DN_V) and its deflator (DN_P) as explanatory variables (7). The difference between the rate of change observed and that of the model estimate (7) is considered to be the unexplained variability (8). The variability explained by this model is broken down between the real component and the price component by means of the change in these explanatory variables and the factors stemming from the coefficients of the model (9). Consequently, the VAT base is broken down into three variability components that reflect the real

change, the change due to prices and the unexplained variability of the model (10).

$$Dlog(BI) = c0 + c1*dlog(DN_V) + c2*dlog(DN_P) + c3*error_correction \quad (7)$$

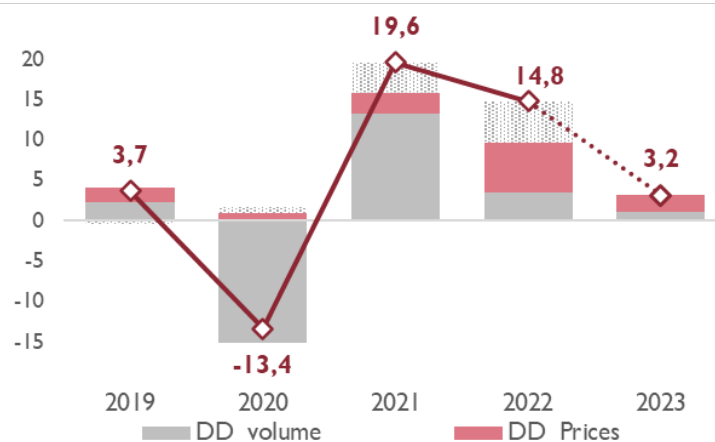
$$\Delta Not_explained = \Delta BI - \Delta \hat{BI} \quad (8)$$

$$\Delta \hat{BI} = \Delta REAL + \Delta PRECIOS \quad (9)$$

$$\Delta BI = \Delta REAL + \Delta PRECIOS + \Delta Not_explained \quad (10)$$

From this breakdown, it can be deduced that the fall in national demand of volume in 2020 and its recovery in 2021 explains most of the variability in these years, while in 2022 the growth in prices is the factor that most affects the increase in Final Expenditure Subject to VAT, while the volume component slows over the course of the year. Furthermore, following the fall experienced during the pandemic, VAT grew by more than the national demand, which increases the unexplained variability component in 2021 and 2022. In 2023, it is expected that the growth of the base will slow down, although the price component will continue to have a greater weight on growth.

Figure 4. FINAL EXPENDITURE SUBJECT TO VAT (% CHANGE)



Source: AEAT, estimates and prepared by AIReF

Figure 5. **EVOLUTION OF FINAL EXPENDITURE SUBJECT TO VAT VS. DOMESTIC DEMAND (2019Q4=100)**

FIGURE 5.A. FESV VS NOMINAL DOMESTIC DEMAND NOMINAL

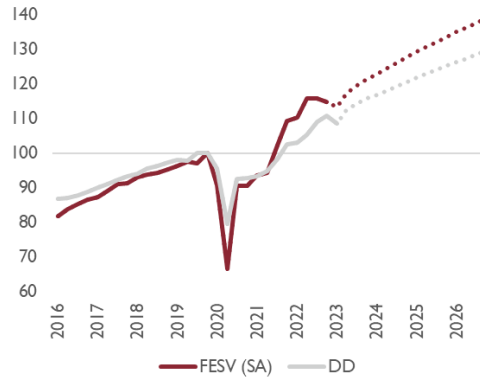


FIGURE 5.B. FESV VS. THE DOMESTIC DEMAND DEFLATOR

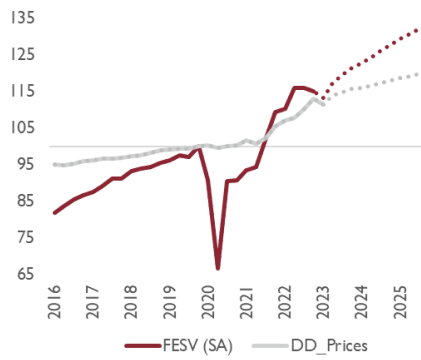
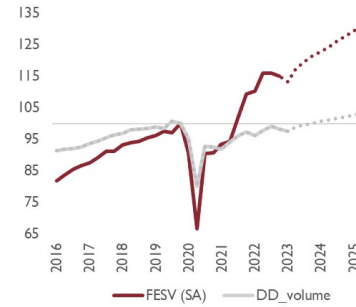


FIGURE 5.C. FESV VS. REAL DOMESTIC DEMAND



Source: AEAT, estimates and prepared by AIReF

3. ELASTICITIES

The tax bases of each of the main taxes can be explained in macroeconomic terms by means of the evolution of certain aggregates included in the national accounts that constitute a good theoretical approximation of each of the taxes analysed, which allows us to deduce the relationship between the change in the tax revenue and the change in the economic variables they depend on, in other words, their elasticity. Although this theoretical elasticity is a static value that constitutes an average estimate (see Annex v), the observance of data over time shows that the ratio between the change in the collection of each tax and the macroeconomic variable that leads to it presents fluctuations (changes in greater or lower collection than in the economic variables) that may respond to the following factors, among others:

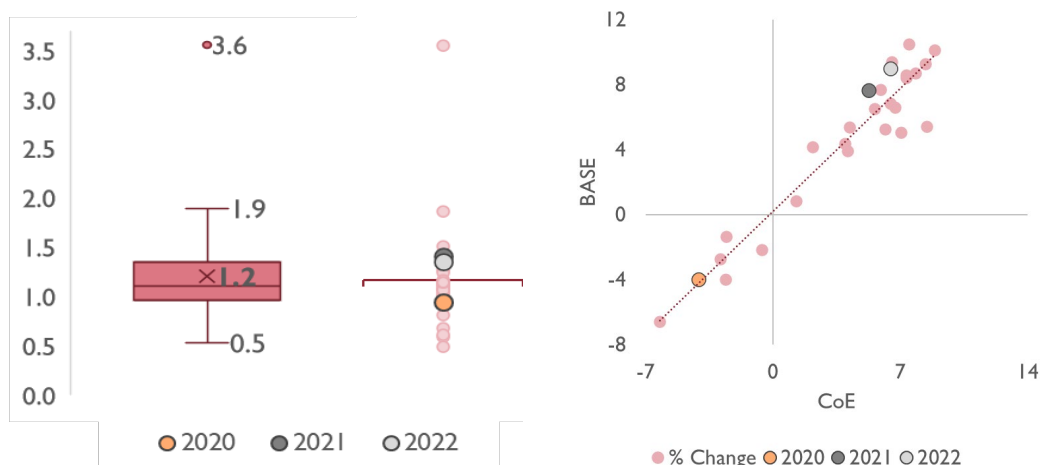
- Changes of composition in the markets or in consumption that are reflected with different intensity in tax collection than in the macroeconomic variables which lead to changes in the average tax rates or have implications for certain reductions and deductions.
- Changes in tax fraud conduct that would lead to variations in collection that would not be reflected in the macroeconomic variables.
- Approval of regulatory measures that introduce tax amendments which, in addition to a direct quantitative impact on revenue, may generate additional changes in the conduct of different agents, affecting the variations in collection that would not necessarily be reflected in the macroeconomic variables.

These fluctuations generate greater volatility in the time evolutions of the elasticities that are reflected in a greater dispersion with the presence of atypical values that affect the comparability of the results. For this reason, the comparisons are performed regarding the average historical values. The averages calculated separate the period prior to the financial crisis (from 1996 to 2007) from the period of the crisis (from 2008 to 2014), and the period prior to the pandemic (from 2015 to 2019) from the recent years on which the analysis is focused (2020, 2021 and 2022).

Figure 6. **PIT: DISPERSION OF THE ELASTICITY OF WAGE BASES WITH RESPECT TO COMPENSATION OF EMPLOYEES AND THEIR RATES OF CHANGE**

FIGURE 6.A. ELASTICITY

FIGURE 6.B. YEAR-ON-YEAR CHANGE (% CHANGE)

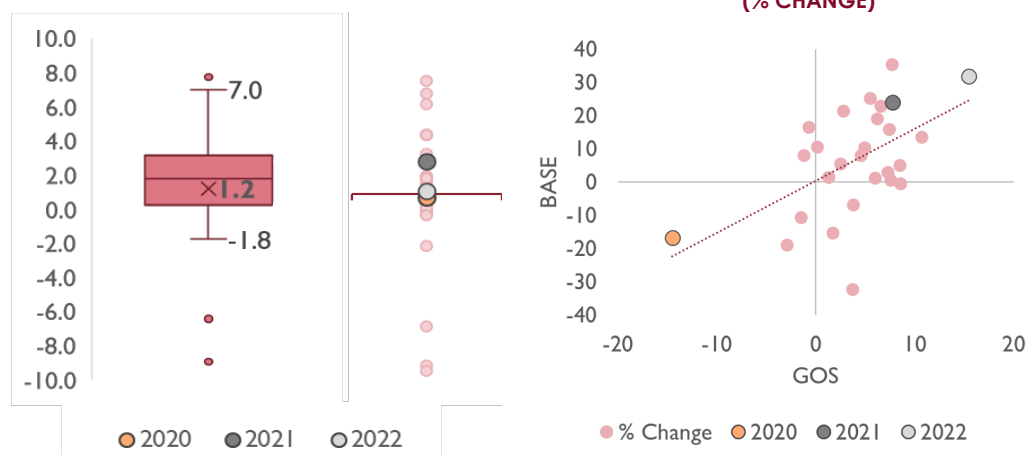


Source: AEAT, estimates and prepared by AIReF

Figure 7. **CIT: DISPERSION OF THE ELASTICITY OF TAX BASE WITH RESPECT TO GROSS OPERATING SURPLUS AND ITS RATES OF CHANGE**

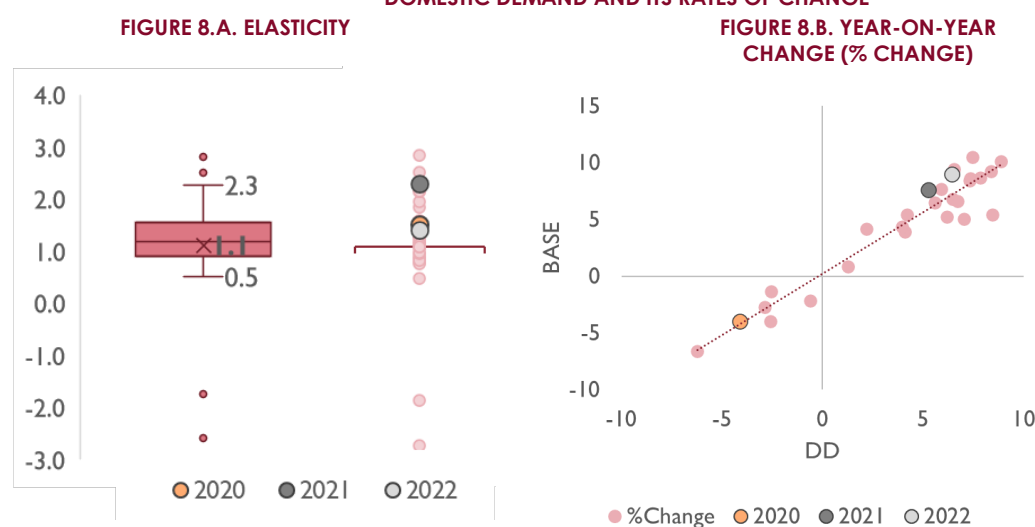
FIGURE 7.A. ELASTICITY

FIGURE 7.B. YEAR-ON-YEAR CHANGE (% CHANGE)



Source: AEAT, estimates and prepared by AIReF

Figure 8. VAT: DISPERSION OF THE ELASTICITY OF TAX BASE WITH RESPECT TO DOMESTIC DEMAND AND ITS RATES OF CHANGE



Source: AEAT, estimates and prepared by AIRcF

Bearing in mind these sources of change in the elasticities, a descriptive analysis is performed on the ratio of change of the main taxes compared with their underlying macroeconomic variables. The analysis is performed on both the tax bases (11) and on revenue in national accounting terms (12) and certain disruptive effects are defined:

- i) For the revenue series in national accounting terms, the cumulative regulatory impact is disregarded in cash terms from the regulatory measures adopted as from the year 2000.
- ii) The observations that show very high elasticity are disregarded as they are considered to be elements of distortion that would require a more detailed study of the underlying causes.

$$E_B = \Delta I_BASE / \Delta M \quad (11)$$

$$E_{CN} = \Delta I_CN / \Delta M \quad (12)$$

Where: I_BASE = tax base; M = macroeconomic variable; I_CN = taxes in national accounts net of measures.

The detailed results are set out below, broken down by tax category.

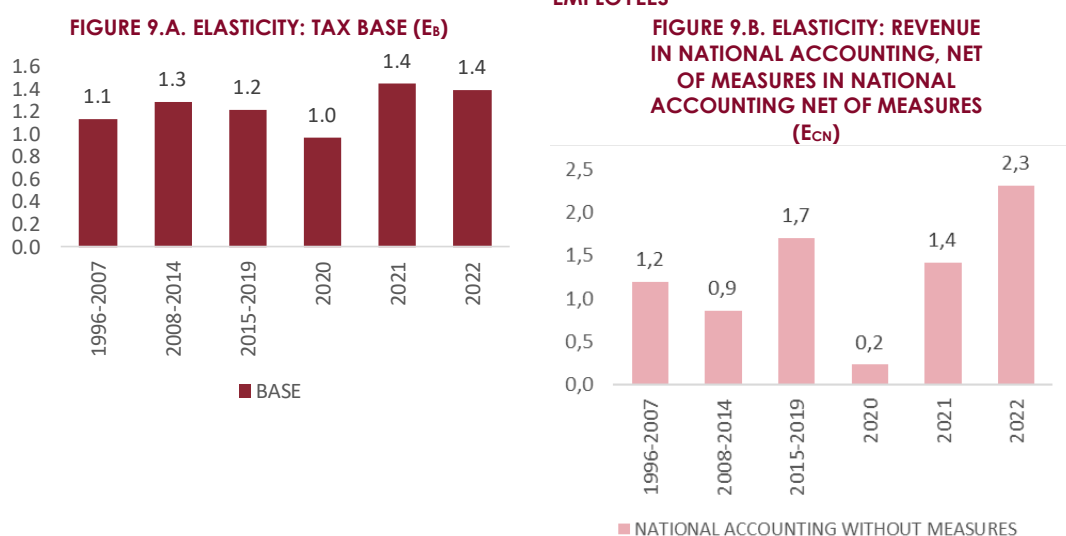
3.1. Elasticity of PIT regarding compensation of employees: descriptive analysis

The evolution of PIT is studied by means of the compensation of employees (CE), regarding which historical elasticity is observed which on average is above unity. Wage increases and the changes in the composition in the

labour market and in the distribution of income influence the changes in the tax base of PIT and justify higher growth of wage bases than of the total compensation of employees. Furthermore, the same fiscal pressure implies an increase in collection that is higher than the wage increase due to the rise in implicit rates associated with their growth, consequently giving rise to a historical elasticity of PIT revenue compared with the compensation of employees that is above unity.

During the financial crisis, there was a higher fall in the wage bases than the drop in the compensation of employees that led to increased elasticity while measures were adopted designed to increase tax collection. Subsequently, during the expansion phase, measures were adopted to reduce the tax burden; without this effect, an increase in the elasticity of revenue in national accounting terms would be generated as a result of the same fiscal pressure. Despite these fluctuations, following the crisis stemming from the pandemic, the tax recovered strongly, which is not reflected in growth in the compensation of employees, generating maximum elasticity in both the wage bases and in national accounting terms net of measures.

Figure 9. EVOLUTION OF PERSONAL INCOME TAX VS. COMPENSATION OF EMPLOYEES



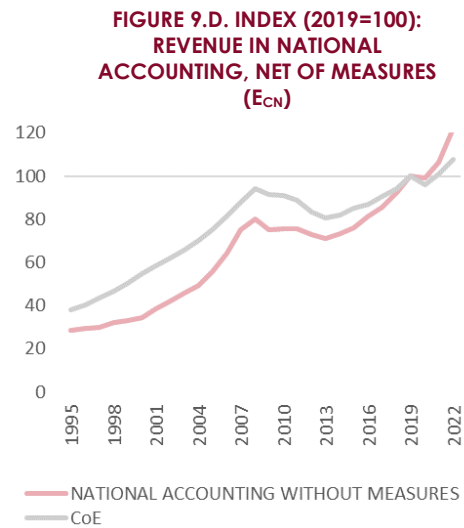
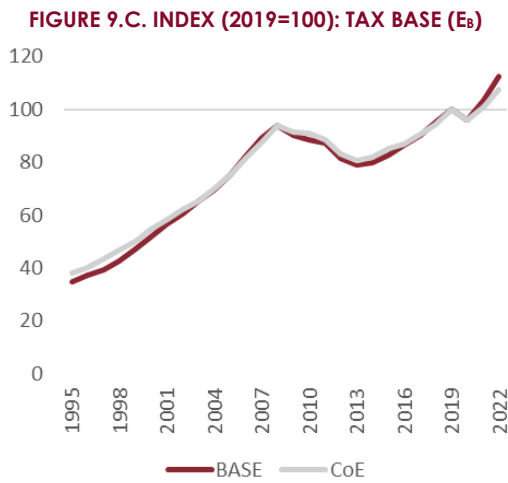


FIGURE 9.E. RATE OF CHANGE: TAX BASE (E_b)

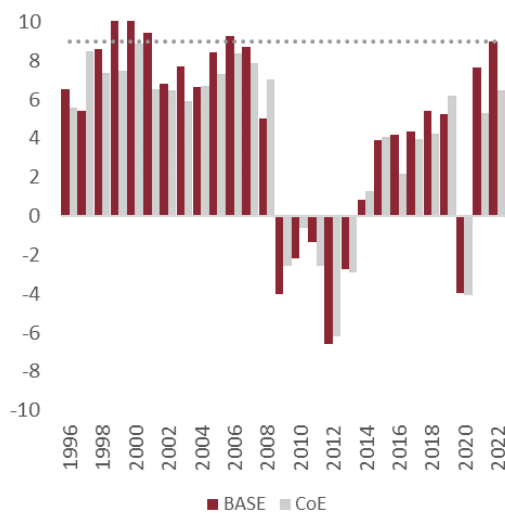
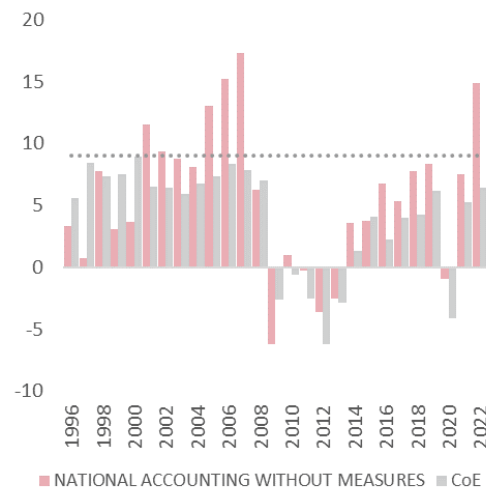


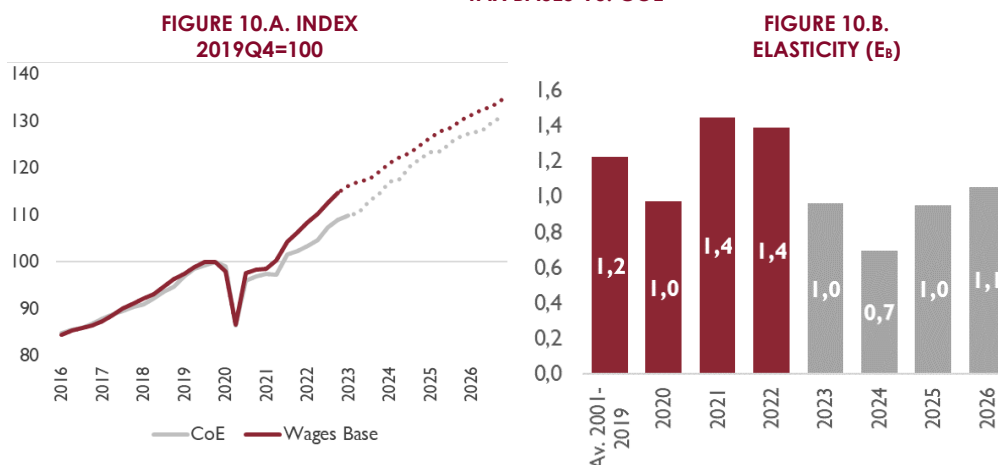
FIGURE 9.F. RATE OF CHANGE: REVENUE IN NATIONAL ACCOUNTING, NET OF MEASURES (E_{CN})



Source: AEAT, INE, IGAE, estimates and prepared by AIReF

AIReF's prediction models for wage bases readjust these imbalances and produce values which, until 2024, have less elasticity as regards the compensation of employees than the historical average, which they will return to as from 2025.

Figure 10. EVOLUTION AND FORECASTS OF THE QUARTERLY PERSONAL INCOME TAX BASES VS. COE

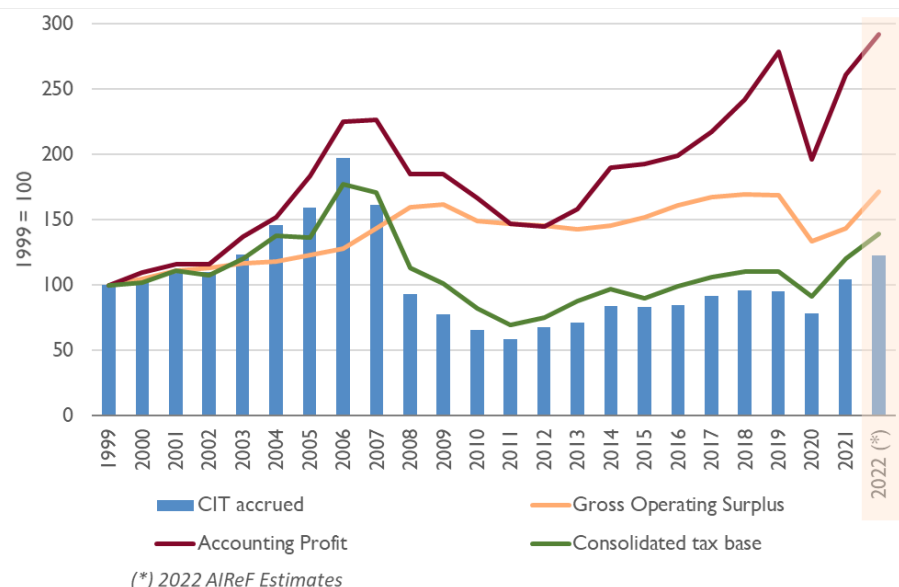


Source: AEAT, estimates and prepared by AIReF

3.2. Elasticity of Corporate Income Tax regarding Gross Operating Surplus: descriptive analysis

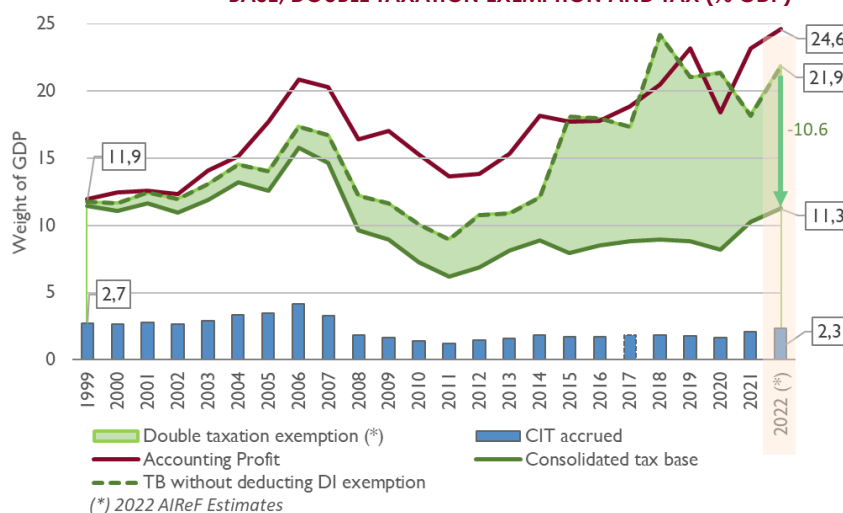
Corporate Income Tax is studied through the Gross Operating Surplus (GOS), regarding which this presents historical elasticity that, on average, is also above unity. This tax is affected by the existence of such elements as exemptions due to double taxation, the offsetting of negative tax bases in previous years, deferred tax assets (DTA), temporary allocation of depreciation and impairment correction criteria, along with discounts and deductions that separate accounting profit from the consolidated tax base of this tax. Consequently, they distort their relationship regarding the Gross Operating Surplus and the evolution of economic activity, which justifies, along with other factors, the presence of an unexplained variability component in this tax. Values for which the ratio of the changes in the tax and GOS present exceptionally high values are eliminated from this analysis.

CORPORATE INCOME TAX: EVOLUTION OF ACCOUNTING PROFIT, TAX BASE, TAX ACCRUED AND GROSS OPERATING SURPLUS (DEFLATED SERIES INDEX 1999=100%)



Source: AEAT, estimates and prepared by AIReF

Figure 11. **CORPORATE INCOME TAX: EVOLUTION OF ACCOUNTING PROFIT, TAX BASE, DOUBLE TAXATION EXEMPTION AND TAX (% GDP)**



Source: AEAT, estimates and prepared by AIReF

Corporate Income Tax presents higher variations than the GOS, with more dynamic growth until 2007, more intense declines during the financial crisis and a greater drop during the pandemic, followed by a more intense recovery. Although the complexity of its composition, influenced by elements outside the scope of the economic cycle, does not allow conclusions to be extracted in absolute terms for all the years under study, it can be deduced

that Corporate Income Tax shows a high elasticity regarding the GOS over the course of its historical series, in which the high values recorded after the pandemic, which correspond to maximum rates of change overall, both for the tax base and for revenue in national accounting terms.

FIGURE 13. EVOLUTION OF CORPORATE INCOME TAX VS. GROSS OPERATING SURPLUS

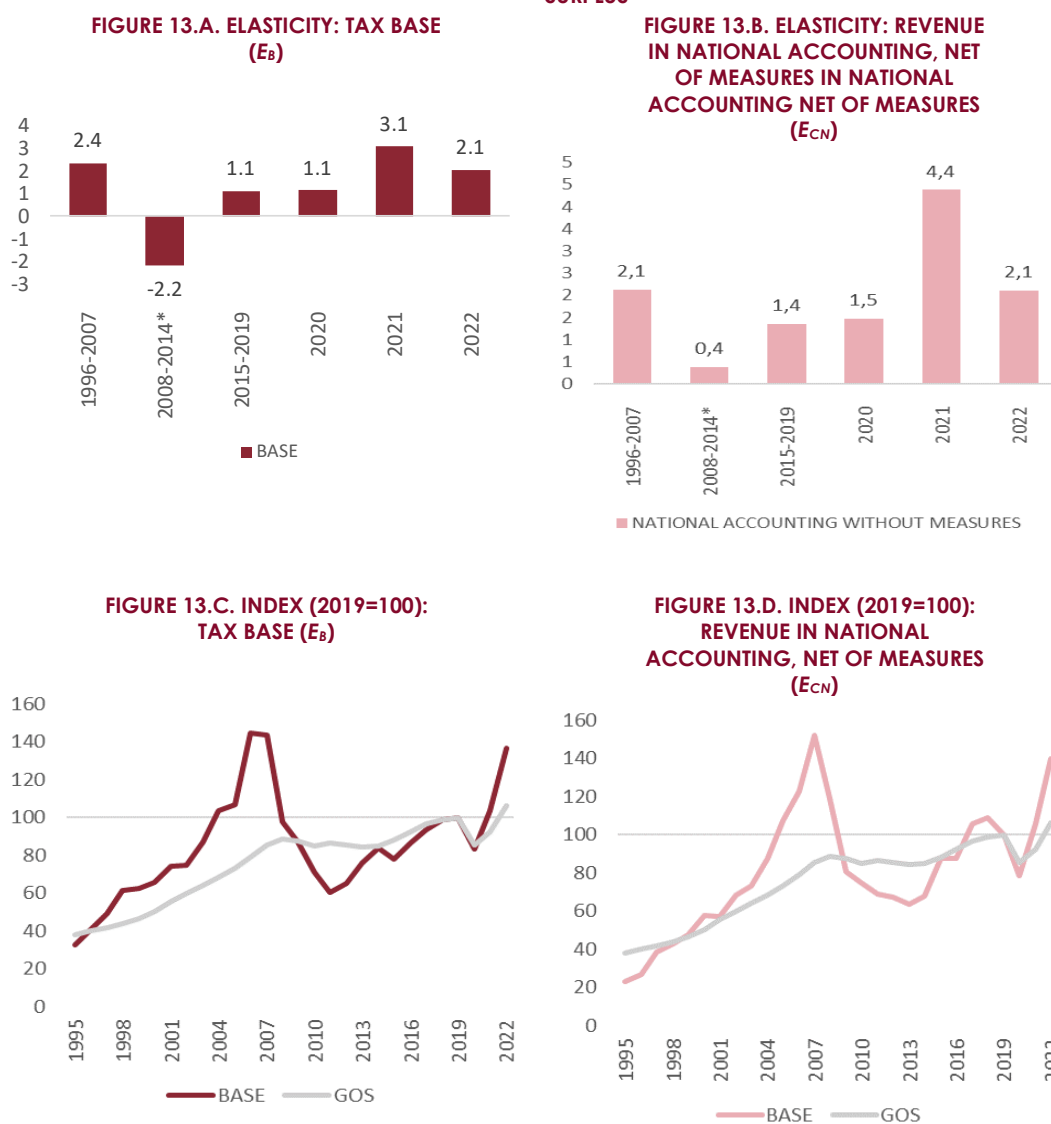


FIGURE 13.E. RATE OF CHANGE: TAX BASE (E_b)

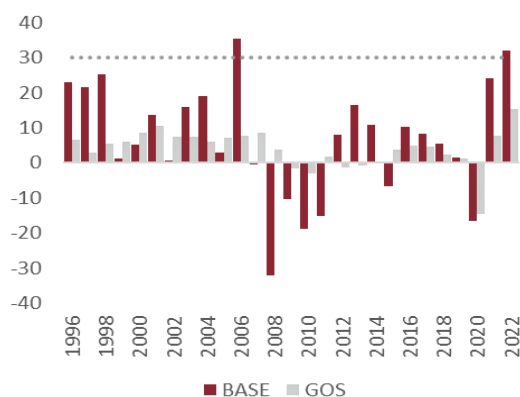
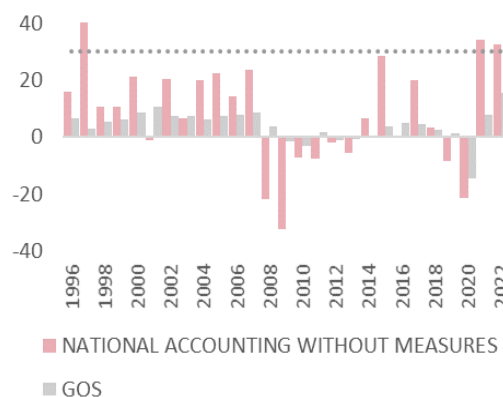


FIGURE 13.F. RATE OF CHANGE: REVENUE IN NATIONAL ACCOUNTING, NET OF MEASURES (E_{CN})

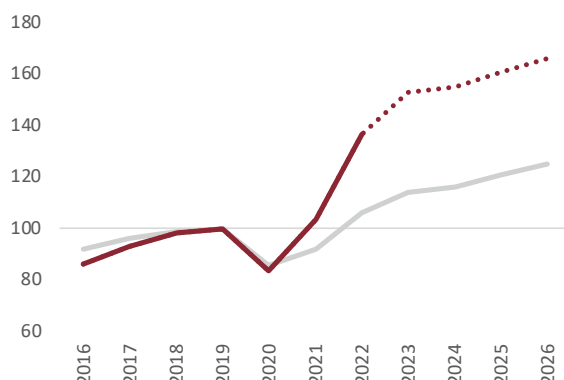


Source: AEAT, INE, IGAE, estimates and prepared by AIReF

AIReF's prediction model for Corporate Income Tax is readjusted after this uncoupling and causes elasticities with regard to the declining Gross Operating Surplus to 2024. Following this downturn, unitary elasticity is considered for both 2025 and 2026.

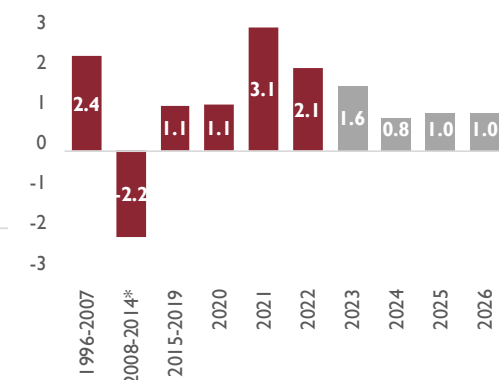
FIGURE 14. EVOLUTION AND PROJECTIONS OF CORPORATE INCOME TAX BASE VS. GOS

FIGURE 14.A. INDEX 2019Q4=100



GOS

FIGURE 14.B. ELASTICITY (E_b)



Source: AEAT, estimates and prepared by AIReF

3.3. Elasticity of VAT regarding national demand: descriptive analysis

The dynamic of VAT is studied through national demand. The literature (see Annex iv) establishes the elasticity of VAT close to unity, although some factors like the changes in the consumption patterns of households, and changes in tax evasion behaviour would justify values above unity. The historical average of the elasticity of its tax base (Final Expenditure Subject to VAT) as regards the

national demand until 2007 stands at 1.1. During the financial crisis, Final Expenditure Subject to VAT fell to the same pace as national demand. However, collection shows more intense declines in 2009 and 2010 due to a combination of effects that distort its evolution with regard to national demand. Together with the intense fall in consumption stemming from the economic crisis, changes take place in the composition of the consumption along with a permanent drop in income from the purchase of new homes, in addition to the extension of the right to request a monthly VAT rebate, an increase in the amount of the deferments requested by companies to alleviate their financial difficulties and a drop in applications for annual rebates at the end of the year as a result of the crisis⁵.

Given that these effects distort the value of the elasticity observed for the year 2010, this has been eliminated from the average of the changes analysed. The consideration of revenue in terms net of regulatory measures enables a homogenous time analysis of the VAT changes with regard to national demand. This analysis clearly shows a separation between the evolution of the two scales, with a larger fall in Final Expenditure Subject to VAT in 2020 and greater subsequent growth, which intensifies in 2021, coinciding with the increase in electricity prices, which eases in 2022⁶.

⁵ More information in the AEAT's Annual Report on Tax Collection 2010: [Annual Report on Tax Collection, AEAT](#)

⁶ Alternative analyses also show this uncoupling of VAT with regard to the macroeconomic bases. Buda *et al.* (2020) perform an analysis of the private consumption of Spanish households through information on transactions and forms of payment of Banco Bilbao Vizcaya Argentaria (BBVA), which show higher growth in consumption following the pandemic than suggested by the national accounting data. Buda, G. & Carvalho, V. M. & Hansen, S. & Mora, J. V. R. & Ortiz, Á. & Rodrigo, T., 2022. [National Accounts in a World of Naturally Occurring Data: A Proof of Concept for Consumption](#)

FIGURE 15. EVOLUTION OF VAT VS. DOMESTIC DEMAND

FIGURE 15.A. ELASTICITY: TAX BASE (E_B)

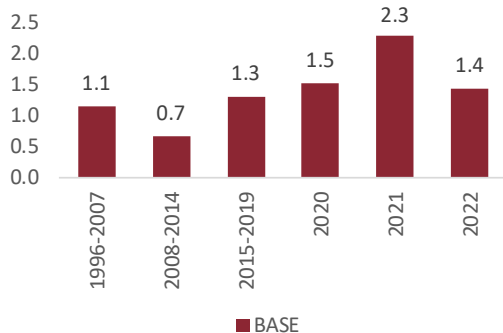


FIGURE 15.B. ELASTICITY: REVENUE IN NATIONAL ACCOUNTING, NET OF MEASURES IN NATIONAL ACCOUNTING NET OF MEASURES (E_{CN})

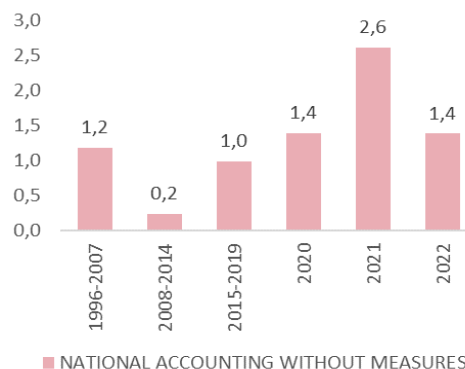


FIGURE 15.C. INDEX (2019=100): TAX BASE (E_B)

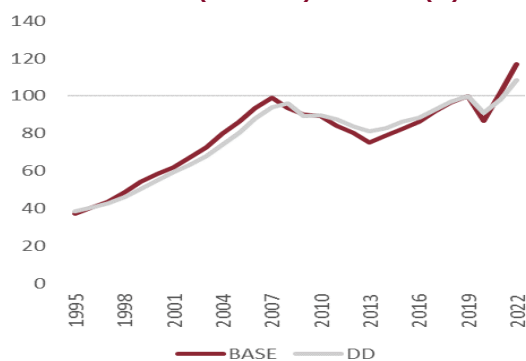


FIGURE 15.D. INDEX (2019=100): REVENUE IN NATIONAL ACCOUNTING, NET OF MEASURES (E_{CN})

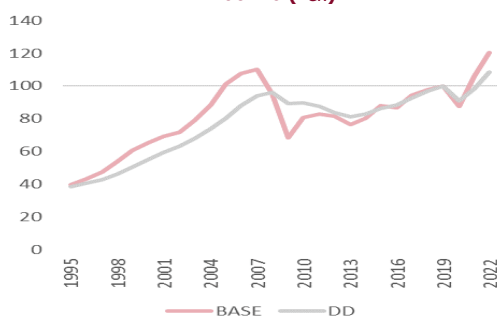


FIGURE 15.E. RATE OF CHANGE: TAX BASE (E_B)

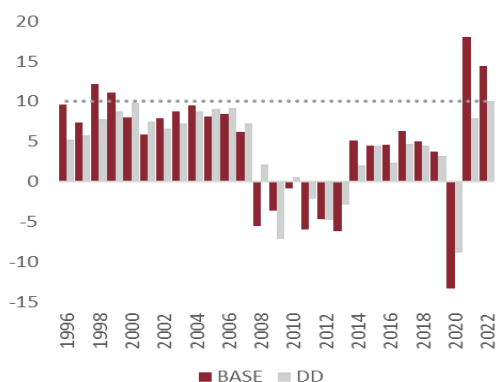
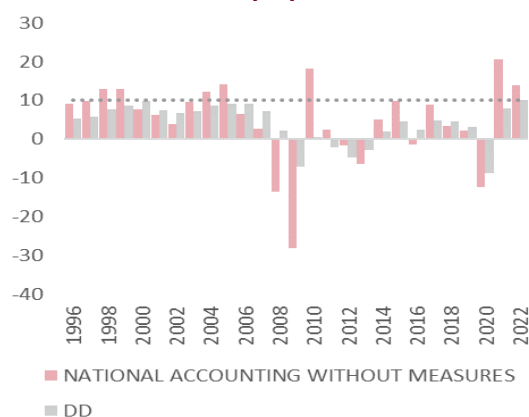


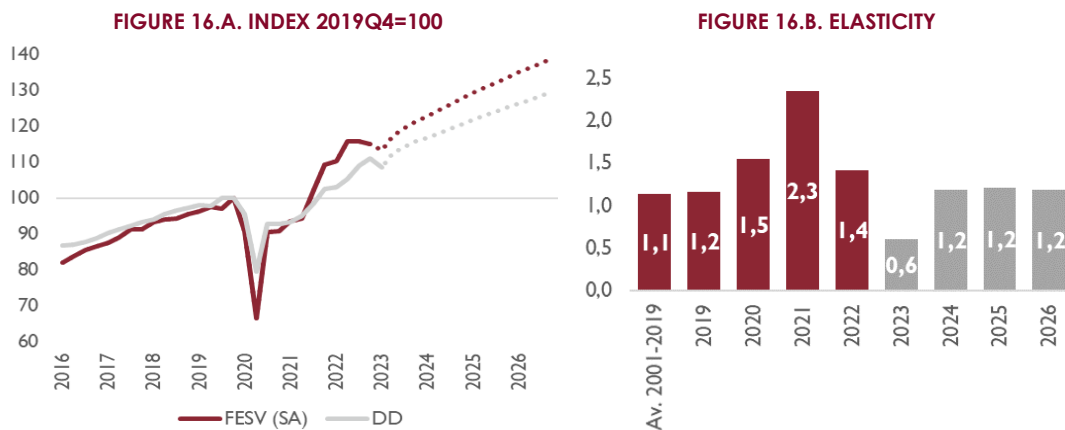
FIGURE 15.F. RATE OF CHANGE: REVENUE IN NATIONAL ACCOUNTING, NET OF MEASURES (E_{CN})



Source: AEAT, INE, IGAE, estimates and prepared by AIReF

AIReF's prediction model readjusts following these imbalances, adopting an elasticity with regard to national demand in 2023 that is lower than the historical average, which it returns to as from 2024.

FIGURE 16. EVOLUTION AND FORECASTS OF FINAL EXPENDITURE SUBJECT TO VAT VS. DOMESTIC DEMAND



Source: AEAT, estimates and prepared by AIReF

4. BREAKDOWN OF REVENUE IN CASH TERMS

From the breakdown of the variation of the main tax bases, the breakdown of the tax revenue can be deduced by applying the inherent structure of each of the taxes analysed, taking into account their accrual by component and isolating the change caused by the regulatory measures introduced in the period analysed.

The breakdown obtained for each block of taxes analysed is achieved by means of the contribution to growth from each of these to the total tax revenue, thus obtaining a global result that completes the partial vision by different taxes. Accordingly, the total change in the tax collection is broken down into the following factors:

- The real component derived from the relationship between the macroeconomic variables in real terms underlying each of the main taxes.
- The price component deriving from the relationship between the deflators associated with the macroeconomic variables in real terms underlying each of the main taxes.
- The effective rate component deriving from the change in the effective PIT rates.
- The measures component associated with the regulatory changes approved for the different taxes in each of the years analysed.

- The variation component derived from the collection structure inherent to each tax, which takes into account the cash-accrual adjustments stemming from the collection mechanics, which is not necessarily associated with the change in the underlying macroeconomic variables.
- The variation component not explained by either the underlying macroeconomic variables or by the collection structure inherent to the different economic figures.

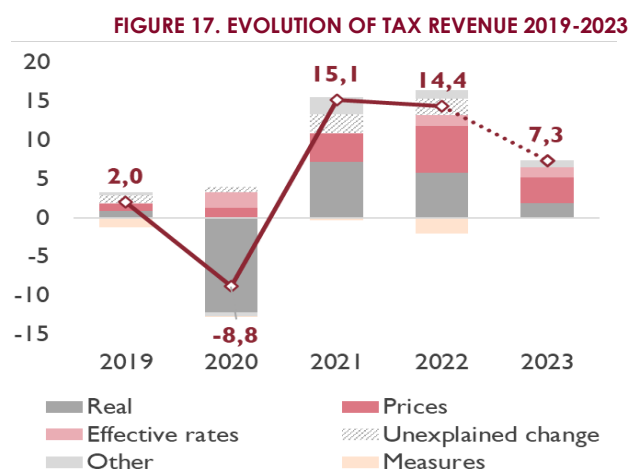
As regards the final result, it can be deduced that out of the 14.4% increase experienced in revenue in 2022, 6 points are due to the price increase while 1.4 points are associated with the rise in effective rates. The real factor, which would be related to the macroeconomic variables tied in to the evolution of the main taxes, accounts for 5.8 points of growth. Another 1.1 points of growth would be associated with the evolution of other elements such as capital withholdings, the annual Corporate Income Tax return, rebates and extraordinary revenue and settlements performed by the public authorities, among others. In 2022, the regulatory measures reduce the increase in total revenue by 2 points due to the impact of the tax reductions established to alleviate escalating prices⁷. The rest of the growth – 2.1 points – corresponds to the variability of VAT and Corporate Income Tax that cannot be explained by means of their associated macroeconomic variables or by other factors.

TABLE 1. BREAKDOWN OF VARIABILITY IN TAX REVENUE

| | Annual rate of change (% CHANGE) | | | | | Weight of GDP (%GDP) | | | | |
|--------------------|----------------------------------|-------------|-------------|-------------|------------|----------------------|-------------|------------|------------|------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Total | 2,0 | -8,8 | 15,1 | 14,4 | 7,3 | 0,3 | -1,7 | 2,4 | 2,4 | 1,3 |
| Real | 0,9 | -12,1 | 7,2 | 5,8 | 1,8 | 0,1 | -2,3 | 1,2 | 1,0 | 0,3 |
| Prices | 0,9 | 1,3 | 3,6 | 6,0 | 3,3 | 0,2 | 0,2 | 0,6 | 1,0 | 0,6 |
| Effective rates | 0,0 | 2,0 | 0,1 | 1,4 | 1,3 | 0,0 | 0,4 | 0,0 | 0,2 | 0,2 |
| Measures | -1,3 | -0,1 | -0,3 | -2,0 | -0,1 | -0,2 | 0,0 | -0,1 | -0,3 | 0,0 |
| Other | 0,4 | -0,5 | 2,1 | 1,1 | 0,9 | 0,1 | -0,1 | 0,3 | 0,2 | 0,2 |
| Unexplained change | 1,0 | 0,7 | 2,4 | 2,1 | 0,0 | 0,2 | 0,1 | 0,4 | 0,3 | 0,0 |

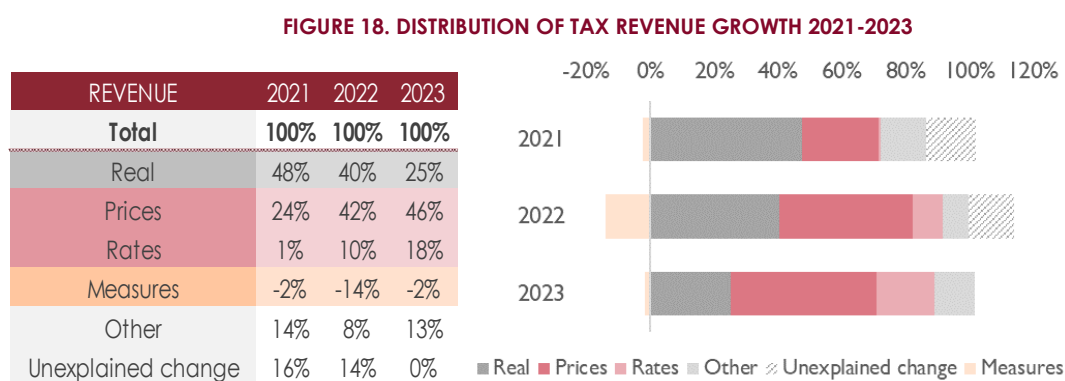
Source: AEAT, estimates and prepared by AIRcF

⁷ Royal Decree-Laws 12, 17 and 29 of 2021 and 6, 11, 17 and 20 of 2022



Source: AEAT, estimates and prepared by AIRcF

As regards the evolution, it can be deduced from the analysis that the fall in tax revenue in 2020 and its recovery over the course of 2021 can primarily be explained by the real component. This component falls in 2022 as the contribution from prices and effective rates increase, which together account for 52% of the growth in tax revenue in 2022. This trend intensifies in 2023, whereby prices and effective rates account for 64% of the growth forecast by AIRcF.



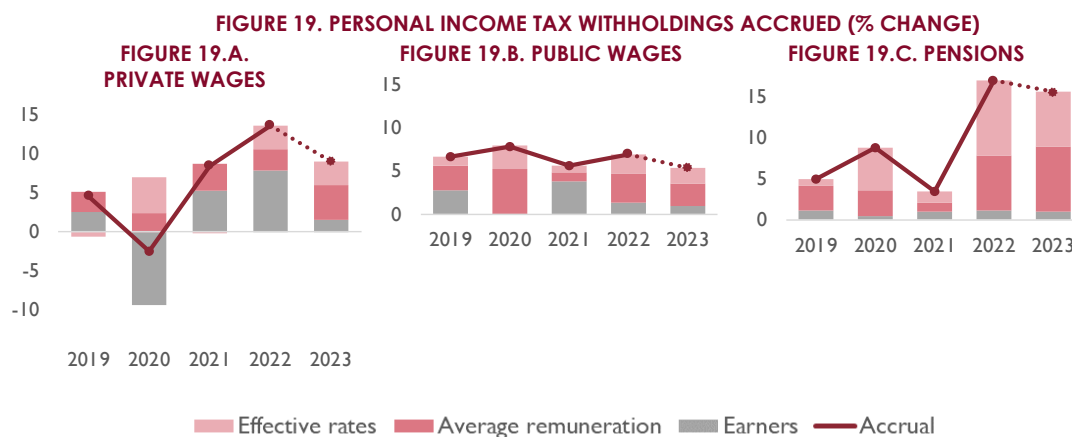
Source: AEAT, estimates and prepared by AIRcF

The detailed results broken down by different tax categories are set out below.

4.1. Breakdown of PIT revenue

The analysis is carried out by separating the heading of withholdings on income from work and economic activities from the other components. These withholdings, which accounted for 86% of PIT revenue in 2022, are broken down based on the breakdown obtained for wage bases and pensions. It is taken into account that the accrual is the result of the multiplying interaction

of the tax bases and effective rates, thus giving rise to the breakdown in cash terms in proportion to that obtained in accrual terms.



Source: AEAT, estimates and prepared by AIRcF

The variability of the rates includes both the effects of the same fiscal pressure and the changes in the composition of employment. The growth in 2020 is due to the uneven impact of the pandemic on the composition of the sector and wage distribution of the labour market, while in 2022 it responds to a greater extent to more widespread wage increases (see annex).

In addition to withholdings on income from work, capital gains not subject to withholding are also broken down, which account for around 7.5% of the remaining PIT revenue and half of the quota to settle. The variability of these forms of income are modelled according to the number of second-hand property transactions, which is established as a component of the real variability and to the evolution of property prices, which includes the price variability. A one-year time lag is also considered because in cash terms the capital gains generated are included in the following year's tax return.

The variability of the rest of the PIT headings⁸ falls under Others factor and depends on the diversity of effects and the collection mechanics.

Lastly, the contribution to growth of other regulatory measures is assessed jointly out of the total PIT revenue.

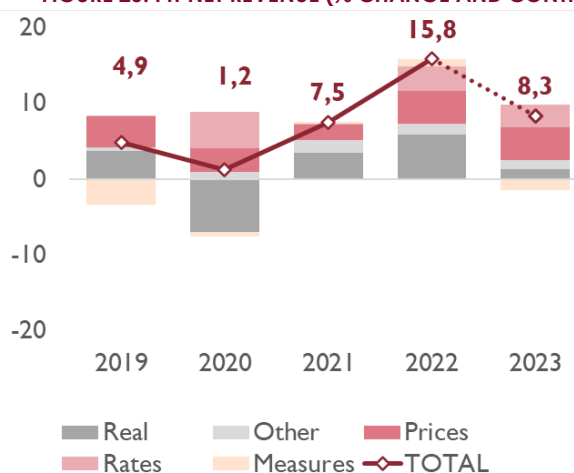
⁸ These include withholdings on capital, instalment payments, the rest of the tax difference (income from moveable capital and leased properties not subject to a withholding), settlements by the public authorities and others.

TABLE 2. PIT: VARIABILITY OF NET REVENUE

| PIT Variability | % Change | | | | | % GDP | | | | |
|-----------------|------------|------------|------------|-------------|------------|------------|------------|------------|------------|------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| TOTAL | 4,9 | 1,2 | 7,5 | 15,8 | 8,3 | 0,3 | 0,1 | 0,5 | 1,1 | 0,7 |
| Real | 3,7 | -7,0 | 3,4 | 5,8 | 1,3 | 0,2 | -0,5 | 0,2 | 0,4 | 0,1 |
| Prices | 4,1 | 3,2 | 2,0 | 4,4 | 4,3 | 0,3 | 0,2 | 0,1 | 0,3 | 0,4 |
| Rates | 0,0 | 4,8 | 0,2 | 3,2 | 3,1 | 0,0 | 0,4 | 0,0 | 0,2 | 0,3 |
| Other | 0,5 | 0,9 | 1,7 | 1,4 | 1,2 | 0,0 | 0,1 | 0,1 | 0,1 | 0,1 |
| Measures | -3,4 | -0,6 | 0,1 | 0,9 | -1,5 | -0,2 | 0,0 | 0,0 | 0,1 | -0,1 |

Source: AEAT, estimates and prepared by AIReF

The results extracted show that the evolution of PIT was determined by the fall in private employment during the pandemic and its growth over the course of 2021. In 2022, employment continued to grow in a widespread fashion, both in large companies and in SMEs, recovering in most sectors affected by the pandemic, including hospitality. Pensions also rose in 2022 and a widespread wage rise and associated effective rates were also recorded. For 2023, increases in wages, pensions and their associated rates are the main factor that explains the rise in revenue forecasts.

FIGURE 20. PIT NET REVENUE (% CHANGE AND CONTRIBUTIONS)


Fuente: AEAT, estimates and prepared by AIReF

4.2. Breakdown of Corporate Income Tax revenue

The analysis of the variability of Corporate Income Tax is performed based on the breakdown of the variability of its tax base and on the separation of the components of this tax. In cash terms, the revenue is separated taking into account the different components of this tax, such that:

- The change in instalment payments is broken down according to the composition derived from the tax base.
- The rest of the components are considered to be associated with the factor that contains the rest of the variability. This includes withholdings on capital and settlements, the dynamics of which are not associated with the evolution of the tax base, along with payments and rebates from tax returns, which correspond to the tax bases from previous years. Extraordinary revenue, court rulings and deferred tax assets (DTA) are also considered to be part of the rest of the variability, the effects of which are evaluated separately.
- The contribution from regulatory measures is also isolated.

TABLE 3. CORPORATE INCOME TAX: VARIABILITY OF NET REVENUE

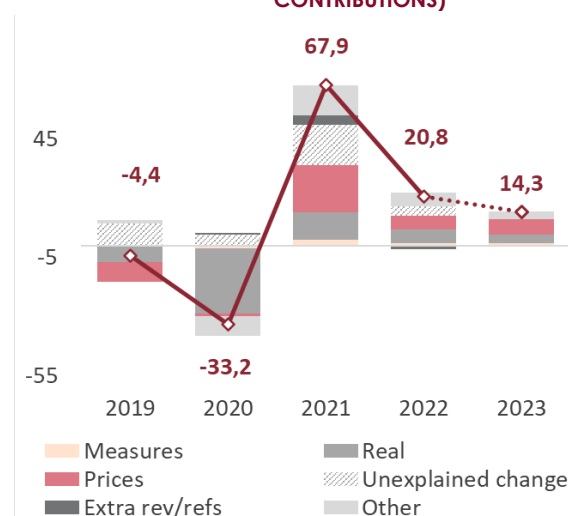
| Tax | % Change | | | | | % GDP | | | | |
|--------------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Variability | | | | | | | | | | |
| TOTAL | -4,4 | -33,2 | 67,9 | 20,8 | 14,3 | -0,1 | -0,7 | 0,9 | 0,4 | 0,3 |
| Real | -7,1 | -27,7 | 11,6 | 5,8 | 3,6 | -0,1 | -0,6 | 0,2 | 0,1 | 0,1 |
| Prices | -8,3 | -0,8 | 20,0 | 5,8 | 6,5 | -0,2 | 0,0 | 0,3 | 0,1 | 0,1 |
| Unexplained change | 9,3 | 4,7 | 17,1 | 3,9 | 0,0 | 0,2 | 0,1 | 0,2 | 0,1 | 0,0 |
| Extra rev/refs | 0,0 | 0,5 | 4,1 | -1,7 | 0,0 | 0,0 | 0,0 | 0,1 | 0,0 | 0,0 |
| Other | 1,6 | -8,6 | 12,8 | 6,1 | 3,2 | 0,0 | -0,2 | 0,2 | 0,1 | 0,1 |
| Measures | 0,0 | -1,3 | 2,4 | 1,0 | 1,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |

Source: AEAT, estimates and prepared by AIRcF

Corporate Income Tax is also affected by the existence of such elements as offsetting from negative tax bases from previous years, which hinders their comparison with economic variables and is reflected in the component of unexplained variability. The real component explains the fall in the volume of business profits experienced in 2020 due to the pandemic, while the factor associated with prices takes on greater importance in 2021, aside from the extraordinary revenue that is recorded⁹. In 2022, the price and volume factors balance out, with a negative contribution from exceptional tax rebates¹⁰. In 2023, a higher price contribution is expected.

⁹ 2021: Exceptional revenue due to the merger of two large companies and a sale of assets.

¹⁰ 2022: Exceptional rebates due to a court ruling and tax credit accrued.

FIGURE 21. CORPORATE INCOME TAX NET REVENUE (% CHANGE AND CONTRIBUTIONS)


Source: AEAT, estimates and prepared by AIReF

4.3. Breakdown of VAT revenue

Effective VAT rates show scant variability despite the tax reductions in place since the second half of 2021. For this reason, they are not considered independently in this analysis. To deduce the variability of net revenue, the contribution of regulatory measures to growth is separated, and the breakdown obtained from its base is applied proportionally to the contribution from revenue not affected by the measures.

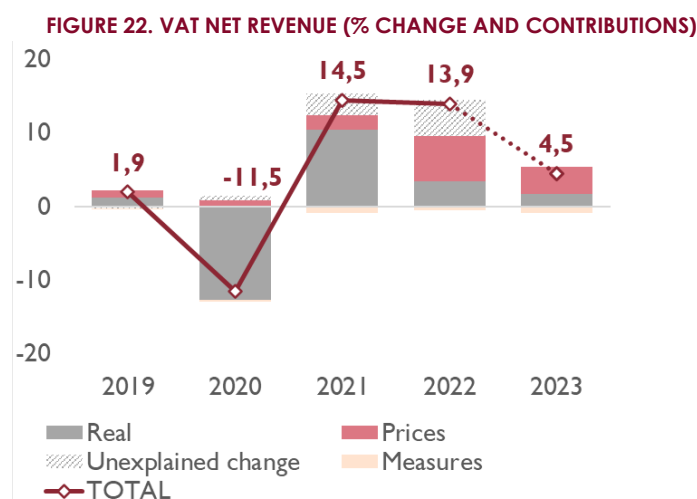
TABLE 4. VAT: VARIABILITY OF NET REVENUE

| IVA | %VAR | | | | | %PIB | | | | |
|-------------------|------------|--------------|-------------|-------------|------------|------------|-------------|------------|------------|------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Variabilidad | | | | | | | | | | |
| TOTAL | 1.9 | -11.5 | 14.5 | 13.9 | 4.5 | 0.1 | -0.7 | 0.8 | 0.8 | 0.3 |
| Real | 1.2 | -12.7 | 10.4 | 3.5 | 1.7 | 0.1 | -0.8 | 0.5 | 0.2 | 0.1 |
| Precios | 1.0 | 0.8 | 1.9 | 6.1 | 3.7 | 0.1 | 0.0 | 0.1 | 0.3 | 0.2 |
| Var. no explicada | -0.2 | 0.7 | 3.0 | 4.9 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 0.0 |
| Medidas | -0.1 | -0.2 | -0.9 | -0.5 | -0.9 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 |

Source: AEAT, estimates and prepared by AIReF

The falls in the volume of consumption and of investment in 2020 and their subsequent recovery in 2021 mark the evolution of VAT over these two years. A price rise associated with energy products begins in the second half of 2021, which is the main driver of growth in 2022, partially offset by the regulatory measures adopted to alleviate the escalation of prices until 2023. The separation between the evolution of VAT and that of national demand since

the pandemic is the main element responsible for the component of unexplained variability in AIReF's prediction model. In 2023, less intense growth is expected than in the previous year, with a higher contribution from prices and from volume.



Source: AEAT, estimates and prepared by AIReF

4.4. Breakdown of revenue from Special Taxes and Other tax revenue

The variability of Special Taxes and Other tax revenue can be explained by the real variability, with the exception of the Special Tax on Electricity and the Tax on the Value of Electricity Production (TVEP), the change of which is associated with the price factor. The contribution from regulatory measures is isolated which, in relation to Special Taxes, includes the reduction in the rate of the Special Tax on Electricity since 2021 and the entry into force of the new Special Tax on Single-use Plastics since 2022. As regards Other tax revenue, the rise in the Tax on Insurance Premiums in 2021 and the suspension of the TVEP since the last quarter of the same year stand out.

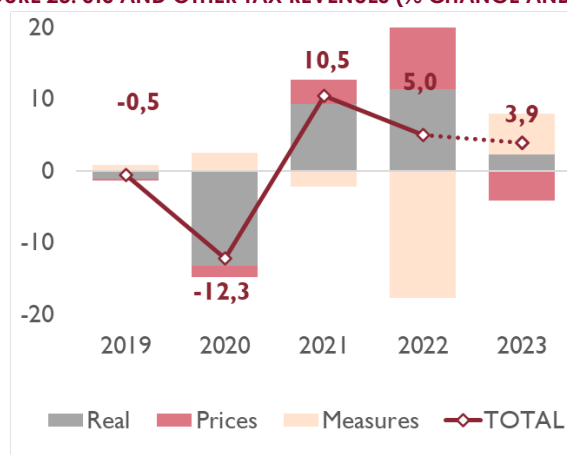
TABLE 5. STS AND OTHERS: VARIABILITY OF NET REVENUE

| Others | % Change | | | | | % GDP | | | | |
|--------------|-------------|--------------|-------------|------------|------------|------------|-------------|------------|------------|------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 | 2020 | 2021 | 2022 | 2023 |
| TOTAL | -0,5 | -12,3 | 10,5 | 5,0 | 3,9 | 0,3 | -1,7 | 2,4 | 2,4 | 1,3 |
| Real | -1,1 | -13,3 | 9,3 | 11,4 | 2,3 | 0,7 | -1,8 | 2,1 | 5,5 | 0,8 |
| Prices | -0,3 | -1,5 | 3,4 | 11,3 | -4,1 | 0,2 | -0,2 | 0,8 | 5,5 | -1,4 |
| Measures | 0,9 | 2,6 | -2,1 | -17,8 | 5,7 | -0,5 | 0,4 | -0,5 | -8,5 | 1,9 |

Source: AEAT, estimates and prepared by AIReF

The evolution of Special Taxes and Other tax revenue in the period analysed is determined by the widespread fall during the pandemic, which, in the case of Special Taxes, affected the situation for a longer period of time than other taxes, and due to the regulatory measures on energy products, the application of which will extend until the end of 2023.

FIGURE 23. STS AND OTHER TAX REVENUES (% CHANGE AND CONTRIBUTIONS)



Source: AEAT, estimates and prepared by AIRcF

ANNEX I. BREAKDOWN OF VARIABILITY OF TAX REVENUE BY DIFFERENT TAXES AND FACTORS

ANNEX I. TABLE 1. BREAKDOWN OF REVENUE VARIABILITY: RATES OF CHANGE (% VAR)

| | | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|--------------------|------------|-------------|-------------|-------------|------------|
| TAX REVENUE | | 2,0 | -8,8 | 15,1 | 14,4 | 7,3 |
| PIT | Real | 1,5 | -2,9 | 1,5 | 2,5 | 0,6 |
| | Prices | 1,6 | 1,3 | 0,9 | 1,9 | 1,8 |
| | Effective rates | 0,0 | 2,0 | 0,1 | 1,4 | 1,3 |
| | Other | 0,2 | 0,4 | 0,8 | 0,6 | 0,5 |
| | Measures | -1,4 | -0,2 | 0,1 | 0,4 | -0,7 |
| CIT | Real | -0,8 | -3,1 | 0,9 | 0,7 | 0,4 |
| | Prices | -1,0 | -0,1 | 1,6 | 0,7 | 0,8 |
| | Unexplained change | 1,1 | 0,5 | 1,4 | 0,5 | 0,0 |
| | Other | 0,0 | 0,1 | 0,3 | -0,2 | 0,0 |
| | Other | 0,2 | -1,0 | 1,0 | 0,7 | 0,4 |
| | Measures | 0,0 | -0,1 | 0,2 | 0,1 | 0,1 |
| VAT | Real | 0,4 | -4,3 | 3,4 | 1,1 | 0,6 |
| | Prices | 0,3 | 0,3 | 0,6 | 2,0 | 1,2 |
| | Unexplained change | -0,1 | 0,2 | 1,0 | 1,6 | 0,0 |
| | Measures | 0,0 | -0,1 | -0,3 | -0,2 | -0,3 |
| STs | Real | -0,1 | -1,2 | 0,5 | 0,6 | 0,0 |
| | Prices | 0,0 | -0,1 | 0,1 | 0,4 | 0,1 |
| | Measures | 0,5 | 0,0 | -0,2 | -0,8 | 0,1 |
| OTHER | Real | -0,1 | -0,8 | 0,7 | 0,9 | 0,3 |
| | Prices | -0,1 | -0,2 | 0,4 | 1,1 | -0,6 |
| | Measures | -0,4 | 0,4 | -0,1 | -1,6 | 0,6 |

Source: AEAT, estimates and prepared by AIRcF

ANNEX I. TABLE 2. BREAKDOWN OF REVENUE VARIABILITY (% GDP)

| | | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------|--------------------|------------|-------------|------------|------------|------------|
| TAX REVENUE | | 0,3 | -1,7 | 2,4 | 2,4 | 1,3 |
| PIT | Real | 0,2 | -0,5 | 0,2 | 0,4 | 0,1 |
| | Prices | 0,3 | 0,2 | 0,1 | 0,3 | 0,3 |
| | Effective rates | 0,0 | 0,4 | 0,0 | 0,2 | 0,2 |
| | Other | 0,0 | 0,1 | 0,1 | 0,1 | 0,1 |
| | Measures | -0,2 | 0,0 | 0,0 | 0,1 | -0,1 |
| CIT | Real | -0,1 | -0,6 | 0,2 | 0,1 | 0,1 |
| | Prices | -0,2 | 0,0 | 0,3 | 0,1 | 0,1 |
| | Unexplained change | 0,2 | 0,1 | 0,2 | 0,1 | 0,0 |
| | Extra rev/refs | 0,0 | 0,0 | 0,1 | 0,0 | 0,0 |
| | Other | 0,0 | -0,2 | 0,2 | 0,1 | 0,1 |
| | Measures | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| VAT | Real | 0,1 | -0,8 | 0,5 | 0,2 | 0,1 |
| | Prices | 0,1 | 0,0 | 0,1 | 0,3 | 0,2 |
| | Unexplained change | 0,0 | 0,0 | 0,2 | 0,3 | 0,0 |
| | Measures | 0,0 | 0,0 | 0,0 | 0,0 | -0,1 |
| STs | Real | 0,0 | -0,2 | 0,1 | 0,1 | 0,0 |
| | Prices | 0,0 | 0,0 | 0,0 | 0,1 | 0,0 |
| | Measures | 0,1 | 0,0 | 0,0 | -0,1 | 0,0 |
| OTHER | Real | 0,0 | -0,1 | 0,1 | 0,2 | 0,0 |
| | Prices | 0,0 | 0,0 | 0,1 | 0,2 | -0,1 |
| | Measures | -0,1 | 0,1 | 0,0 | -0,3 | 0,1 |

Source: AEAT, estimates and prepared by AIRcF

ANNEX II. PIT

Outline of the breakdown

ANNEX II. TABLE 1. BREAKDOWN OF VARIABILITY ACCORDING TO PERSONAL INCOME TAX COMPONENTS

| Components and their breakdown | | Variability |
|--|--|---|
| • Withholdings from work and economic activities | Earners | Public Private Pensioners REAL |
| | Average remuneration | Public Private Pensioners PRICES |
| | Effective rates | Public Private Pensioners RATES |
| • Annual return | Income/ Gains not subject to withholding tax | OTHER |
| | Leased properties | OTHER |
| | Capital gains | REAL PRICES |
| • Withholdings on movable capital | | OTHER |
| • Withholdings on leases | | OTHER |
| • Withholdings on investment funds | | OTHER |
| • Instalment payments | | OTHER |
| • Lottery levy | | OTHER |
| • Settlements made | | OTHER |
| • Catholic Church allocation | | OTHER |
| • Regulatory measures | | MEASURES |

Variability of average wages and associated rates

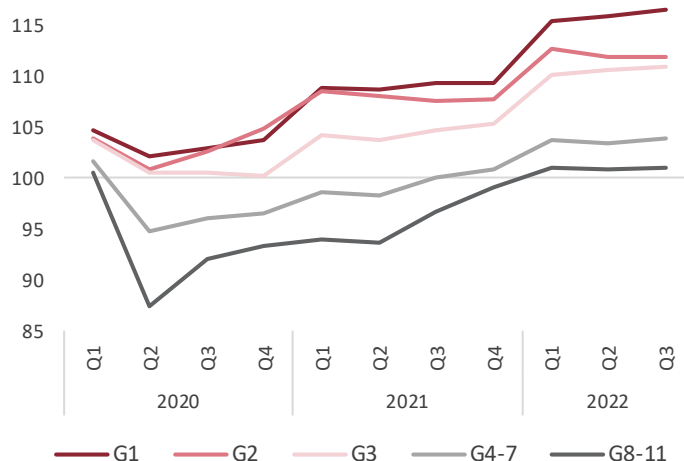
The variability of the effective rates of PIT includes both the effects of the same fiscal pressure and the changes in the composition of employment.

In 2020, a rise in the rates is generated that fundamentally stems from changes in the composition of the labour market, with sector wage increases, sectors with a volume of significant employment and higher-than-average wages (public sector, healthcare, information technologies and telecommunications). This increase coincides temporarily with a drop in

employment in professional categories with lower compensation than recorded, above all, in sectors of activity with low compensation (hospitality and trade). In short, although the drop in employment during the pandemic in net terms implied a fall in the compensation of employees, this nonetheless generates a rise in the average wage per worker and in their associated effective rates as a result of the differences in the composition of employment and in wage variations by branch of activity.

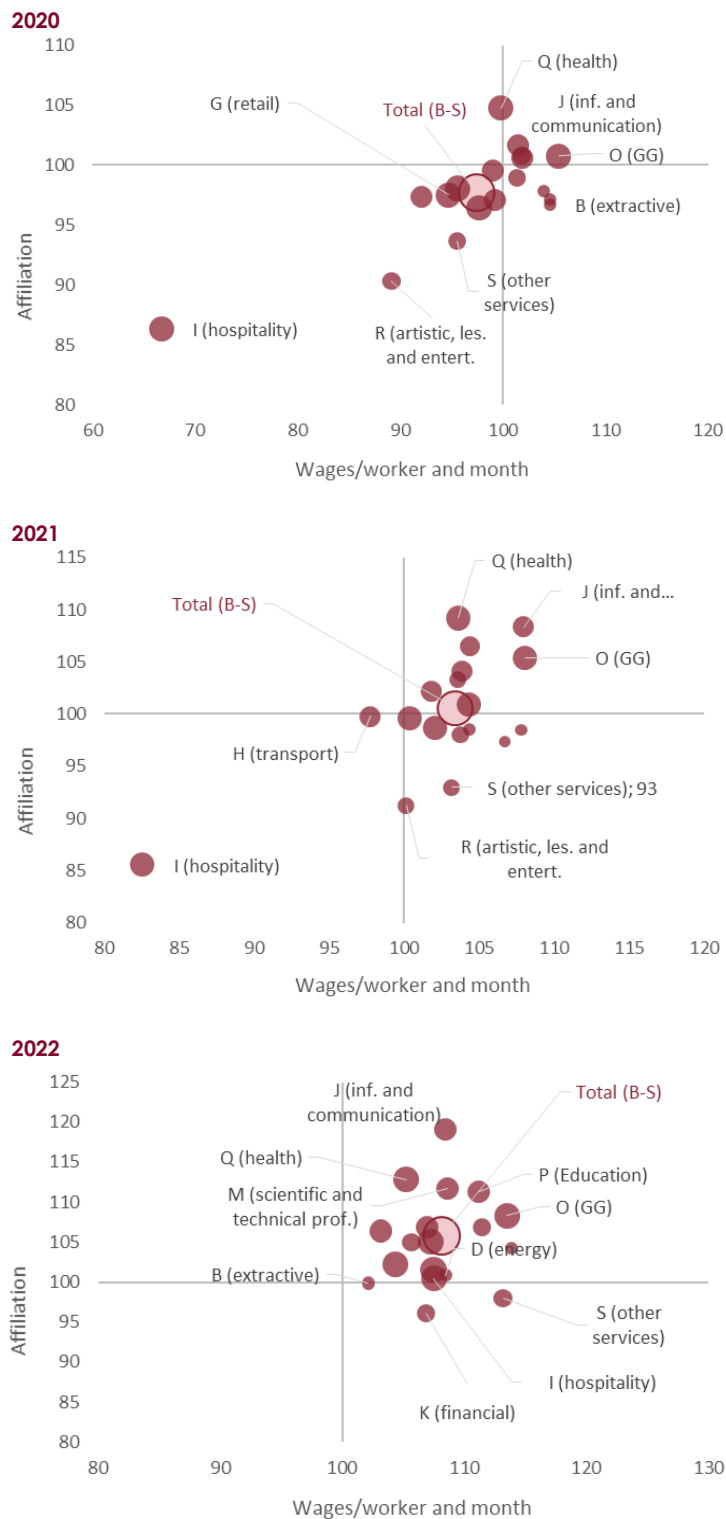
Over the course of 2021, employment recovers such that by 2022, most industrial activities, construction and services show employment growth accompanied by wage rises. Consequently, increases are recorded in the effective rates of PIT associated with increases in average compensation that is a widespread phenomenon in most sectors of activity.

ANNEX II. FIGURE 1. EVOLUTION OF WAGES PER WORKER PER MONTH VS. AFFILIATION (2019=100)



Source: General Treasury of Social Security

ANNEX II. FIGURE 2. EVOLUTION OF WAGES PER WORKER PER MONTH VS. AFFILIATION (2019=100)



Source: General Treasury of Social Security, INE, estimates and preparation AIReF

ANNEX III. CORPORATE INCOME TAX

Outline of the breakdown

ANNEX III. TABLE 1. OUTLINE OF THE BREAKDOWN OF THE VARIABILITY ACCORDING TO COMPONENTS OF CORPORATE INCOME TAX

| Components and their breakdown | Variability |
|---|---|
| <ul style="list-style-type: none"> • Instalment payments | GOS: volume component REAL |
| | GOS: price component PRICES |
| | Unexplained variability UNEXPLAINED VAR. |
| <ul style="list-style-type: none"> • Withholdings on capital • Settlements and other • Revenue and refunds from the return | OTHER |
| <ul style="list-style-type: none"> • Extraordinary revenue • Judgments • Deferred tax assets (DTA) | OTHER |
| <ul style="list-style-type: none"> • Regulatory measures | MEASURES |

Breakdown of Gross Operating Surplus

The Gross Operating Surplus (GOS) is the surplus generated by operating activities once the work factor has been offset. This includes income from property and business, along with Capital Consumption. The Gross Operating Surplus is obtained by deducting the compensation of employees from Gross Added Value at basic prices after adding the difference between Subsidies associated with production and Taxes associated with production, which is then deducted as the difference between the GDP, net of taxes and Subsidies on production and imports GDP_{I/S}, and of compensation of employees (RdA).

$$EBE = GDP_{I/S} - RdA \quad (13)$$

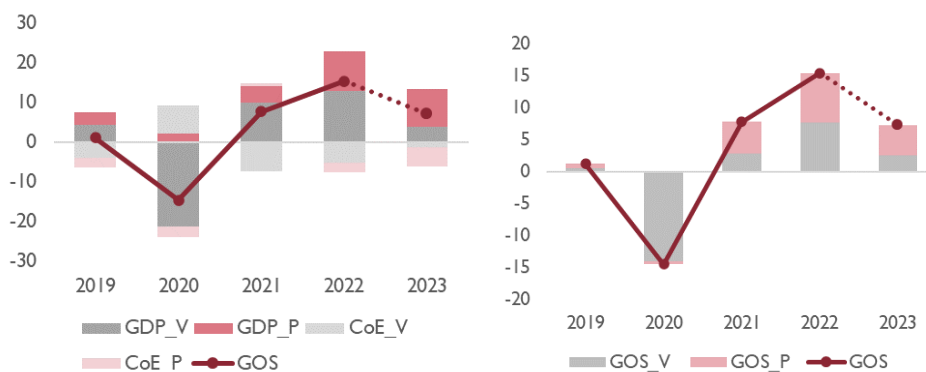
It is assumed that the breakdown of the variability of GDP between price and volume is applicable to the variability of GDP net of taxes and subsidies on production and imports (14) and the change in the compensation of employees is broken down as a change in the number of employees (RdA_V), plus that of the compensation per employee (RdA_P) (15).

$$\Delta GDP_{I/S} \approx \Delta GDP = \Delta GDP_V + \Delta GDP_P \quad (14)$$

$$\Delta R d A = \Delta R d A _ V + \Delta R d A _ P \quad (15)$$

Consequently, the change of the GOS between the real and price components is broken down, using these relations through their contributions.

ANNEX III. FIGURE 1. COMPONENTS OF GROSS OPERATING SURPLUS (% CHANGE AND CONTRIBUTIONS)



Source: INE, estimates and prepared by AIReF

ANNEX IV. VAT

Outline of the breakdown

ANNEX IV. TABLE 1. OUTLINE OF THE BREAKDOWN OF VARIABILITY ACCORDING TO COMPONENTS OF VAT

| Components and their breakdown | | Variability |
|--------------------------------|-------------------------------------|------------------|
| • Net revenue | → Domestic demand: volume component | REAL |
| | → Domestic demand: price component | PRICES |
| | → Unexplained variability | Unexplained VAR. |
| • Regulatory measures | | MEASURES |

Deduction of the model's variability coefficients

The tax base (BI) is modelled according to national demand, separating the real component of the deflator (for the sake of simplicity, the constant term and atypical elements are removed):

$$d\log(BI) = c_0 + c_1 * d\log(DN_V) + c_2 * d\log(DN_P) + c_3 * [\log(BI(-1)) - c_4 * \log(DN_P(-1))] \quad (16)$$

$$CE(-1) = [\log(BI(-1)) - c_4 * \log(DN_P(-1))] \quad (17)$$

$$\begin{aligned} \Rightarrow d\log(BI) &= c_0 + c_1 * d\log(DN_V) + c_2 * d\log(DN_P) + c_3 * [\log(BI(-1)) - \log(BI(-2)) + \log(BI(-2)) - \\ &c_4 * \log(DN_P(-1)) + c_4 * \log(DN_P(-2)) - c_4 * \log(P(-2))] = \\ &c_0 + c_1 * d\log(DN_V) + c_2 * d\log(DN_P) + c_3 * [d\log(BI(-2)) - c_4 * d\log(P(-2)) + CE(-2)] = \dots \\ &\dots = c_0 + c_1 * d\log(V) + c_2 * d\log(P) + c_3 * \sum [(d\log(BI(-i)) - c_4 * d\log(P(-i)) + CE(-i)) \end{aligned} \quad (18)$$

Bearing in mind this relationship, the following coefficients associated with volume and price are defined:

$$\text{coefV} = c_1 + c_3 * c_1 \quad (19)$$

$$\text{coefP} = c2 + c3 * (c2 - c4) \quad (20)$$

Finally, the variability explained by the model is broken down into the real and price components by means of the change in the components of national demand and deduced coefficients:

$$\Delta\text{REAL} = \Delta\text{DN}_V * \text{coefV} \quad (21)$$

$$\Delta\text{PRECIOS} = \Delta\text{DN}_P * \text{coefP} \quad (22)$$

$$\Delta\text{BI_EST} = \Delta\text{REAL} + \Delta\text{PRECIOS} \quad (23)$$

ANNEX V. ELASTICITY OF TAX REVENUE

Main literature

Tax elasticity is the relationship between the percentage change in tax revenue and the percentage change in the macroeconomic bases. Specifically, it measures the endogenous percentage change in tax revenue following a 1% change in the macroeconomic driver of this source of revenue.

For the correct evaluation of the elasticities of the tax revenue, it is necessary to use the revenue adjusted by regulatory measures. Jenkins *et al.* (2000¹¹) define elasticity under the supposition that the revenue is evaluated by excluding the regulatory changes. Given that tax elasticity is a measure of the capacity of response of a determined tax structure to changes in revenue, it is necessary to segregate the effects on revenue of changes in tax rates and tax bases from the calculation in order to obtain the correct measure of this response. Accordingly, to evaluate the elasticity, it is necessary to adjust revenue to the changes in tax policy. Barrios & Fagnoli (2010¹²) analyse how discretionary tax measures may have altered elasticities in the European Union. Conroy (2020¹³) underlines that if the effect of regulatory measures is not taken into consideration, the elasticities are underestimated, which particularly stands out in income tax where elasticities are obtained that are significantly above unity for revenue adjusted by measures and significantly below unity when they are not adjusted.

In international literature, the empirical analysis of elasticity is habitually performed by means of error correction models (ECM), which assume that a long-term and short-term relationship exists between tax revenue and macroeconomic bases and that short-term deviations are continually adjusted towards the long-term relationship at a certain speed. As a result, the ECM estimate three coefficients of interest: short-term elasticities, long-term elasticities and the speed of adjustment. The importance of these coefficients depends on the aim of the research in question. For example, an analysis of the impact of the economic cycle on tax revenue should focus more on the

¹¹ G.P. Jenkins *et al.* (2000). [Tax analysis and revenue forecasting: issues and techniques](#). Duke University Press

¹² Barrios, S. & R. Fagnoli, 2010. European Commission Economic Papers no. 419. Available at: [Discretionary measures and revenues in the run-up to the financial crisis](#)

¹³ Niall Conroy, 2020, Irish Fiscal Advisory Council. The Economic and Social Review, Vol. 51, No. 2, Summer 2020. [Estimating Ireland's Tax Elasticities: a Policy-Adjusted Approach](#)

short-term coefficients, while an analysis of tax sustainability should focus more on the long term.

In its 'Opinion' on the long-term sustainability of the General Government sector'¹⁴, AIReF deduces an implicit average elasticity of long-term revenue with regard to the GDP in the absence of measures of 1.04, which is slightly higher than 1 for revenue from direct taxes and slightly lower than 1 for indirect taxes.

ANNEX V. TABLE 1. LONG-TERM AIREF ESTIMATES: ELASTICITY OF REVENUE OVER NOMINAL GDP EXEMPT FROM MEASURES: AVERAGE 2027-2050

| Average elasticity of revenue | Elasticity over nominal GDP 2027-2050 |
|---|---------------------------------------|
| Modelled part | 1,04 |
| D.211r+D.214r VAT & STs | 0,99 |
| D.211r Value-added taxes VAT | 1,10 |
| D.214r Taxes on products, excluding VAT and import. | 0,70 |
| D.51r PIT | 1,18 |
| D.51r CIT | 1,20 |
| D.61 Social contributions | 1,00 |
| Non-modelled part (rest) | 0,00 |
| Other | 1,00 |

Source: AIReF estimates.

The OECD also deduces elasticities of long-term revenue for Spain above unity¹⁵, establishing them at 1.12. Other empirical works also confirm the existence of elasticities above unity. For example, Belinga *et al.* (2014¹⁶), Dudine & Jalles (2017¹⁷) and Mourre & Princen (2015¹⁸) estimate long-term elasticity for a broad set of countries at between 1.26/1.5 for Corporate

¹⁴ [AIReF-2023 Opinion-sostenibilidad-de-las-AAPP-largo-plazo](#)

¹⁵ (Dougherty, S., P. de Biase & L. Lorenzoni (2022), "Funding the future: The impact of population ageing on revenues across levels of government", OECD Working Papers on Fiscal Federalism, No. 39, OECD Publishing, Paris, [Documentos de trabajo de la OCDE sobre federalismo fiscal](#))

¹⁶ V. Belinga *et al.* (2014) Tax buoyancy in OECD countries. IMF Work Pap 14(110):1. <https://doi.org/10.5089/9781498305075.001>

¹⁷ P. Dudine, J. T. Jalles (2017) How buoyant is the tax system? New evidence from a large heterogeneous panel. IMF working papers. <https://doi.org/10.1002/jid.3332>

¹⁸ G. Mourre & S. Princen (2015) Tax revenue elasticities corrected for policy changes in the EU. EC discussion paper 018. <https://doi.org/10.2765/622532>

Income Tax, such that, for contributions, PIT and VAT estimate elasticities at close to unity.

In Dougherty & de Biase (2021¹⁹), you can find an analysis of the short-term tax dynamic between levels of government in OECD countries, in which elasticities can be deduced that are above unity for all taxes in Spain, established at 1.13 for Central Government and 1.91 for the other General Government sub-sectors, although a lack of significance for short-term estimates broken down by tax that are analysed with adjustments for regulatory measures should be mentioned.

¹⁹ Dougherty, S. & de Biase, P. Who absorbs the shock? An analysis of the fiscal impact of the COVID-19 crisis on different levels of government. *Int Econ. Policy* 18, 517–540 (2021). <https://doi.org/10.1007/s10368-021-00518-1>