Fiscal Drag in Theory and in Practice: a European Perspective*

(preliminary and incomplete, please do not circulate)

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Abstract

This paper presents a comprehensive characterization of "fiscal drag"—the increase in tax revenue that occurs when nominal tax bases grow but nominal parameters of the tax legislation are not updated accordingly—across 21 European countries through a microsimulation approach. First, we estimate tax-to-base elasticities, showing that the progressivity built in each country's personal income tax system induces an elasticity that ranges from 1.7 to 2 for most countries, indicating a potential for large fiscal drag effects. We unpack these elasticities to show stark heterogeneity in the mechanisms that give rise to them (e.g. tax brackets or tax deductions and credits), by income source (labor, capital, self-employment and public benefits) and across the individual income distribution. Second, we extend the analysis beyond these theoretical elasticities to study fiscal drag in practice for 2019-2023, incorporating observed income growth and actual changes in legislation. This allows us to quantify the impact of fiscal drag over this recent period as well as the extent to which government policies have effectively offset it. We further project fiscal drag effects until 2026 under different indexation counterfactuals. Our results provide insights into the fiscal and distributional effects of fiscal drag in Europe, as well as statistics of interest for forecasting and modelling public finances and the macroeconomy.

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1 Introduction

Fiscal drag refers to the increase in tax revenue that occurs when there is nominal growth of the tax base while parameters that define a progressive tax system are not increased in line with such growth, leading to a rise in the average effective tax rate. This effect is more prevalent in personal income taxes (PIT), which often display a high degree of progressivity due to progressive tax schedules or to tax deductions and credits.

Fiscal drag therefore plays an important role in public finance analysis with implications for the elaboration of fiscal projections (e.g. Creedy and Gemmell, 2004; Belinga et al., 2014), for macro modeling of public finances (e.g. Hack, 2024), and for the analysis of distributional consequences of taxation and optimal tax design (e.g. Immervoll, 2005; Sutherland et al., 2008; Paulus et al., 2020). Fiscal drag can also play a role as a discretionary revenue measure[1] or as automatic stabilizer (Immervoll, 2006). In line with this, the recent spike in inflation and the consequent growth in household income has triggered a renewed interest in fiscal drag from analysts and policy makers interested in estimating its budgetary effects and distributional implications.[2]

The study of fiscal drag can be split along its two distinct determinants: the progressivity embedded in the design of the tax at a given point in time, and the degree of updating of nominal tax parameters over time to keep up with the nominal growth of the tax base. The progressivity of the tax system provides a measure of potential fiscal drag that would occur, *in theory*, if the nominal tax base grows but tax parameters are not updated. The combination of this progressivity with the updating of parameters for a given growth of the tax base determines the actual fiscal drag that occurs *in practice*.

In line with this conceptual distinction, a first strand of the literature on fiscal

[1]For an example of explicit use of fiscal drag as a discretionary measure see Waters and Wernham (2022). Under the new fiscal framework of the European Union, revenue induced by fiscal drag could be considered as a discretionary income measure.

[2]See the OECD (2023), the IMF (Balasundharam et al., 2023), the European Commission (Leventi et al., 2024), the Institute for Fiscal Studies for the U.K. (Waters and Wernham, 2022) or the Bank of Spain (Balladares and García-Miralles, 2024).

drag[3] has focused on studying tax-to-base (TTB) elasticities, such as the pioneered work of Immervoll (2005) and more recent contributions of Price et al. (2015) or Boschi and d'Addona (2019).[4] More recently, a second strand has placed more emphasis on studying the effects of fiscal drag in practice, as in Paulus et al. (2020) or Waters and Wernham (2022) shifting the focus from potential fiscal drag embedded in tax system to government actions through indexation or structural reforms and their impact on actual fiscal drag.

This paper provides a comprehensive characterization of fiscal drag across 21 European countries (all euro area and Hungary) in the recent period, which aims to connect and extend the two conceptual standpoints considered in the literature. We leverage microdata from the European Union Survey of Income and Living Conditions (EU-SILC) and a microsimulation tool that models the tax and benefits legislation of all European countries[5], allowing for the simulation of individual tax liabilities under different counterfactual scenarios of income growth and tax policies. Our results provide detailed and comparable estimates of tax progressivity across Europe in terms of tax-to-base elasticities and their potential impact on fiscal drag, through a deep exploration of their determinants and heterogeneous effects. We also estimate actual fiscal drag in the recent period, isolating the effect of government action indented to offset these effects and providing a data-driven characterization of indexation practices across Europe.[6]

In the first part of the paper, we estimate the potential fiscal drag embedded in the tax system of each country through TTB elasticities, i.e. the relative change in

[3]The focus of this paper is on fiscal drag and on personal income taxation, but our analysis relates to the more general concept of tax buoyancy and the more specific concepts of bracket creeping or benefit erosion, as we discuss later.

[4]Note that Immervoll (2005) focuses on understanding the impact of fiscal drag on inequality rather than on estimating elasticities, but in a setting that corresponds to our notion of fiscal drag in theory, under homogeneous income growth and constant tax parameter

[5]We use EUROMOD, an open-source microsimulation model for the EU developed and maintained by the Joint Research Center of the European Commission that contains detailed coding of the legislation on direct taxes and benefits of all 27 EU Member States

[6]It is worth emphasizing that our methodology follows closely that of Balladares and García-Miralles (2024) using administrative tax registers for Spain, which allows for a validation of our survey-based analysis for that country. We find generally consistent results, as illustrated in Online Appendix C.

tax revenue following a nominal homogeneous 1% increase in the tax base with no change in tax legislation. This exercise provides us with an estimate of the progressivity of the tax system that indicates, at a given point in time, what would be the fiscal drag that would occur *in theory* if incomes grew homogeneously and tax parameters remained unchanged. These elasticities have a direct use in models of fiscal projections as they indicate what would happen to tax revenue in a no-indexation scenario. We implement our analysis on the most recent microdata available at the time of the study, corresponding to incomes received during 2019 and the corresponding PIT legislation, although we also compute elasticities given the 2023 legislation based on updated data.

Across the set of countries studied, two thirds have tax systems that produce similar TTB elasticities, ranging from 1.7 to 2. Interestingly, despite the complexity and differences that characterize the personal income tax designs across countries, elasticities seem to converge around these values.[7] These estimates are large, but in line with previous results (Price et al., 2015, report an elasticity of around 1.85 on average for all OECD countries) and imply that in the absence of adjustments in the tax parameters, tax revenue and effective average tax rates would grow markedly.

We document, however, stark differences in the mechanisms that give rise to these elasticities as well as large heterogeneity by income source and across the individual income distribution. We unpack these elasticities by exploring the mechanisms that give rise to them, as we decompose the contribution to the elasticity that stems from bracket progressivity as well as each tax deduction or credit present in the tax legislation. We observe large differences across countries, ranging from cases where the elasticity is almost entirely due to bracket progressivity (as tax deductions and credits are inexistent or very small) to cases where the elasticity is almost entirely driven by these deductions and credits, when these are sizable across the income distribution. We also find many cases where the contribution of bracket progressivity and deductions and credits is more balanced. Overall, we conclude that on average,

[7]Specifically, we document that the TTB elasticities for the four biggest economies in Europe, Germany, France, Italy and Spain, are 1.8, 1.5, 1.9 and 2 respectively. We find the largest elasticity of 2.4 for Croatia while the lowest elasticity is estimated for Hungary at 1.1.

around half of fiscal drag is driven by bracket progressivity and half is driven by tax deductions and credits, with the later often concentrated in just one or two large tax deductions.[8]

We further explore the drivers of these elasticities by estimating heterogeneity by income source. We estimate TTB elasticities that results from increasing a specific income source, which can induce different elasticities due to differential treatment in the tax legislation and due to composition effects of the individual distribution. We generally document larger elasticities for labor income and smaller elasticities for capital incomes and for pensions and benefits (the two later often subject to a more flat schedule or to exemptions and large allowances). We also estimate the elasticity for self-employed income, which we find to vary markedly across countries. These elasticities and their heterogeneity by income source can be useful tools for modeling and projecting tax revenues.[9]

We then explore heterogeneous effects across individuals. We compute TTB elasticities across decile groups of the individual income distribution to provide a non-parametric illustration of the heterogeneous elasticities across individuals and its mechanisms. We uncover wide within country variation, with elasticities as large as 10 for some decile groups, often placed at the mid-low range of the distribution, as these individuals are often more affected by the relative loss of tax deductions or credits, that in some cases can be phased-out as nominal income increases. We

[8]For example, we document smaller elasticities in countries with flat tax schedules such as Latvia, Lithuania or Hungary, but there are exceptions like France whose elasticity is small despite being driven mainly by bracket progressivity. On the other end, we document larger elasticities for countries with a more progressive tax schedule who also have relevant tax deductions and credits, such as the Netherlands, Spain or Portugal, but there are exceptions such as Croatia, whose elasticity is the largest and it is driven entirely by a very large and widespread tax deduction, or Cyprus, who presents the second largest elasticity, entirely driven by bracket progressivity. In between these two polar groups, countries with elasticities in the mid-range tend to display both bracket progressivity and tax deductions and credits, but again here we observe exceptions.

[9]While elasticities from labor incomes are generally just above the overall elasticity of each country, at around 1.8-2.1 we find some significant dispersion for other income sources in some countries, explained by the specificities of their tax systems. For example, elasticities from pension income are remarkably low for countries such as Croatia, Malta, Germany, Ireland and Hungary where these incomes are either exempt or subject to a flat and low rate. Self-employment incomes also standing out in some countries both in the upper end (Croatia, Greece and Austria) and lower end (Slovakia, Italy, Finland, Estonia and Lithuania).

also document decreasing elasticities at the top of the distribution, where the tax brackets flatten and tax deductions are less relevant. These statistics provide detailed information on the specific tax design of each country and their distributional consequences with implications for optimal tax design and inequality.[10]

We further document the impact of fiscal drag in this theoretical setting on the progressivity of the system and on inequality. We find that as a result of fiscal drag, the tax system becomes less progressive in all countries (tax rates grow more for the low income tax payers, as illustrated in our decile analysis), a result in line with existing literature. However, we find mixed results on inequality. For a majority of countries inequality is reduced, mainly due to the fact that many zero-tax payers remain so, while tax rates increase for all positive tax payers. However, for around one forth of countries, inequality increases. This paints a more nuanced picture than the common finding in the literature that inequality always decreases.

In the second part of the paper, we study the fiscal drag that occurred *in practice* during the period 2019 and 2023. To do so, we incorporate both the observed growth of different income sources and actual changes in the tax legislation. Specifically, we compute tax liabilities for baseline scenarios in 2019 and 2023 that reflect actual tax collection in these two years, and we then construct counterfactual scenarios for 2023 for two polar cases: one of no indexation, where the tax system of 2019 remains unchanged and one with full indexation, where the tax system of 2019 is fully indexed according to a certain index (we consider three indices: concurrent HCPI, lagged HCPI, and nominal growth of the tax base). The difference between these two polar counterfactuals provides an estimation of the potential impact of fiscal drag (that is, the revenue that could be collected during this period if tax parameters remained unchanged with respect to a fully-indexed scenario). Note that this potential fiscal drag is directly related to the TTB elasticities, but in this case it interacts with potentially heterogeneous income growth across sources. Against

[10]We see this deeper exploration of heterogeneity and mechanisms as a valuable contribution to the existing literature given the breath and homogeneity of our cross-country analysis, which we complement in our detailed Online Appendix B. A careful exploration of mechanisms across the income distribution is provided in Waters and Wernham (2022) for the U.K. and in Balladares and García-Miralles (2024) for Spain.

this potential fiscal drag, the difference between actual tax collection of 2023 and the counterfactual of full indexation provides an estimate of the actual impact of fiscal drag. Interestingly, the inverse of the ratio of this actual fiscal drag over the potential fiscal drag provides a measure of how much fiscal drag has been effectively offset by legislative changes (either indexation mechanisms or other structural changes of the tax legislation). This measure provides a comparable indicator across countries that can be interpreted as a data-driven characterization of recent indexation practices.

Cross-country results based on this methodology show that a large group of countries, including Germany and France, have fully compensated (or overcompensated) the potential fiscal drag effect, through policy changes introduced between 2019 and 2023. Other countries such as Spain, Cyprus and Malta only offset, in the same period, around 30% of the total potential increase of the PIT tax revenue due to fiscal drag. These are significant differences that can result in up to 0.6% of GDP in higher tax revenues in a year like 2023 with respect to a counterfactual of full indexation since 2019 or just above 1 percentage point increase in average effective tax rates.

The main contribution of this paper is that we provide estimates of fiscal drag based on microdata for 21 European countries, while previous studies have been limited to a few countries.[11] We provide therefore micro-based estimates that are novel for many countries and allow us to extract richer insights from comparing many different tax systems. The second contribution of our paper is the connection between the two complementary approaches within a consistent and homogeneous framework, providing estimates of interest that map fiscal drag from its origin (the progressivity of each tax system) to the end (the adjustment to tax parameters and tax policies). All of which have implications for policy makers interested in fiscal developments as well as for optimal tax design. Finally, we go beyond existing analyses by un-

[11]For example, Immervoll (2005) studies Germany, the Netherlands and the U.K. and Paulus et al. (2020) studies Belgium, Bulgaria, Estonia, Greece, Hungary, Italy and the UK. Other works have considered a large set of countries like us, but to answer different questions, such as the effect of wage indexation in Europe (Leventi et al., 2024). There are also papers estimating fiscal drag for a large set of countries using aggregate time series data or aggregate distributional data and representative households (Price et al., 2015).

packing tax-to-base elasticities across income sources, across the income distribution and through its mechanisms.[12] We also extend the analysis of Paulus et al. (2020) quantifying potential and actual fiscal drag over specific periods of times by adding a fiscal focus that includes observed and projected budgetary impacts and effects through average tax rates, going beyond inequality and poverty indicators.

The paper is structured as follows. Section 2 introduces the institutional framework of the analysis. Section 3 presents the data and the microsimulation tool used in the study. Section 4 and section 5 describe the methodology and the results of our static approach and dynamic approach, respectively. Section 6 concludes with a summary and discussion of our results.

2 Institutional framework

2.1 The personal income tax across Europe

The personal income tax framework encompasses all fiscal mechanisms established by the government to levy taxes on household incomes, regardless of the income source. Tax legislation is country-specific and often complex, varying not only between countries but also within them in some cases due to both state and regional tax policies. In theory, personal income taxes enable governments to raise revenue and reduce inequalities, employing various tools to achieve this. Typically, tax systems include tax rates and brackets, which determine the amount levied based on individual incomes, as well as tax benefits designed to relieve some individuals of fiscal pressure based on their personal situations. Given the wide variety of tools and objectives associated with personal income tax, tax systems differ significantly across European countries.

[12] Balladares and García-Miralles (2024) do a similar exploration of TTB elasticities in Spain, and Waters and Wernham (2022) explores nominal impact across decile groups in the U.K.

2.2 Definitions

Throughout the paper, we consider the following concepts and definitions, that aim to encompass the different features of PIT systems across Europe:

Gross incomes: Total income a person or household earns from all sources, whether taxed or not. It includes labor income (wages and salaries), capital income (such as interest, dividends, rental income, capital gains), self-employment income and pensions and benefits.

Tax base and taxable income: The tax base includes all gross incomes subjected to PIT, before any exemptions, allowances and deductions are applied. The taxable income is then obtained from the tax base by eventual exempting, partially or fully, some types of incomes (e.g. pensions or some types of benefits) and substracting deductions or allowances (e.g. social insurance contributions are often deducted from the tax base). Taxable income represents the share of income to which the PIT tax schedule is effectively applied.

Personal income tax revenue: Personal income tax revenue refers to the amount effectively collected by the government from the taxable income of residents. The collection may vary depending on the source of income, such as labor income, self-employment income, capital income, or pensions and benefits. This revenue is calculated by applying tax rates, as defined by law, to the taxable income, and then subtracting any applicable tax credits. Tax credits are allowances that directly reduce the household's gross tax liability. While in some countries there is one single personal income tax instrument, in others there is more than one, sometimes as a results of supplementary tax instruments, in which case, we treat them together as long as we consider them economically equivalent.

Social security: In most countries, workers contribute a share of their gross income to social security, in return for a pension income in the future. Often, these contributions are matched by a tax exemption of the same size. [13]

Nominal tax parameters: Parameters defined in the tax legislation which characterize tax allowances, deductions and credits amounts and thresholds, as well as tax

[13]EUROMOD already incorporates these type of automatic adjustments, which we preserve and account for when calculating tax-to-base-elasticities, as detailed in section 4.1.

brackets limits, influencing the marginal or average tax rate. These parameters are nominal as they define amounts not systematically indexed with inflation. In case of wage growth and unchanged parameters, households face higher tax burden.

For a detailed description of each country's PIT system and how it is captured by the framework described above, see Online Appendix B.

3 Data and the microsimulation tool

3.1 Data

Tax-benefit microsimulation models, such as the one used in this paper, are generally run on rich microdata, as they require detailed information — beyond the tax-benefit rules encoded within the models — about not only the incomes earned, benefits received and taxes payed by households, but also about socio-demographic characteristics, such as age, gender, marital, educational and labour status, etc. We thus recur to the the cross-sectional version of the European Union Survey on Income and Living Conditions (EU-SILC), produced by Eurostat, which covers all EU countries.[14] This annual survey collects individual and household-level information on disposable income components—earnings, social contributions, taxes, pensions, and other social transfers—as well as living conditions.

The simulations performed in this paper are based on the EU-SILC 2020 survey, whose income reference period is 2019. In order to study the fiscal drag in practice, we update the income variables observed in 2019 according to their aggregate growth between 2019 and 2023, using *uprating* indexes. Those are derived for each income source, based on the latest available administrative statistics, and they reflect the change in their average amount between the income data reference period and the target year.

[14] https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions.

3.2 Microsimulation and EUROMOD

The results presented in this paper are generated using EUROMOD, the open-source microsimulation model for the EU [15]. The model contains detailed coding of the legislation on direct taxes and benefits of all 27 EU Member States, in most cases from 2006 up to 2023, allowing for the simulation of tax liabilities and benefit entitlements at both the individual and household level. The microsimulation model runs upon survey data on specific characteristics of individuals and households, in our case EU-SILC 2020. EUROMOD simulates taxes and benefits accounting for their complex interactions in each of the countries studied, enabling an accurate calculation of individual and household disposable income.

Microsimulation models like EUROMOD allow for simulations of scenarios under the current legislation, comparison of outcomes from counterfactual policy scenarios, and assessments of the effects of changes in the tax-benefit system. This paper relies heavily on the construction of these hypothetical scenarios to estimate different measures of fiscal drag and its underlying mechanisms. Additionally, EUROMOD is particularly useful in our case as it facilitates cross-country comparisons without the need to address the limitations posed by varying national models with different methodologies and data sources.

It is important to note that EUROMOD is a static model, meaning it only delivers the first-order outcomes of policy or income changes - the so-called "morning-after" effects. However, the static elasticities estimated in this paper are still relevant to policymakers, as they represent the tax base elasticities embedded in each country's tax system under different scenarios.

[15] EUROMOD is developed and maintained by the Joint Research Center of the European Commission. For more details on this microsimulation model see https://euromod-web.jrc.ec.europa.eu/ and Sutherland and Figari (2013).

4 Fiscal drag in theory: tax-to-base elasticities

4.1 Methodology

The objective of our analysis is to characterize fiscal drag originating from various personal income tax (PIT) systems across the countries under study. Our primary instrument for measuring fiscal drag is the *tax-to-base elasticity* (ε), which captures the response of taxes to a standardized (1%) increase in gross income. Formally, we define the tax-to-base (TTB) elasticity for each taxpayer as:

$$\varepsilon = \frac{\frac{\partial t}{t}}{\frac{\partial y}{y}} = \frac{\partial t / \partial y}{t/y}\,, \tag{1}$$

where y denotes income, and t represents personal taxes paid. Notably, these elasticities are *static* because they are calculated under a *ceteris paribus* assumption, where all parameters outside the PIT system remain fixed, and no dynamic responses (often termed the "morning-after" effect) are incorporated. The elasticity ε depends on several factors, particularly the design of tax brackets, deductions, and credits, as well as the population's distribution across tax brackets and eligibility for tax benefits.

To compute fiscal drag, we employ a micro-based approach using EUROMOD, where we apply a standardized 1% income shock to individual incomes. This initial shock provides the "theoretical" fiscal drag, which will later be expanded to incorporate observed wage increases to measure fiscal drag "in practice".

Our approach differs from comparable studies in two main ways. First, we aim to model aggregate tax revenue (a "fiscal perspective") to generate elasticities that inform revenue forecasting. To do this, we incorporate the distributional nature of the microsimulator, rather than focusing on stylized household examples (or "HHoT" in EUROMOD terminology). Second, we isolate the effects of PIT alone, as opposed to calculating effective tax rates that include social security contributions (SSC). Since SSC are often deductible from gross income, they interact with PIT, potentially impacting the effective rate. To neutralize this effect, we adjust SSC parameters (such as thresholds) in response to income shocks, which ensures that a 1% income

increase typically results in a proportional 1% increase in deductible SSC.

4.1.1 Exploration of mechanisms

An importance advantage of our microsimulation approach is that it allows a thorough exploration of the mechanisms that give rise to these elasticities. We decompose tax-to-base elasticities by isolating the effects of the different tax parameter of each country's legislation, distinguishing between tax brackets and the most important tax credits and deductions. We proceed by first simulating a 1% increase to total income while simultaneously increasing all PIT parameters by the same relative amount, simulating a scenario close to perfect indexation to income growth. Second, by iteratively removing these increases to each of the parameters that determine the brackets and specific deductions and credits, we calculate the contribution of each of these components to the overall elasticity.

4.1.2 Heterogeneity by income source

We also explore the determinants of the TTB elasticities by calculating tax-to-base elasticities specific to income types: labor, self-employment, capital income, and benefits. We shock each income component individually and calculate the elasticity as the relative change in revenues divided by the relative change in total income (with this change in total income being solely driven by a 1% increase in the income source of interest).

4.1.3 Distributional Analysis

Elasticities by income decile. To deepen our analysis of fiscal drag, we compute tax-to-base elasticities across the income distribution, calculating separate elasticities for each decile of equivalized household income. This non-parametric approach enables a granular view of how fiscal drag affects different income levels, revealing the distinct impacts of tax mechanisms across the income distribution. For each decile, we calculate elasticity as the ratio of the change in total taxes paid by individuals within that decile to the change in their gross income. Special attention is given to

zero-taxpayers in lower deciles, as their tax-to-base elasticity is zero, which affects the aggregate elasticity calculations. We present these results along with the share of zero-taxpayers in each decile to account for country-specific variations.

Progressivity and inequality. While our primary focus is on revenue effects, our microsimulation approach allows for an examination of fiscal drag's distributional impacts. We assess inequality using the Gini index, as well as the 90/10 and 80/20 decile ratios, which compare the income levels of the top and bottom 10% and 20% of the distribution, respectively. To measure progressivity, we apply the *Kakwani index* (see Kakwani, 1977), defined as the difference between the concentration index of the tax change (indicating the distribution of tax changes) and the baseline Gini index of income distribution. Unlike a simple comparison of pre- and post-simulation Ginis, the Kakwani index accounts for the number of individuals affected and the magnitude of change in taxes, offering a more nuanced measure of progressivity.

This methodology allows us to identify and quantify the sources and distributional impacts of fiscal drag across different income levels and PIT components, offering a comprehensive view of its role in revenue generation and income inequality.

4.2 Results

4.2.1 Tax-to-Base elasticities and its determinants

This section presents the results of static simulations for all countries considered. Figure 1 shows that the estimated TTB elasticity induced by personal income tax regulations in 2019 broadly range from 1.7 to 2 for most countries (twelve out of the twenty-one studied) showing a certain homogeneity in elasticities across these countries with similar *"theoretical"* fiscal drag despite the wide variety of tax designs. We also document some outlying cases with elasticities varying from 2.4 for Croatia to 1.1 for Hungary. In other words, following a 1% income growth, tax revenue increase between 2.4% (Croatia) and 1.1% (Hungary) among the countries studied.

When breaking down the TTB elasticities by the mechanisms that give rise to them, we uncover wide heterogeneity across countries. In general, bracket progressivity is often responsible for a large amount of fiscal drag but the combination of

tax deductions and tax credits is of similar importance. Further, among these tax deductions and credits, it is often one or two specific ones that have a significant effect on the elasticity, such as the often present family allowance or other types of large tax deductions for a minimum income. Panel (b) of Figure 1 illustrates clearly that the relevance of bracket progressivity in explaining the over-proportional effect ranges from almost 100% in some countries to almost 0% in others. With the complementary effect being explained by tax deductions and tax credits. These dynamics capture the specificities of each country's tax design.

In addition to the 2019 TTB elasticity, we also estimate elasticities based on 2019 microdata updated to 2023 and under 2023 tax legislation to cross-check the results from 2019 and obtain more updated estimates. The comparison and the 2023 values are presented in Appendix Figure A.1 and Appendix Table A.2. We find that results are generally stable across these years. Since static elasticities measure the theoretical fiscal drag embedded within a taxation system, we expect the 2023 elasticities to be relatively close to those from 2019, barring any major structural tax reforms during this period. We find that the few meaningful changes between 2019 and 2023 are mainly explained by changes in the tax legislation, as described in the relevant cases in the Online Appendix B. Furthermore, slight differences in elasticities may arise due to varying growth rates in income sources or across the individual income distribution, which could shift the weight of different income types or levels in overall income between 2019 and 2023.

4.2.2 Tax-to-base elasticities by income source

We also document significant differences in fiscal drag when we calculate elasticities specific to each income source (see Figure 2 and Appendix Table A.1). The elasticity for labor income is close to the overall elasticity, as labor income is the main component of households' overall income. Some countries, such as France and Latvia, have little dispersion in their elasticities across income sources, indicating a homogeneous fiscal drag effect embedded by the tax system. In contrast, others show high disper-

sion, with the most extreme case being Croatia, where pension and benefits income are not subject to fiscal drag, with an elasticity close to 1, while self-employment income is highly affected by fiscal drag, with an elasticity higher than 3.5. Overall, we note that pensions and benefits are less subject to fiscal drag in many countries in the panel, with nine countries reporting an elasticity close to or lower than one. Capital income also tends to induce a lower elasticity than labor income across the panel, although to a lesser extent than pension and benefits. This is consistent with the personal income tax design where capital income are generally subject to less progressive tax brackets or only subject to a flat tax. However, there are notable exceptions where capital income is more affected by fiscal drag, such as in Austria, Portugal, and Slovenia, among others as a results of specific tax deductions and tax credits.

It is worth noting that in some countries, certain income categories have elasticities close or below 1%. This primarily pertains to pensions and benefits. The main explanation is that pensions and benefits may be subject to lower tax rates or even exempt from taxation (as is the case for pensions in Hungary, which are tax-free). As this incomes are tax-free or taxed differently, the increase in income is taxed as a inferior marginal rate than the average rate, lowering the relative weight of the tax bill. Additional country-specific explanations for low elasticities are provided in Online Appendix B.

4.2.3 Tax-to-base elasticities across the individual income distribution

Figure 3 and Table A.3 report the estimated tax-to-base elasticities by decile of the taxable base distribution. The Figure also illustrates the share of zero-tax payers within each decile who do not affect the resulting elasticities as explained in 4.1. In approximately half of the countries analyzed, over 90% of taxpayers in the first decile do not pay PIT, indicating that the elasticity calculated for this segment is relevant to only a small fraction of taxpayers and should be interpreted with caution.

This non-parametric approach to studying heterogeneity has the advantage of visually and transparently documenting the different elasticities and the mechanisms

behind them, beyond the information provided by aggregate indices. It allows the identification of jumps or kinks in the elasticity of importance for understanding and evaluating the tax design of each country in light of our results. Notably, the exceptionally high elasticities observed in some deciles suggest that average tax rates increase disproportionately with income growth in the absence of indexation. This raises concerns about potential inefficiencies, as very high marginal tax rates could undermine the fairness of the tax system and diminish work incentives at the intensive margin. By decomposing the sources of these elasticities across deciles, this paper highlights the specific features of the tax that drive these inefficiencies, significantly enhancing its relevance for policymakers. Further details are provided for each country in Online Appendix B, including the explanation for some extreme values.

Despite the huge variability in cross country results, some common trends emerge. Panel b in Figure 4 depicts the tax-to-base elasticities in the lower and upper halves of the distribution. In all countries studied, elasticities are higher in the lower half of the distribution, indicating that fiscal drag reduces the progressivity of the tax. Panel b in Figure 4 depicts the maximum and minimum values of tax-to-base elasticities by deciles. Although there is a wide range of peak-to-trough differences, for most countries, the highest elasticities are found either in the second decile or in adjacent deciles, with Croatia, Hungary, Greece and France being notable exceptions.

Across the income distribution, we identify two polar cases in profiles of tax-to-base elasticities: (1) relatively homogeneous elasticities across deciles, with differences between the lower and upper halves of the distribution limited to about 1 and peak-to-trough differences around 2; (2) sharply declining elasticities along the income distribution after a peak around the second decile, with peak-to-trough differences exceeding 5 and elasticities in the lower half being more than 2 points higher than those in the upper half. France and Spain are clear examples of countries in case (1) and (2), respectively.[16]

Between these two extreme cases are countries where the differences in elasticities

[16] **AT**: The high elasticity in decile 2 is caused by persons switching from negative tax (payable tax credits, SSC refunds) to the regular tax schedule. In 2019 there was also a special edge case of negative taxes interacting with a children's benefit which further increased elasticities at this point (fixed in tax legislation since 2020). **BE:** ... For further details see Online Appendix B.

between the lower and upper halves range from 1 to 2. In these cases, elasticities may either show a clear decreasing pattern with taxable income, as seen, for instance, in Germany and Italy, or display a hump shaped pattern, as in Croatia.

4.2.4 Inequality and progressivity

We begin by examining the effect of fiscal drag on the progressivity of the tax system. The change in progressivity refers to the relative impact of the tax system on different income groups after accounting for simulated income growth in our static setting. To measure this impact, we compute the Kakwani index, which quantifies the degree of progressivity of the tax system. Panel (b) of Figure 5 shows the difference in the Kakwani progressivity index before and after the 1% increase in incomes. We observe negative values across all countries, meaning that when incomes grow and tax parameters are unchanged, the progressivity of the system is reduced. This maps to the TTB elasticities by decile shown in Figure 3 and Figure 4, as effective tax rates are increasing less for the top incomes than for the middle and low incomes, while they remain the same for those with a zero tax base.

We then study the effect of fiscal drag on inequality in our static setting, computing an inequality indicator (e.g. the Gini index or the Ratio 80:20) for the net-of-tax income before and after the increase in income, keeping the tax legislation constant. The difference in Gini or in the Ratio 80:20 after income growth indicates whether inequality has increased or decreased. The brown diamond-shaped markers in panel (a) of Figure 5 show these differences and we observe that they take negative values in a majority of countries, meaning that inequality is reduced. These results hold both for the Gini index (that puts more weight on inequality in the middle part of the distribution) and on the Ratio 80:20 (that puts more weight on the extremes of the distribution) although we observe some stark differences for a few countries.

However, it is worth mentioning that income growth per se already impact inequality (either based on gross-incomes or based on net-of-tax incomes even with a fully indexed tax legislation). This is due to the presence of individuals with a tax

base equal to zero, who are not affected by the 1% growth in incomes.[17] This change in inequality is therefore not strictly caused by fiscal drag. To overcome this, we compute a different statistic that seeks to filter-out the effect of income growth to focus on the capacity of the tax system to reduce inequality before and after the increase in incomes, provided that tax parameters remain unchanged. Specifically, we compute the percentage change in a given inequality indicator (Gini or Ratio 80:20) in the scenarios before and after incomes have grown by 1%. We then take the difference between these two percentages, to measure whether the inequality-reduction capacity of the tax system has increased or decreased. The round-shaped markers in panel (a) of Figure 5 show that these differences are generally positive, meaning that inequality-reduction increases after incomes have grown, given constant tax parameters. This is in line with the results obtained using the simpler approach described earlier.

All in all, our results show that inequality tends to decrease as a result of fiscal drag in most countries but not all, and that these results are robust to alternative estimation methods. We have observed that TTB elasticities tend to be larger for low- to middle-income individuals, which leads to a decrease in progressivity due to fiscal drag. However, inequality still tends to decrease because elasticities are either zero or very low for individuals with very low incomes (note that our computation of elasticities by deciles does not include these zero-elasticities in the calculations), outweighing the negative impact of progressivity in inequality and leading to a decrease in inequality in most cases.

It is worth emphasizing, that the inequality-reduction effect of fiscal drag is a common result in the literature, however, our results show that this is not a universal result, as a significant proportion of the countries we analyse display an increase in inequality.

[17] The composition of taxable income is not homogeneous across countries, with some countries excluding significant parts of social transfers, which are typically more relevant for low income households.

5 Fiscal drag in practice: counterfactual indexation scenarios

Our second approach aims to explore fiscal drag "in practice", by incorporating actual growth of different income sources as well as actual policy changes - some of which might consist in the nominal updating of tax parameters intended to offset fiscal drag, and some might be more structural changes in the design of the tax. In this sense, we aim at measuring the impact of those policy changes in compensating the potential fiscal drag that may occur between 2019 and 2023. As before, we recur to the microsimulation model EUROMOD to construct counterfactual scenarios of full and no indexation that allow us to quantify the potential fiscal drag in 2023 and how much was effectively compensated (by any type of policy changes). The next two sub-sections describe in more detail the counterfactual scenarios and the fiscal drag offsetting metric used, as well as preliminary results for our group of European countries.

5.1 Methodology

As mentioned before, in order to estimate fiscal drag "in practice" we consider both tax legislation changes and actual income growth that occurred between 2019 and 2023, following closely the methodology in Balladares and García-Miralles (2024). Beyond the baseline simulations for 2019, we now construct a simulation for 2023 based on the tax legislation of that year and we update the 2019 microdata using disaggregated growth rates for the different components of the tax base to better approximate the tax revenue that would be collected in 2023.

Note that the simulated and observed tax revenue reported in aggregate statistics in the period 2019 to 2023 may differ. Recall that tax revenues are computed in EUROMOD based on a representative sample of the population derived from survey data, and the results do not perfectly match national accounts due to survey biases, such as difficulties in capturing accurately the top part of the income distribution. Additionally, by updating only nominally the monetary variables of the survey we are

leaving out the composition changes occurred between 2019 and 2023, importantly the ones occurred in the labour market on the intensive and extensive margins. Finally, divergences may also arise from simulation simplifications in EUROMOD, due to lack of data. In order to align the simulated tax revenues with the ones registered in aggregate statistics, such as national accounts, we rescaled them according to the ratio between the simulated tax revenues and the observed aggregated ones, for each year of analysis.

To estimate how much of the tax revenue collection of 2023 was caused by fiscal drag, we compare the actual 2023 scenario described above - simulation of the 2023 tax and benefit system with the uprated 2019 EU-SILC wave - with the following counterfactual scenarios:

- Scenario A, where no indexation took place, i.e. the PIT parameters subjected to indexation are maintained at their 2019 values. Under this scenario, we would be able to simulate an upper bound for the tax revenue collected, if no structural reforms were implemented in the period.
- Scenario B, where there was a full indexation of the 2019 PIT parameters, based on three alternative indices: tax-base growth, lagged HICP or concurrent HICP. Under this scenario, we would be able to simulate a lower bond for the tax revenue, again if no structural reform were implemented.

Table 1 summarizes the description of the counterfactual scenarios used in this analysis.

The fiscal drag mitigation effect that the PIT policy changes may have induce between 2019 and 2023 can be measured by comparing the actual fiscal drag effectively offset - difference between the tax revenue collected under scenario A and actual 2023 tax collection - with the total potential fiscal drag - the difference in tax revenue under scenarios A and B, as describe below in Equation 2:

$$\text{FD Offsetting} = \frac{TaxRevenueA - TaxRevenue2023}{TaxRevenueA - TaxRevenueB} \tag{2}$$

This metric is a data driven characterization of the fiscal drag compensation and can

Table 1: Counterfactual scenarios

	Scenario A: no indexation	Scenario B: full indexation
PIT policy: parameters that can be subject to indexation	as of 2019	2019, indexed
PIT policy: other elements	as of 2023	as of 2023
Other policies	as of 2023	as of 2023
Incomes	uprated to 2023	uprated to 2023

be used for cross-countries comparisons. However, for now it is agnostic regarding the type of policies that led the fiscal drag compensation between 2019 and 2023, i.e. it does not allow us to distinguish between indexation policy changes and structural reforms. While this distinction is of course valuable and we plan to include it in future versions of our analysis (following the work of Paulus et al. (2020)), we consider that our approach is a good starting point as it abstracts from making difficult classification choices between what are structural changes and what are not, providing a more homogeneous description across all countries. Nevertheless, for the moment, we complement our analysis with a description of relevant changes and choices in the tax legislation of each country during the recent period in Online Appendix B.

5.2 Results

Figure 6 shows results for the four biggest economies in the EA - (a) Germany, (b) Spain, (c) France and (d) Italy regarding the tax revenue collected yearly between 2019 and 2023, including for the counterfactual scenarios A and B in 2023[18]. We observe that both Germany and France have actually overcompensated the potential fiscal drag in 2023. The observed (rescaled) tax revenue in 2023 situates below the most "demanding" fiscal drag indexation mechanism in these countries (i.e. using the concurrent HICP index). Spain finds itself on the other side of the spectrum: the

[18]Results for all countries are shown in Appendix Figure **??** and detailed numbers are shown in Appendix Table 4.

policy changes that took place between 2019 and 2023 were only able to offset the potential fiscal gap in 31%. It is interesting to observe also that in Germany, between 2022 and 2023, there seems to be an inversion on the increase of the PIT revenue collected, which could indicate a concern about the effects that the inflation surge of 2021/2022 may have had on the families tax bill, which was effectively reflected in the PIT tax system.

Interestingly, there are more countries that, like Germany and France, have over-compensated fiscal drag. This is the case of Portugal, Austria, Croatia, Slovenia and Greece, as we can observe from the results on the fiscal drag offsetting metric shown in Figure 7, where panel (a) displays the actual and potential fiscal drag, measured by the tax revenue share of GDP in absolute terms, while panel (b) shows the percentage of fiscal drag compensated by policy changes.[19] In countries, such as Cyprus and Malta, the offsetting of fiscal drag is, similarly to Spain, less than one third of the total effect, while other countries such as Estonia, Ireland and the Netherlands were able to compensate more than half of the potential effect through policy changes. Panel (a) allows also to observe that some countries, like the Netherlands and Austria (to a lesser extent), show a potential fiscal drag effect that represents more than 0.01 percentage point of GDP, which may indicate that a higher effort, in terms of policy measures budgetary cost, to mitigate this effect may have to be incurred.

Overall, it seems that the majority of countries included in their legislative programme and budgetary strategy concerns about the impacts that the inflationary crisis and the period of strong income growth would cause in terms of the PIT tax burden. This seemed to be reflected in the tax changes, whether indexation rules or structural reforms, between 2019 and 2023.

[19]These calculations are based on an average of the results obtained based on the three indices considered. The results vary depending on the index used.

6 Conclusion

This study presents a comprehensive characterization of the fiscal drag embedded in the PIT system of 21 European countries. On a first approach, the fiscal drag is measured as the elasticity of PIT revenue to the tax base at a certain moment in time, the year 2019. This measure reflects a theoretical quantification of fiscal drag, under an homogeneous growth on the different sources of incomes, no changes on the tax legislation and no population composition effects. This allows comparing the potential stabilization effect of PIT systems across countries, as well as to uncover the different tax mechanisms and income sources that drive it. Our study then departs from this controlled environment to quantify also the fiscal drag effect in practice, a data driven measure that compares how the actual fiscal drag compares to the *extreme* cases of full and no indexation of tax parameters, letting incomes grow and tax changes occur between 2019 and 2023 (while the population composition stays the same).

The analysis is performed using microsimulation tools and microdata - the EUROMOD model and the EU-SILC survey, which allow the construction of the necessary counterfactual scenarios under very detailed and accurate modeling of the different tax and benefit (and their interactions) systems across the European countries studied. This methodology allows also the analysis of the fiscal drag effect from a distributional dimension and to draw insights on inequality, progressivity and redistribution impacts.

Results show that there is limited heterogeneity on the elasticity of revenue to the tax base across the 21 European countries analysed, but in contrast, there is large heterogeneity in the mechanisms that lead to it: on average about half of the elasticity is driven by tax brackets and another half by the tax deductions and credits present in the PIT system. However, the weight of these two drivers differs markedly across countries. The distribution of this elasticity across deciles of taxable income shows also a great variety of profiles, which together with the distribution of tax payers, help to explain the impacts of the fiscal drag on inequality, progressivity and the redistribution capacity of the PIT. Preliminary results on "in practice" uncover that

a large group of countries seemed to have compensated fully the potential fiscal gap effect in 2023 with the policy changes introduced between 2019 and 2023, whatever their nature (indexation or structural reforms).

These results contribute to a more comprehensive knowledge of the PIT systems in Europe, providing relevant information on issues such as its stabilization power, its progressivity and distributional impacts of tax changes and income growth thought this tax system on poorer and richer households. They have also important implications for policy debates on the indexation of PIT systems and can provide relevant information on tax elasticities for projection exercises.

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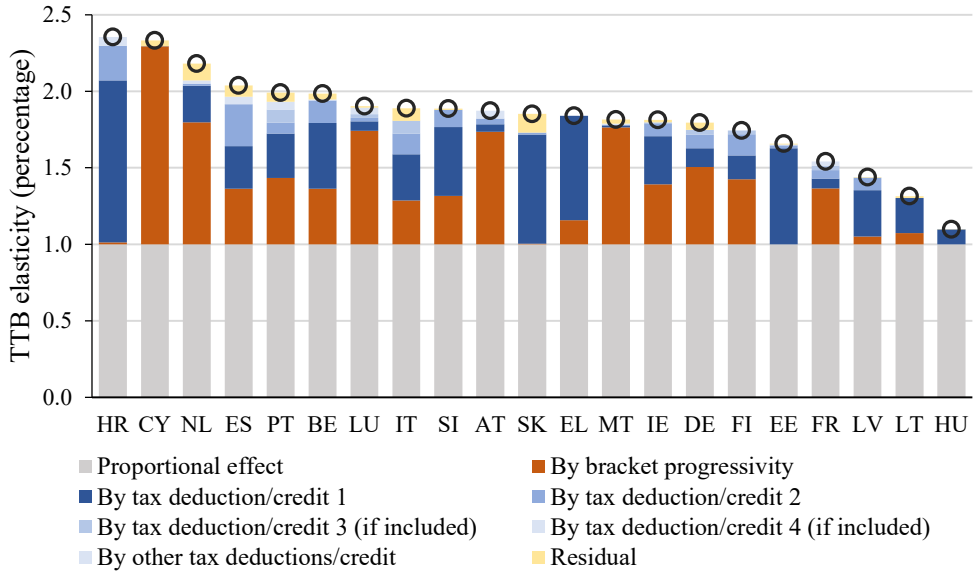
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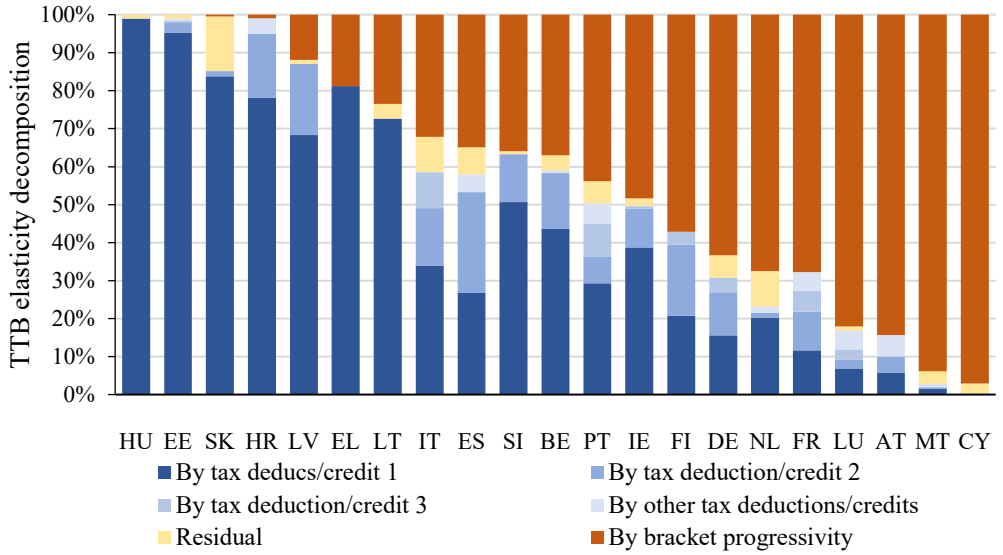
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Figure 1: Cross-country comparison of 2019 tax-to-base elasticities and their mechanisms

(a) 2019 tax-to-base elasticities and mechanisms

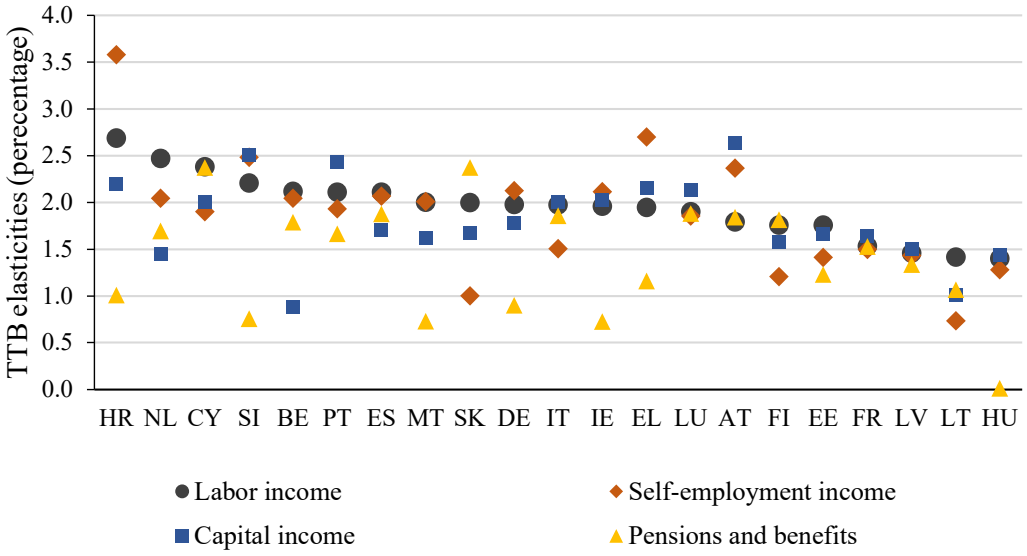


(b) Weight of each mechanism



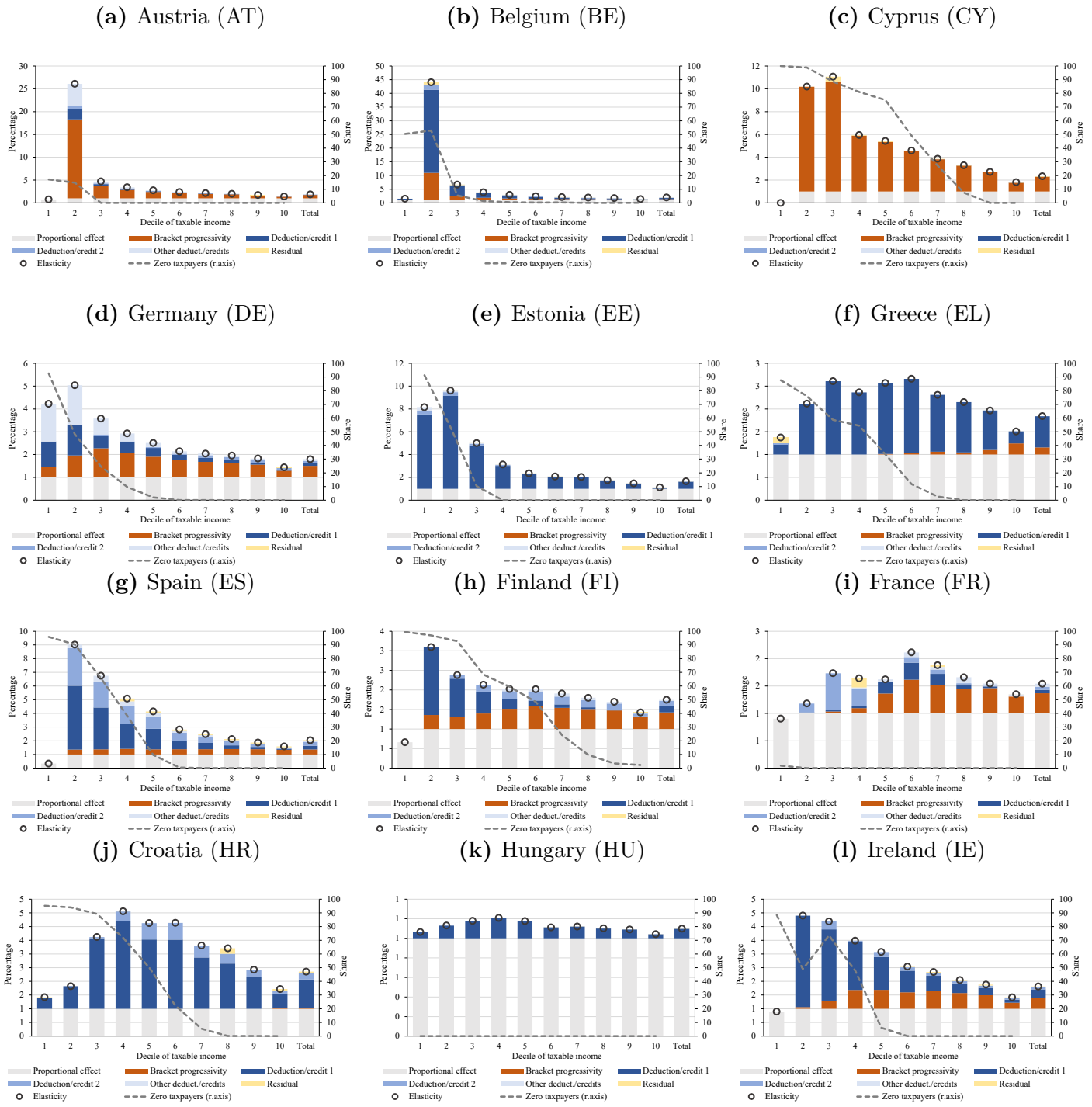
Notes: These figures present a cross-country comparison of tax-to-base (TTB) elasticities and the mechanisms that give rise to them. The first graph shows the elasticity by country, broken down by mechanisms. The elasticities are calculated by estimating the increase in tax revenue following a 1% increase in nominal income for each individual. The second graph shows the decomposition of the elasticity above one, normalizing its size to 100. This allows comparing the relevance of each mechanism independent of the size of the elasticity.

Figure 2: Tax-to-base elasticities by source of income

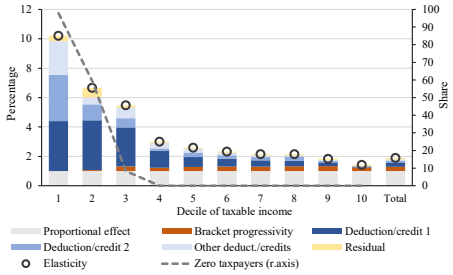


Notes: This figure represents a cross-country comparison of 2019 tax-to-base elasticities by source of income: labour, pensions and benefits, self-employment, and capital income. Each elasticity is computed as the percentage growth in personal income tax revenue after a simulated 1% growth in the specific income source, divided by the percentage growth in overall tax base.

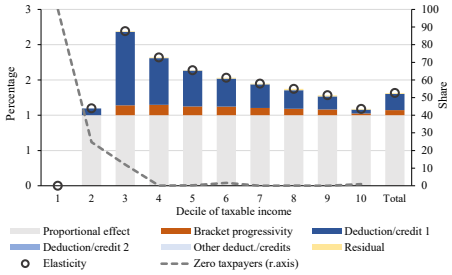
Figure 3: Decomposition of the tax-to-base elasticities across the income distribution for each country



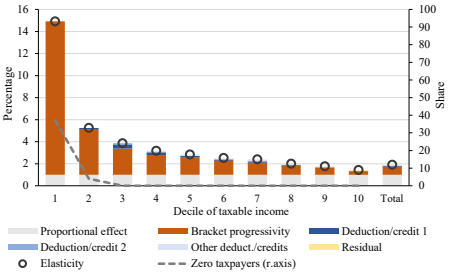
(m) Italy (IT)



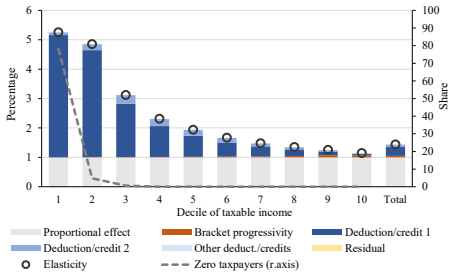
(n) Lithuania (LT)



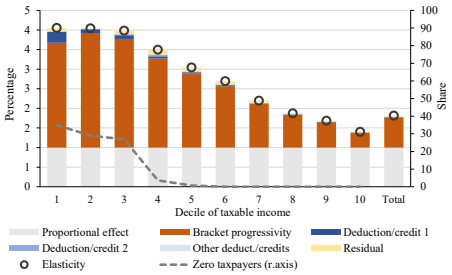
(o) Luxembourg (LU)



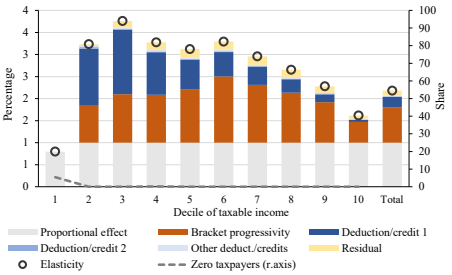
(p) Latvia (LV)



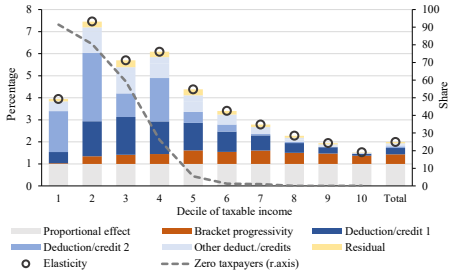
(q) Malta (MT)



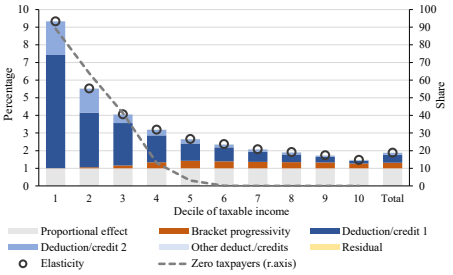
(r) Netherlands (NL)



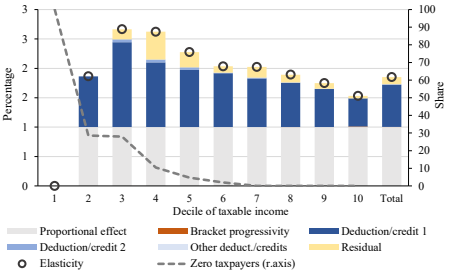
(s) Portugal (PT)



(t) Slovenia (SI)



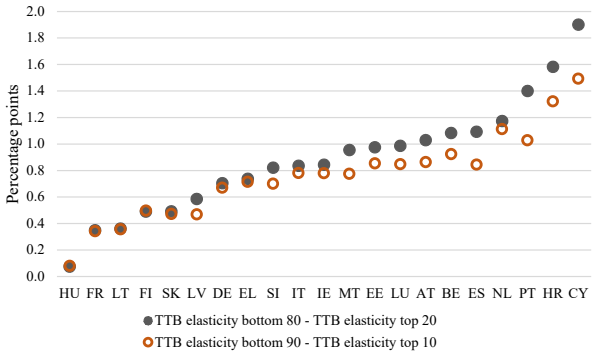
(u) Slovakia (SK)



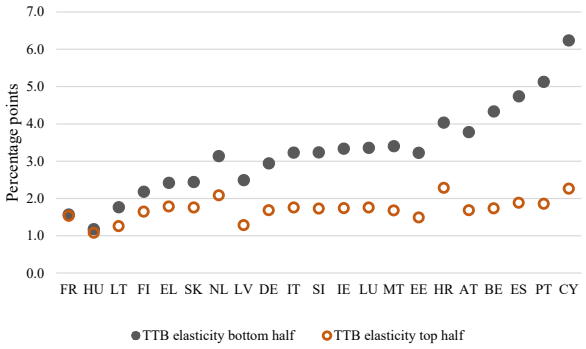
Notes: Each graph shows the distribution of tax-to-base elasticities across the individual tax base distribution by decile groups. Each elasticity is broken down by the mechanisms that give rise to the elasticity, such as the proportional effect, tax bracket progressivity, and tax deductions or credits. Each graphs shows also the share of individuals who pay zero taxes. These individuals have a tax-to-base elasticity of zero, which does not impact the elasticity of the decile nor the aggregate elasticity.

Figure 4: Distribution of TTB elasticities and share of zero taxpayers

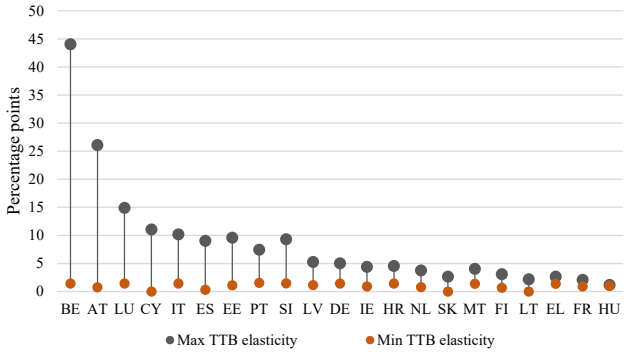
(a) Bottom to top elasticities (80:20 and 90:10)



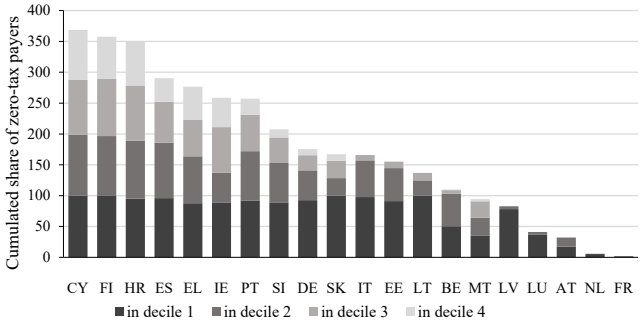
(b) Bottom and top half elasticities



(c) Maximum and Minimum TTB elasticity



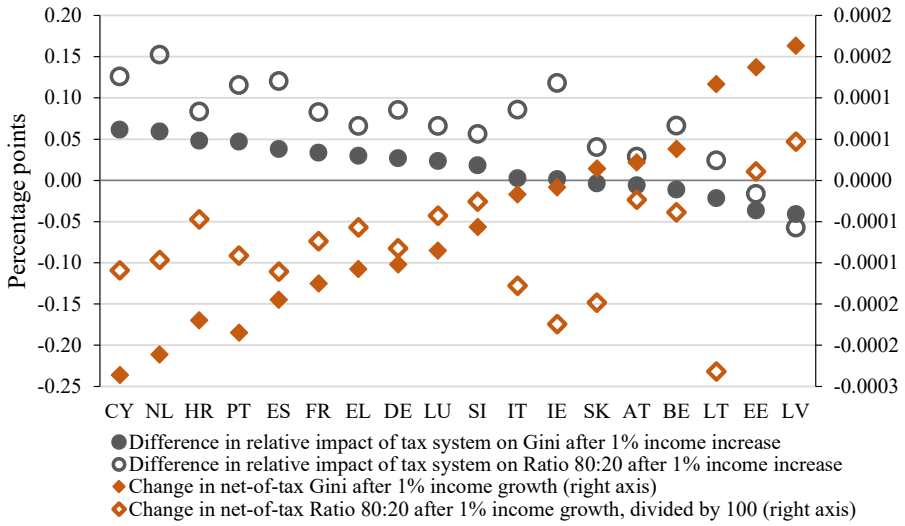
(d) Cumulated share of zero taxpayers



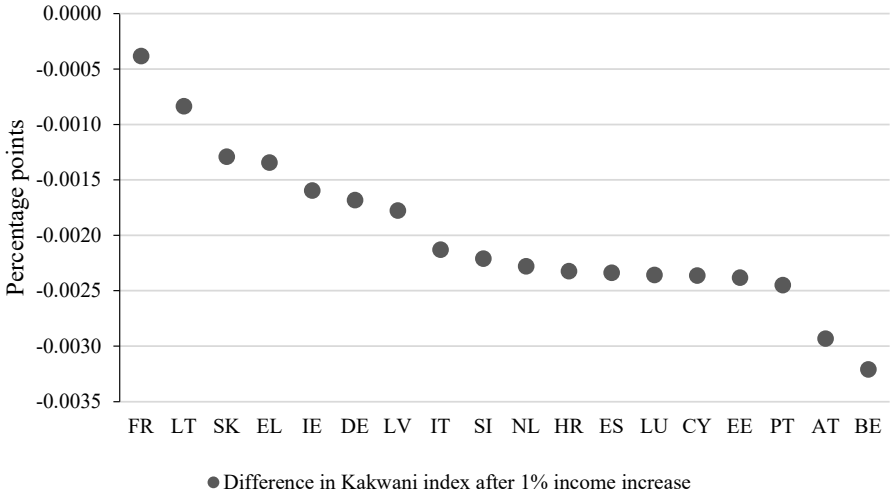
Notes: Panel a shows the differences between the weighted tax-to-base elasticity of the top 20 percent (respectively 10 percent) of individuals accrosinf to their taxable base, and the weighted tax-to-base elasticity of the bottom 80 percent (respectively 90 percent) percent. Each weighted elasticity is computed by summing the elasticity of each decile, weighted by the share of personal income tax paid by each decile of income earners in the group considered. Panel b shows the same weighted averages of the tax-to-base elasticity for the top and bottom half of the distribution. Panel c shows the dispersion in elasticities by plotting the highest and the lowest elasticity across decile groups. Panel d represents the cumulated share of zero taxpayers in the bottom 40% of the distribution of taxable base, i.e. the sum of shares of zero taxpayers in the first four deciles.

Figure 5: Impact on inequality and progressivity

(a) Impact on inequality



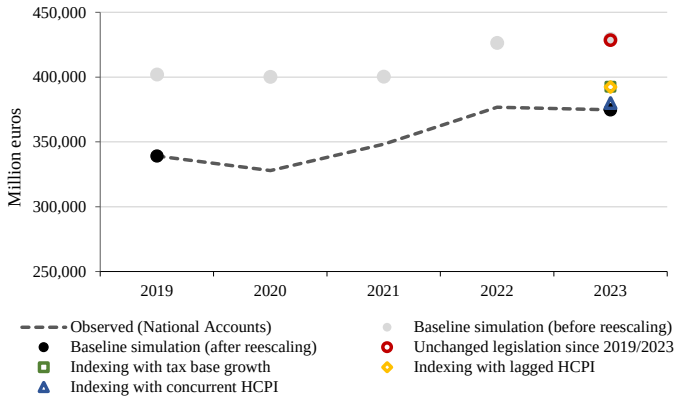
(b) Impact on progressivity



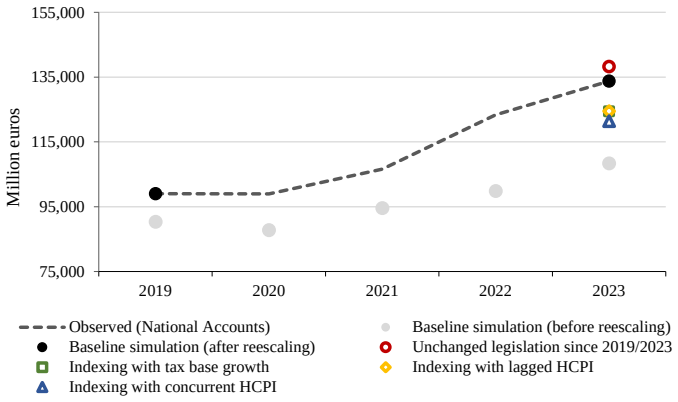
Notes: These figures show the impact of fiscal drag on inequality in a static setting, where incomes grow homogeneously by 1%. Panel (a) shows the effect on inequality through the lenses of four different statistics. The diamond-shaped markers show the change in a given inequality indicator (either Gini or Ratio 80:20) for net-of-tax incomes after incomes growth. Therefore, negative values indicate that inequality is reduced. The circle-shaped markets show the difference in inequality-reduction effect of the tax system after the increase in income, which is measured as the percentage variation in the Gini Index or in the Ratio 80:20 computed for incomes before or after taxes. Panel (b) shows the change in the Kakwani progressivity index calculated before and after the 1% increase in income. Negative values mean that the system becomes less progressive.

Figure 6: Tax revenue evolution, 2019-2023
Results for the 4 biggest economies of EA

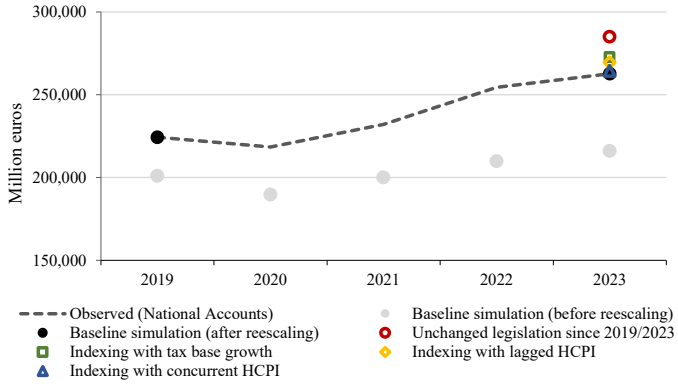
(a) Germany (DE)



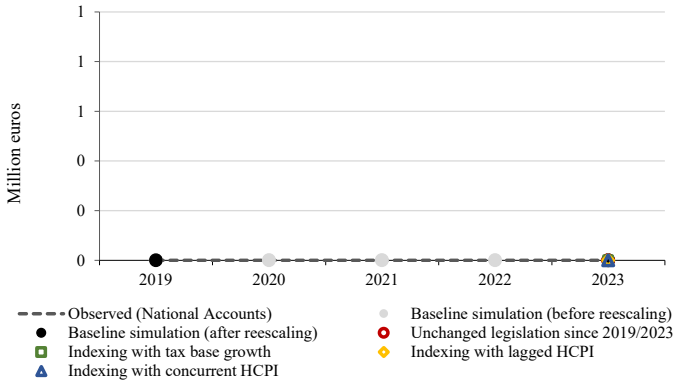
(b) Spain (ES)



(c) France (FR)

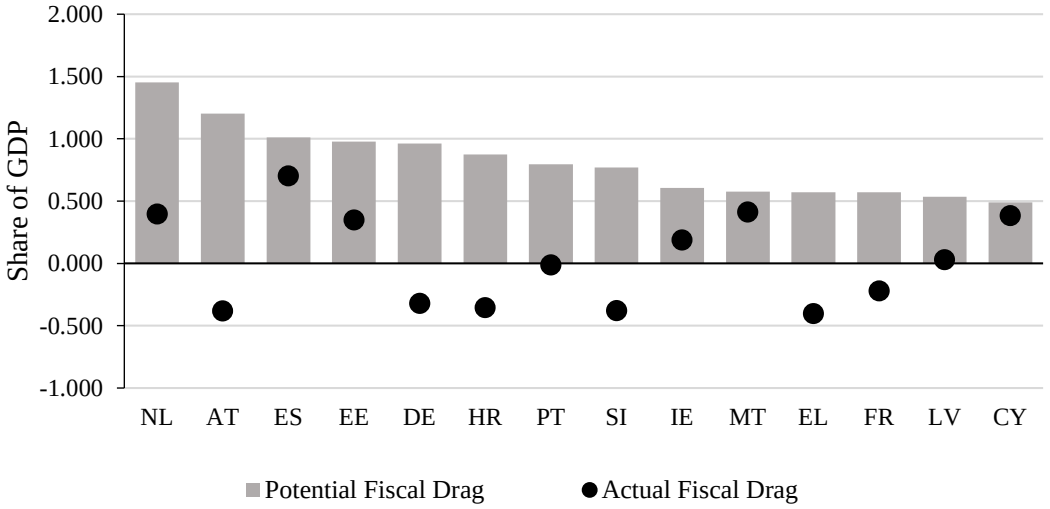


(d) Italy (IT)

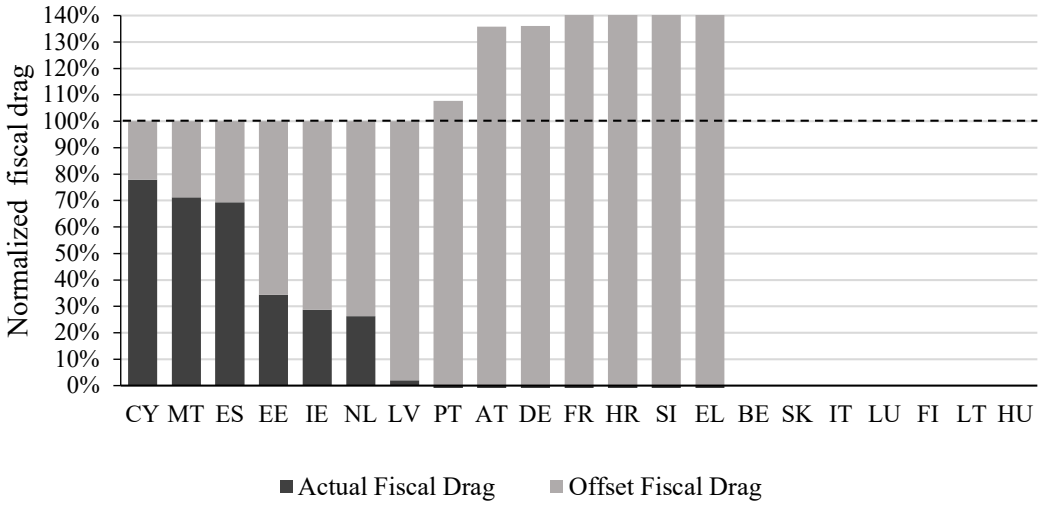


Notes: Results for all other countries are shown in Appendix Figure A.4. Each of these panels show, for a given country, the observed evolution of PIT revenue over time (dotted line), our baseline simulations for each year (black markers) and different counterfactual simulations (colored hollow markers). Note that all baseline and counterfactual simulations are rescaled to match the observed value in each year. As it is explained in section 5, differences between observed and simulated baselines without reescaling are due data and modelling limitations in 2019 and further lack of growth in the real taxable base in the simulated years after 2019.

Figure 7: Actual and Potential Fiscal Drag in 2023



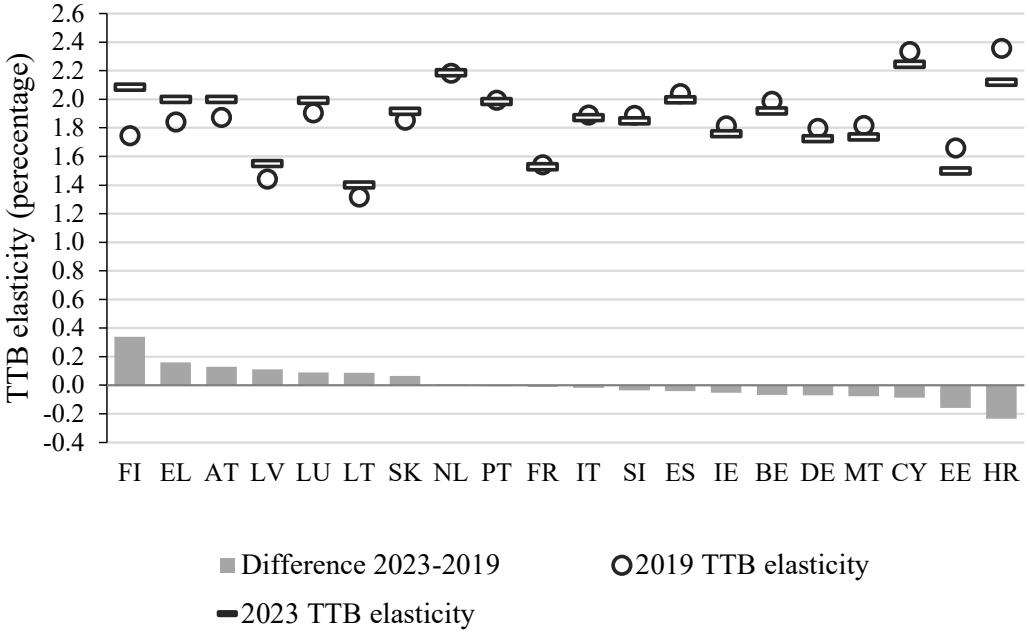
(b) Relative impact



Notes: This figure illustrates actual and potential fiscal drag in 2023. Actual fiscal drag is defined as the tax revenue actually collected in 2023, given the 2023 legislation, with respect to a counterfactual where the 2019 legislation was kept but all its tax parameters were fully indexed each year since 2019 with respect to a certain index. Potential fiscal drag is defined as the tax revenue that would have been collected in 2023 if the tax legislation from 2019 was kept without updating its tax parameters with respect to the counterfactual where 2019 parameters were fully updated. The counterfactual of full updating is based on an average of the three alternative indexation indicators considered (lagged HCPI, contemporaneous HCPI and growth of the tax base). Disaggregated results for each indicator are shown in Appendix Table 4. Panel (a) shows absolute amounts as percentage of GDP while panel (b) shows a normalized potential where 100% corresponds to full offsetting of fiscal drag, values above 100% correspond to an overcompensation of fiscal drag, and values below 100% correspond to partial offsetting. The figure is capped at 140%. Offestting can be due to indexation of tax parameters or any other measure that affects the structure of PIT.

Appendix A Supplementary Figures and Tables

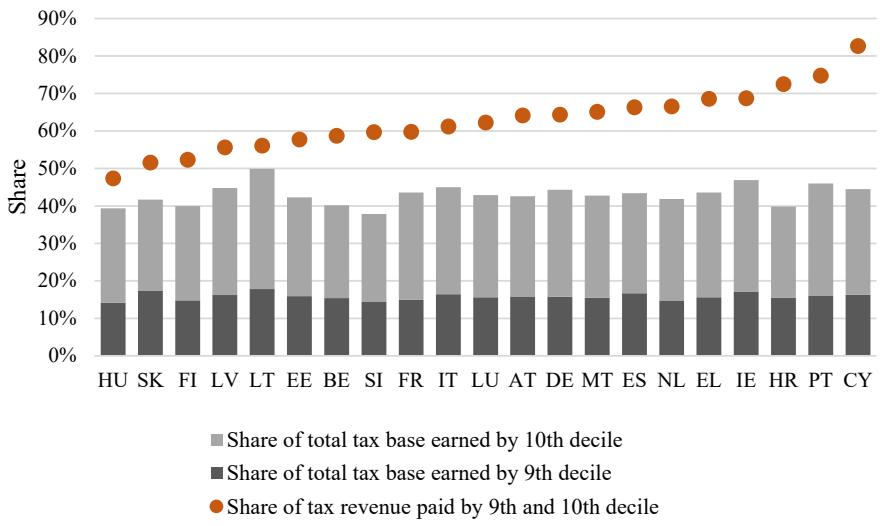
Figure A.1: Comparison between 2019 and 2023 TTB elasticities



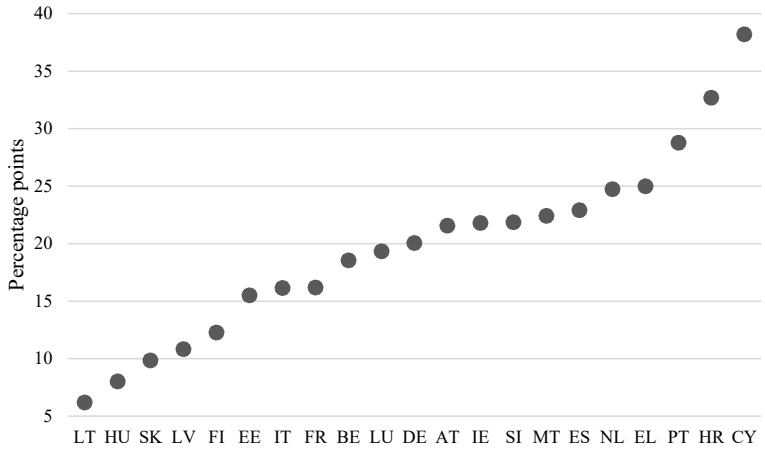
Notes: This figure compares the tax-to-base elasticities computed with 2019 legislation with those calculated with 2023 legislation and 2019 data updated to 2023. The figure also shows the difference between the 2023 and 2019 elasticities. The differences between these two elasticities are mainly due to tax reforms between these two years. A secondary driver of the differences is composition changes due to differential growth of alternative income sources between 2019 and 2023.

Figure A.2: Concentration of tax base and tax liabilities on the top

(a) Share of tax base earned and tax revenue paid by the top 20 percent of the tax base distribution

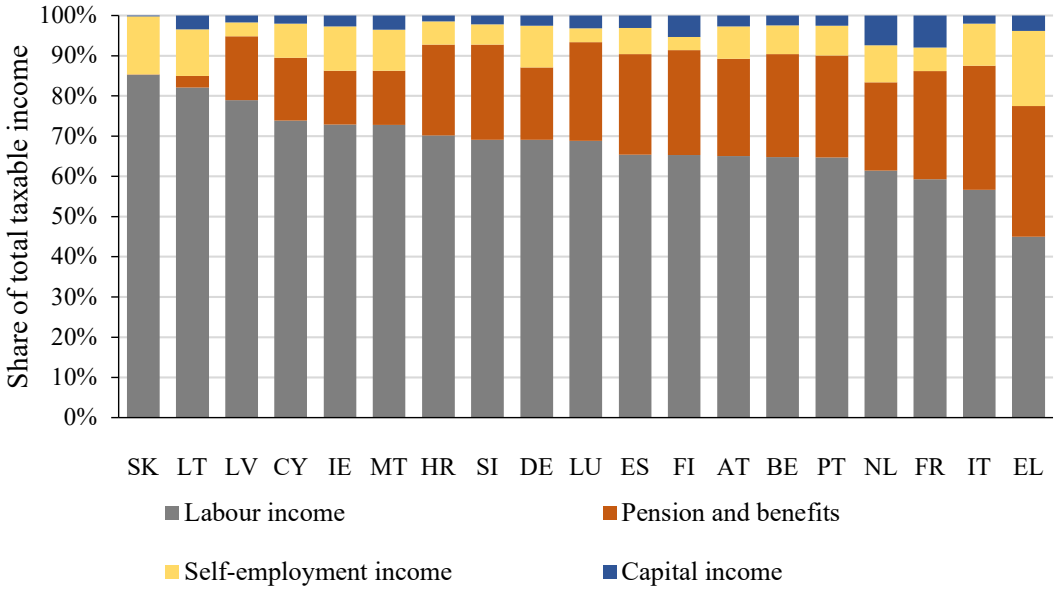


(b) Difference between share of income tax paid and share of income earned by the top 20



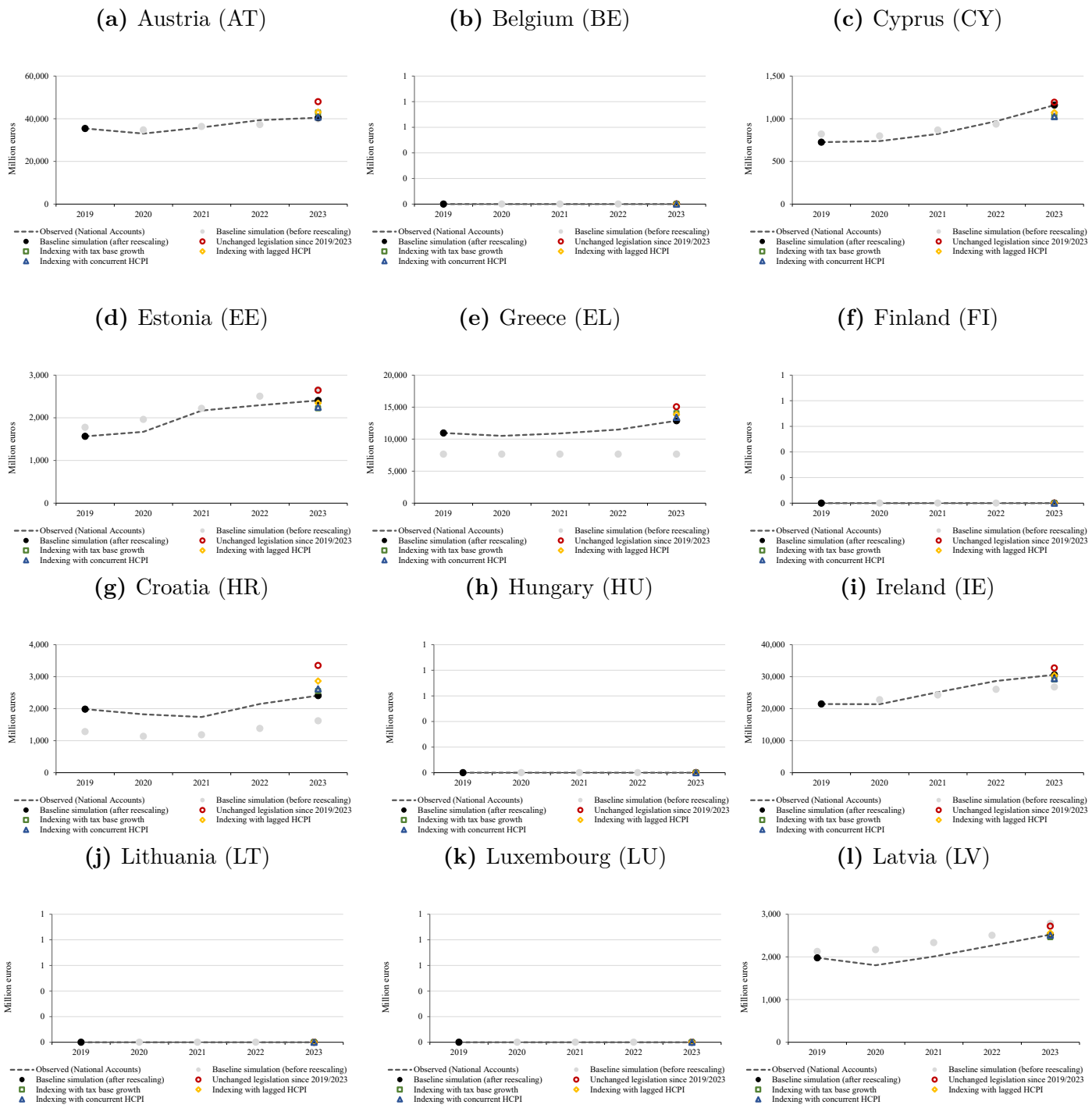
Notes: These figures illustrate the concentration of the tax base and tax liabilities at the top of the distribution. Panel (a) shows the share of the tax base attributed to the top two deciles. This share is generally around 40% across all countries. Additionally, the graph shows the share of tax revenue attributed to these two deciles, displaying more variation. Panel (b) represents the difference between the share of tax revenue paid by the top two deciles and their share of the total tax base. This difference corresponds to the gap between the orange dots and the histogram bars in Panel (a). The results show considerable heterogeneity across the countries studied in line with the different progressivity of each tax system.

Figure A.3: Share of tax base by income sources in 2019

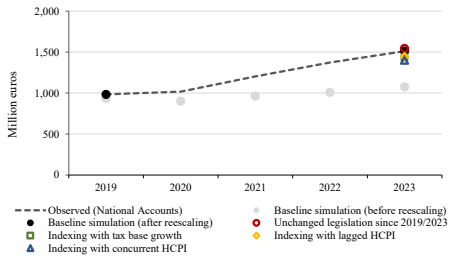


Notes: This figure illustrates the tax base broken down by income sources, showing the share of the total PIT base derived from each revenue source. In all countries, labor income is the main component of the tax base, though significant differences exist. For example, in Slovakia, Latvia, and Lithuania, nearly 80% of the tax base comes from labor income, while in France, Italy, and Greece, the share is below 60%. In nearly all countries, self-employment and capital income represent a small share of the overall tax base. The share of income from pensions and benefits, which typically varies inversely with labor income, is highest in France, Italy, and Greece.

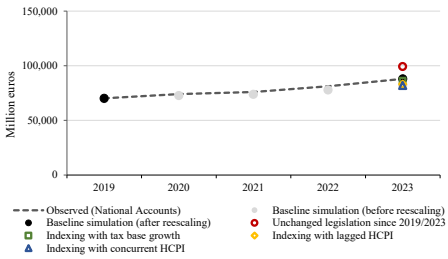
Figure A.4: Tax revenue counterfactuals with dynamic microsimulation approach
Result for available countries other than big 4



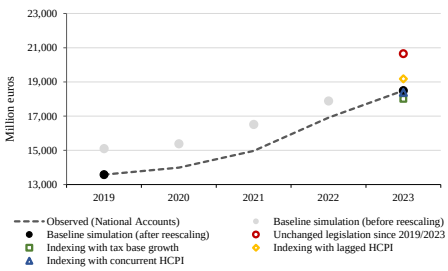
(m) Malta (MT)



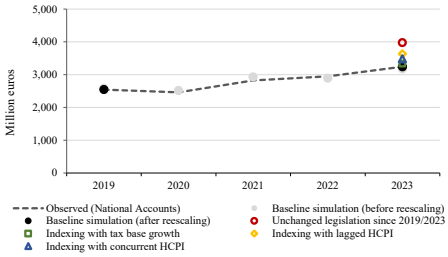
(n) Netherlands (NL)



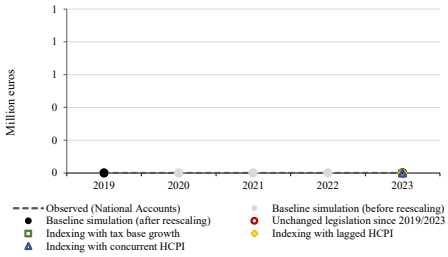
(o) Portugal (PT)



(p) Slovenia (SI)



(q) Slovakia (SK)



Notes: This figure is a complement of Figure 6 with results for all other countries studied. Each of these panels show the observed evolution of PIT revenue (in million euros) over time (grey line), our baseline simulations for each year (black markers) and different counterfactual simulations with different indexation policies for tax legislation (colored hollow markers).All simulation results are reescaled to match the observed data reported in national accounts, with reasons leading to discrepancies reported between national accounts and our simulation explained in section 5 and in Figure 6

Table A.1: Static estimation of 2019 tax-to-base elasticities, mechanisms and heterogeneity by income source

		Share explained by:					TTB elasticity by income source			
	TTB elasticity	Bracket Progressivity	Tax benefit #1	Tax benefit #2	Other tax benefits	Residual	Labor	Benefits and pensions	Self-employment	Capital
Austria (AT)	1.87	84%	6%	4%	6%	0%	1.79	1.84	2.37	2.64
Belgium (BE)	1.99	37%	44%	15%	1%	4%	2.12	1.79	2.05	0.89
Cyprus (CY)	2.33	97%	0%	0%	0%	3%	2.38	2.37	1.90	2.01
Germany (DE)	1.80	63%	22%	4%	9%	2%	1.98	0.90	2.13	1.78
Estonia (EE)	1.66	0%	95%	3%	1%	1%	1.76	1.23	1.41	1.66
Greece (EL)	1.84	19%	81%	0%	0%	0%	1.95	1.16	2.70	2.15
Spain (ES)	2.04	35%	27%	26%	5%	7%	2.11	1.88	2.07	1.71
Finland (FI)	1.74	57%	21%	6%	16%	0%	1.76	1.81	1.21	1.58
France (FR)	1.54	68%	12%	10%	10%	0%	1.53	1.53	1.50	1.64
Croatia (HR)	2.36	1%	78%	17%	0%	5%	2.69	1.01	3.58	2.19
Hungary (HU)	1.10	0%	99%	0%	0%	1%	1.40	0.01	1.28	1.44
Ireland (IE)	1.81	48%	39%	10%	1%	2%	1.96	0.73	2.11	2.02
Italy (IT)	1.89	32%	34%	15%	10%	9%	1.97	1.86	1.50	2.00
Lithuania (LT)	1.31	0%	70%	-3%	0%	33%	1.42	1.07	0.73	1.01
Luxembourg (LU)	1.90	82%	7%	2%	8%	1%	1.90	1.88	1.86	2.14
Latvia (LV)	1.44	12%	68%	19%	0%	1%	1.46	1.33	1.43	1.50
Malta (MT)	1.82	94%	2%	0%	1%	3%	2.00	0.73	2.01	1.62
Netherlands (NL)	2.18	67%	20%	1%	1%	10%	2.47	1.69	2.05	1.45
Portugal (PT)	1.99	44%	29%	7%	14%	6%	2.11	1.66	1.93	2.43
Slovenia (SI)	1.89	36%	51%	13%	0%	1%	2.21	0.76	2.48	2.50
Slovakia (SK)	1.85	0%	84%	1%	0%	14%	2.00	2.38	1.00	1.67

Notes: Static estimations are derived from a simulation where all incomes grow homogenously by 1% and tax parameters are kept unchanged. The tax-to-base (TTB) elasticitiy of 2019 and its decomposition is based on EU-SILC data corresponding to the incomes received during 2019 and on the corresponding 2019 tax legislation. The TTB elasticity of 2023 is based on the same microdata, updated according to obverved aggregates of income growth and on 2023 tax legislation. The share explained by each coumns (2) to (6) refers to the component of the 2019 TTB elasticity over and above the proportional effect of 1.

Table A.2: Static estimation of 2023 TTB elasticities, heterogeneity by income source and comparison with 2019 elasticities estimations

	2023 TTB elasticities by income source					Difference w.r.t. 2019				
	2023 TTB elasticity	Labor	Benefits and pensions	Self-employment	Capital	TTB elasticity	Labor	Benefits and pensions	Self-employment	Capital
Austria (AT)	2.00	1.95	1.95	2.36	2.86	-0.13	-0.16	-0.11	0.01	-0.22
Belgium (BE)	1.92	2.00	1.80	1.84	0.52	0.07	0.12	-0.02	0.21	0.36
Cyprus (CY)	2.24	2.31	2.19	1.88	1.88	0.09	0.08	0.18	0.02	0.12
Germany (DE)	1.73	1.83	1.02	2.23	1.84	0.07	0.15	-0.12	-0.10	-0.06
Estonia (EE)	1.50	1.61	0.99	1.33	1.47	0.16	0.14	0.24	0.08	0.19
Greece (EL)	2.00	2.20	1.04	3.07	2.21	-0.16	-0.25	0.12	-0.37	-0.06
Spain (ES)	2.00	2.08	1.83	2.01	1.60	0.04	0.03	0.04	0.05	0.11
Finland (FI)										
France (FR)	1.53	1.54	1.47	1.53	1.64	0.01	0.00	0.06	-0.03	0.00
Croatia (HR)	2.12	2.38	1.15	2.73	1.84	0.24	0.31	-0.14	0.85	0.35
Hungary (HU)										
Ireland (IE)	1.76	1.88	0.72	2.06	1.93	0.05	0.08	0.01	0.05	0.09
Italy (IT)	1.87	1.89	1.82	1.66	2.01	0.02	0.09	0.04	-0.16	0.00
Lithuania (LT)	1.40	1.51	1.10	0.83	1.02	-0.09	-0.09	-0.03	-0.10	-0.01
Luxembourg (LU)	1.99	2.03	1.85	2.02	2.17	-0.09	-0.12	0.03	-0.17	-0.03
Latvia (LV)	1.55	1.65	1.08	1.44	1.61	-0.11	-0.19	0.26	-0.01	-0.12
Malta (MT)	1.74	1.96	0.35	2.02	1.45	0.08	0.04	0.38	-0.01	0.17
Netherlands (NL)	2.19	2.47	1.55	2.17	1.56	-0.01	0.00	0.14	-0.13	-0.11
Portugal (PT)	1.98	2.12	1.54	1.88	2.26	0.01	-0.01	0.12	0.05	0.18
Slovenia (SI)	1.85	2.18	0.69	2.2.35	2.55	0.04	0.03	0.07	0.13	-0.04
Slovakia (SK)	1.92	1.89	2.59	2.06	1.50	-0.06	0.10	-0.22	-1.06	0.16

Notes: Static estimations are derived from a simulation where all incomes grow homogenously by 1% and tax parameters are kept unchanged. The TTB elasticitiy of 2023 is based on the same microdata used for 2019 TTB elasticities (2019 EU-SILC), updated according to observed aggregates of income growth and on 2023 tax legislation.

Table A.3: Static estimation of 2019 TTB elasticities across the income distribution, share explained by tax brackets and inequalities between the top and the bottom of the distribution

	TTB elasticity by decile of income										Share of TTB elasticity explained by tax brackets by decile											
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	b80-t20	b90-t10
Austria (AT)	0.75	26.09	4.70	3.42	2.77	2.39	2.14	1.99	1.75	1.40	0%	69%	72%	77%	79%	83%	86%	87%	90%	92%	1.03	0.86
Belgium (BE)	-1.52	44.06	6.68	3.86	2.92	2.44	2.12	1.94	1.76	1.42	0%	23%	25%	30%	33%	36%	37%	40%	44%	47%	1.11	0.94
Cyprus (CY)	0.00	10.19	11.07	5.95	5.42	4.59	3.86	3.29	2.72	1.81	0%	100%	96%	99%	98%	98%	99%	99%	98%	95%	1.90	1.49
Germany (DE)	4.23	5.04	3.58	2.93	2.51	2.14	2.04	1.95	1.83	1.44	14%	24%	49%	55%	60%	68%	65%	65%	68%	67%	0.70	0.67
Estonia (EE)	8.16	9.60	5.01	3.13	2.36	2.08	2.04	1.75	1.47	1.12	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.98	0.85
Greece (EL)	1.37	2.12	2.61	2.36	2.57	2.66	2.31	2.15	1.96	1.51	0%	0%	0%	0%	1%	2%	5%	4%	10%	48%	0.74	0.72
Spain (ES)	0.33	9.02	6.75	5.08	4.14	2.82	2.48	2.12	1.87	1.58	0%	4%	7%	10%	12%	21%	26%	35%	44%	58%	1.09	0.85
Finland (FI)	0.66	3.09	2.38	2.13	2.02	2.02	1.91	1.80	1.69	1.42	0%	17%	22%	35%	50%	58%	60%	64%	68%	75%	0.49	0.50
France (FR)	0.90	1.18	1.73	1.64	1.62	2.12	1.88	1.66	1.54	1.35	0%	7%	5%	15%	58%	55%	59%	67%	85%	88%	0.35	0.34
Croatia (HR)	1.42	1.82	3.62	4.56	4.13	4.13	3.31	3.21	2.43	1.72	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	1.58	1.32
Hungary (HU)	1.06	1.13	1.18	1.21	1.18	1.11	1.12	1.10	1.09	1.04	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.07	0.08
Ireland (IE)	0.90	4.40	4.19	3.48	3.08	2.54	2.34	2.04	1.88	1.42	0%	2%	9%	28%	33%	39%	48%	55%	56%	53%	0.84	0.78
Italy (IT)	10.20	6.66	5.47	3.00	2.59	2.32	2.15	2.15	1.83	1.42	0%	1%	7%	12%	18%	24%	26%	29%	41%	57%	0.84	0.78
Lithuania (LT)	0.00	1.10	2.19	1.82	1.64	1.53	1.45	1.37	1.28	1.09	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.36	0.36
Luxembourg (LU)	14.92	5.25	3.87	3.17	2.83	2.52	2.39	2.00	1.78	1.43	100%	96%	83%	82%	84%	83%	76%	83%	84%	77%	0.99	0.85
Latvia (LV)	5.26	4.85	3.12	2.31	1.94	1.67	1.48	1.35	1.25	1.14	0%	0%	0%	1%	2%	4%	6%	12%	29%	49%	0.59	0.47
Malta (MT)	4.05	4.04	3.98	3.50	3.04	2.69	2.20	1.87	1.69	1.40	88%	96%	93%	91%	93%	92%	93%	95%	93%	96%	0.96	0.78
Netherlands (NL)	0.80	3.23	3.76	3.28	3.12	3.29	2.96	2.65	2.28	1.62	0%	38%	40%	48%	57%	65%	67%	68%	72%	76%	1.17	1.11
Portugal (PT)	3.94	7.46	5.70	6.09	4.38	3.40	2.79	2.28	1.94	1.53	1%	5%	9%	9%	18%	23%	34%	40%	50%	70%	1.40	1.03
Slovenia (SI)	9.33	5.53	4.06	3.19	2.66	2.37	2.08	1.91	1.74	1.48	0%	1%	5%	16%	25%	28%	34%	38%	45%	58%	0.82	0.70
Slovakia (SK)	0.00	1.86	2.67	2.62	2.28	2.03	2.02	1.89	1.75	1.53	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0.49	0.47

Notes: Static estimations are derived from a simulation where all incomes of the decile considered grow homogeneously by 1% and tax parameters are kept unchanged. The tax-to-base elasticity of 2019 is based on EU-SILC data corresponding to the incomes received during 2019 and on the corresponding 2019 tax legislation. To estimate the share of TTB elasticity explained by tax brackets, the elasticity is computed assuming a uniform 1% growth in both income and tax brackets. The difference between this newly computed TTB elasticity and the elasticity considering only income growth provides the share explained by tax brackets. Inequalities between the top and bottom of the distribution are assessed by comparing the weighted elasticity of the bottom and the top deciles, based on the share of tax paid by each decile.

Table 4: Tax revenue and average effective tax rate under different scenarios (2019 and 2023) and actual and potential fiscal drag that occurred over the period studied

	Million Euros								Average Tax Rate							
	2019	2023							2019	2023						
	Obs.	Obs.	With 2019 legislation	With 2019 legislation indexed tax base growth	With 2019 legislation indexed lagged HCPI	With 2019 legislation indexed contemp. HCPI	Actual FD (wrt average of 3 ind. sim.)	Potential FD (wrt average of 3 ind. sim.)	Obs.	Obs.	With 2019 legislation	With 2019 legislation indexed tax base growth	With 2019 legislation indexed lagged HCPI	With 2019 legislation indexed contemp. HCPI	Actual FD (wrt average of 3 ind. sim.)	Potential FD (wrt average of 3 ind. sim.)
Austria (AT)																
Belgium (BE)																
Cyprus (CY)																
Germany (DE)																
Estonia (EE)																
Greece (EL)																
Spain (ES)																
Finland (FI)																
France (FR)																
Croatia (HR)																
Hungary (HU)																
Ireland (IE)																
Italy (IT)																
Lithuania (LT)																
Luxembourg (LU)																
Latvia (LV)																
Malta (MT)																
Netherlands (NL)																
Portugal (PT)																
Slovenia (SI)																
Slovakia (SK)																

Notes: TO DO

Online Appendix B for

Fiscal Drag in Theory and in Practice: a European Perspective

This Appendix contains relevant information about 1) each country's institutional background 2) their indexation practices 3) recent structural reforms and 4) a detailed discussion of the results for that country.

Index

Austria (AT) 2

Croatia (HR) 4

Estonia (EE) 6

France (FR) 8

Italy (IT) 10

Latvia (LV) 13

Portugal (PT) 15

Spain (ES) 18

References for Appendix B 21

Austria (AT)

Description of the Personal Income Tax

The Austrian personal income tax system formally covers seven classes of income (farmers, sole proprietors, non-incorporated firms, labor, rent, some capital gains and other sources). Employees typically receive twelve regular income payments plus an additional two "Sonderzahlungen" (termed "vacation" and "christmas" salaries due to their payment dates). Both types of salaries are taxed at different rates, so that employee income is first split into regular salaries (12/14 of yearly income) and special payments (remaining 1/7). To calculate the taxable base – seven sources of income less special employee payment) - are reduced by deductible expenses, most notably (regular) social security contributions for employees, tax-free amount for profits and other deductions specific to certain groups (e.g., pensioners or commuters). Especially social security contributions interact with the tax system, as these feature both an upper and lower limit, certain sliding scales in terms of gross income and different rates for various groups of taxpayers. In addition, most of the limits in the SSC are indexed but with a different reference value than the PIT system (see below).

The resulting taxable income is taxed according to a progressive tariff with a 0% bracket which then increases to 50% for high incomes (55% for incomes above EUR 1 million). On top of this calculated tax, taxpayers can claim various tax deductibles which directly reduce the income tax paid. Among these the most important are children-related deductibles ("family bonus"), deductibles for employees and pensioners, sole earners, single parents, and an additional distance-based commuter deductible.

For income earners where the result income is negative a negative tax system exists, that (among other factors) refunds a certain share of social security contributions out of the overall PIT revenue. In addition some of the tax deductions are either payable and are thus paid out cash or complemented by other payments ("Kindermehrbetrag" complements "family bonus") in case the tax deductible could not be paid out (in full) due to too low income tax.

Special payments are only reduced by their associated SSC (at lower rates) and taxed according to a simplified progressive tax tariff with not tax deductibles applicable.

Capital gains are for the largest part taxed by separate capital gains tax, which is a flat tariff and levied by banks directly on savings, dividends and similar. Taxpayers can however opt into the progressive PIT schedule, where certain capital gains are then taxed at half of the average PIT tax rate. This is only favourable in cases where this rate lies below the standard capital gains tax rate of 27,5% (25% in certain cases) which is only the case for low incomes.

Indexation practices

Since 2023 limits in the PIT are partly indexed to previous inflation. This includes the tariff itself (only regular except the topmost backet above EUR 1 million, brackets for special payments also remain fixed) and most of the tax deductibles, with the exception of the sizable "family bonus".

A yearly "progression report" calculates the nominal aggregates for fiscal drag in ????? that should be reimbursed in the following year based on the 1 ½ year lagged inflation (July t-2 to June t-1). Two thirds of this amount are then automatically distributed by raising brackets and deductibles (again by 2/3 of the reference inflation). The remaining third is distributed through discretionary measures by the governments, e.g. by raising certain non-indexed parts of the tariff or increase certain deductions by a higher amount.

Note that in contrast to the PIT, the (deductible) SSC limits are typically fully indexed but with the (full) increase of the wage sum as reference rather than inflation. These two systems may thus interact in various unpredictable ways, especially in phases of high inflation/wage increases.

Static results

Implementation Notes

(WIP list of things to mention here)

- Certain health care expenditures (tintahl_s) are tax deductible with a degressive rate depending on income. Since we do not uprate expenditures this leads to negative tax-to-base elasticity effects. Quantitatively these are however negligible and do not change the final country results qualitatively.
- For 2023 the negative tax component of the family bonus ("Kindermehrbetrag") has been increased substantially (€250 to €550) and eligibility conditions have been loosened.
- Until 2020 only persons with zero tax liability were eligible for the negative tax, which leads to the very strong tax-to-base elasticity increases in D2 for 2019. Since 2020 negative taxes are decreased gradually for persons with positive tax liabilities, which removes this effect from the 2024 scenario.

Croatia (HR)

Description of personal income tax

Personal income tax in Croatia is applied at the individual level. Non-taxable sources of income include all sorts of social benefits (family, unemployment, social assistance, housing and sickness benefits), scholarships and grants and voluntary maintenance payments.

All other income sources (i.e. employment and self-employment incomes, pensions, property income, capital income and income from contractual work) are taxed. All types of income, except self-employment income, are taxed by withholding during the year; employment income and pensions are taxed using a monthly-adjusted general tax schedule, while other sources are taxed by income-specific schedules. For property and capital incomes the tax withheld is final. In contrast, employment income, pensions, income of self-employed and income from contractual work enter the yearly assessment, whereby the yearly tax obligation is obtained. Additionally, taxpayers can submit a yearly tax file in order to obtain certain tax reliefs.

Social insurance contributions effectively represent tax allowances. Each tax unit can also claim the basic personal allowance, a tax allowance for supported family members (children and other family members such as spouses and parents) and a tax allowance for people with disabilities. Those allowances are not available in income-specific schedules. Tax deductions are available for: (a) donations for cultural, educational, scientific, medical, humanitarian, sports and religious purposes, (b) expenditures on research and development, (c) outlays for education of young employees, (d) outlays for salaries of first-time employees.

The general schedule has two rates: 24% (20%) in 2019-2020 (2021-2023) and 36% (30%) in 2019-2020 (2021-2023). The most important income-specific schedules are as follows:

(a) Income from contractual work: 24% (20%) in 2019-2020 (2021-2023);

(b) Property income: 12% (10%) in 2019-2020 (2021-2023);

(c) Capital incomes (dividends, interest income, capital gains): 12% (10%) in 2019-2020 (2021-2023).

Finally, self-employed persons whose yearly revenue from business activity does not exceed 39,816 EUR/year pay PIT according to lump-sum schedule.

The main changes in the calculation of PIT between 2019 and 2023 concerned the PIT rates. The tax brackets remained the same, whereas the basic personal allowance slightly increased from 504.34 EUR/month to 530.89 EUR/month.

Indexation practices

Tax parameters in Croatia are adjusted on a discretionary basis, as there are no indexation rules regulating their change over time.

Static results

The tax-to-base elasticity estimated for Croatia is 2.36 in 2019. The largest elasticity is associated to self-employment income (3.56), followed by the one for employees (2.69); the lowest elasticity is associated to benefits and pensions (1.01). The latter is due to the fact that (i) social benefits are not taxable and (ii) pension recipients are mostly located at the bottom of the income distribution and are hence faced with zero (or very

low) average tax rates. The large elasticity of self-employment incomes is associated to the position of the self-employed in the income distribution, as well as the existence of the special lump-sum schedule for the self-employed on relatively low incomes.

As mentioned above, the personal income tax system in Croatia only has two rates; as the vast majority of tax payers fall on the first tax bracket, bracket indexation has a minimal impact on the elasticity (it falls from 2.36 to 2.34). The country's TTB elasticity is almost entirely explained by the lack of indexation of the basic personal allowance. In 2019, this was worth 514EUR/month and it was universal (i.e. applied to all individuals with taxable income). According to our estimates, the indexation of this tax allowance alone reduces the tax-to-base elasticity from 2.34 to 1.26 overall. The indexation of the tax allowance for supported family members further reduces the elasticity to 1.06.

Tax -to-base elasticities vary greatly across the income distribution, and are especially high in the middle of the income distribution (deciles 3-8). The elasticities are much lower for individuals in the two lowest income deciles. This result is mostly due to the fact that the proportion of individuals paying income tax in these deciles is very low (5% in the first decile and 6% in the second). The TTB elasticities are also lower for individuals in the two highest deciles of the income distribution. This is explained by the fact that richer taxpayers are more likely to be relatively less affected by tax allowances and have incomes that are taxed on the specific, single-rate schedules mentioned above.

These results hold when moving from 2019 to 2023. The main change being a substantial decrease in the tax-to-base elasticity itself (from 2.36 to 2.12), resulting from the general reduction of the tax rates and the small increase in the value of the basic personal allowance, which has particularly benefitted the (very few) tax payers of the two poorest income deciles.

Estonia (EE)

Description of personal income tax

Personal income tax in Estonia (*füüsilise isiku tulumaks*) is applied at the individual level, as the possibility of joint taxation was abolished in 2017. Non-taxable sources of income include: family benefits (with the exception of parental benefits), unemployment-related allowances and benefits, social assistance benefits, scholarships and grants, voluntary maintenance payments and dividends (which are subject to corporate income tax).

All other income sources (including employment and self-employment incomes, property incomes, royalties, benefits and pensions, interests) are taxed in a uniform way. These incomes can be reduced by deductible expenses, which are based on the amounts of contributions to unemployment insurance fund, voluntary pension contributions, housing loan interest payments, education expenses, donations, and rental income (up to 20%).

The resulting taxable income is taxed at a flat 20% rate, after tax allowances are taken into account. There is a basic income tax allowance which can be claimed by all taxpayers, while other tax allowances are linked to the presence of children or a low-income spouse in the household. An additional allowance exists for self-employment incomes in the agricultural sector. All the allowances are non-refundable and there are no tax credits.

The main changes in the calculation of PIT between 2019 and 2023 concern the calculation of the allowances. First, the introduction of a higher family tax allowance for parents of more than 2 children. Second the introduction of a new basic tax allowance for individuals of pension age (equal to the average pension in the previous year). Finally, the basic allowance has been substantially increased and went from 6,000 EUR to 7,848 EUR.

Indexation practices

Tax parameters in Estonia are adjusted on a discretionary basis, as there are no indexation rules regulating their change over time.

Static results

The tax-to-base elasticity estimated for Estonia is 1.66 in 2019. The largest elasticity is associated to employment income (1.76) and lowest to benefit and pension incomes (1.23). These two sources of income are subject to the same taxation rules. However, benefit and pension receivers are to be found mainly in the lower half of the income distribution and, for this reason, they are faced with lower average tax rates and suffer less from the impact of fiscal drag. The same holds for self-employment incomes, whose elasticity is also lower than average (1.41). Finally, the TTB elasticity of capital income is 1.66.

As mentioned above, the personal income tax system in Estonia is characterised by a flat rate. Therefore, the elasticity is entirely explained by the progressive loss of relative value of the tax allowances. The tax allowance with the biggest impact on the TTB elasticity is the basic allowance, which is applied to all individuals with taxable income (even if its size decreases as incomes increase). The indexation of this tax allowance alone reduces the tax-to-base elasticity from 1.66 to 1.03 overall, according to our estimates. This decrease is even larger when looking at the lower deciles of the income distribution, with the tax-to-base elasticity for the 1st decile going from 8.16 to 1.64 simply in virtue of the update of the value of the basic allowance.

The tax-to-base elasticities vary greatly across the income distribution, and are especially high in the first and second decile. This result is partially due to the fact that the proportion of individual paying income tax in these deciles is relatively low (9% in the first decile, 47% in the second) and, therefore, results are very sensitive to sampling. TTB elasticities are much lower for individuals in higher deciles of the income distribution (reaching a minimum of 1.12 for the 10th decile). This is explained again by the fact that richer taxpayers are more likely to be faced with a flat tax regime, to which very few or no allowances can be applied.

Most of these results hold still when moving from 2019 to 2023. The main change being a substantial decrease in the elasticity itself (from 1.66 to 1.5), resulting from the introduction of two new tax allowances and the significant increase in the value of the basic tax allowance, as explained above. These policy changes have the effect of reducing the TTb elasticity especially for taxpayers in the lower deciles of the income distribution. This is consistent also with the fact that individuals receiving pension income are the one who benefitted the most from the policy change.

Dynamic results

France (FR)

Description of the Personal Income Tax

In France, the Personal Income Tax is a national system where people are taxed the same way in whatever region they live. It is defined in the National Accounts (D51) as the sum of 5 components:

- *Impôt sur le revenu des personnes physiques* (IRPP) which amounts for about one third of the aggregate Personal Income Tax. All incomes, regardless of origin, are aggregated to give an overall (net of social contributions for the wage part) income to which a single tax scale is applied. The tax base is called Net taxable income (*Revenu net imposable)*. The tax base differs according to the income category. The tax scale has five progressive income bands, from 0% to 45%. Taxation is adjusted to personal circumstances (composition of the family, disabled people, children etc.). The IRPP is assessed annually on a tax unit's (a "foyer fiscal") taxable income in a calendar year: People who are married or who have signed a contract of civil partnership are assessed together with dependent children. The system is based on the family quotient: all household incomes are added together and then divided by the number of shares before being submitted to the tax schedule. There are capping to the family quotient. There is also a tax rebate (*Décote*) for low income tax units, and additional reductions for families with children at school, for low-income earners (Supplementary tax reduction from 2017-2019) which is applied after the tax rebate.

  There is also an exceptional contribution on high incomes ("*Taxe exceptionnelle sur les hauts revenus*") which is an annual tax based on the same incomes as the IRPP. It concerns people whose incomes (incomes as "revenu fiscal de reference, RFR") are higher than EUR 250, 000 for singles and EUR 500 000 for couples.
- General Social Security Contribution (*The Contribution Sociale Généralisée*, CSG) is the main household level income tax and amounts to more than half of the aggregate Personal Income Tax in the National Accounts. The contribution is paid on the income of residents of France and individuals subject to the French compulsory health insurance scheme. It is a flat tax. The tax rate varies by income sources. There are some exoneration for low income depending on the tax unit (*Quotient familial*).
- The Social security debt repayment contribution (Contribution au remboursement de la dette sociale", *CRDS*). Like the CSG, it is paid by individuals who are domiciled in France for tax purposes and who contribute to the French compulsory health insurance scheme. It is a flat tax (0.5%).
- Social contribution on capital income (*Prélèvement de solidarité*): these social contributions apply to capital (investment & property) incomes and are a flat tax.
- Capital income taxation (*Prélèvement sur les revenus de capitaux mobiliers).* There is flat tax of 12.8% and social contributions on capital income (17.2 %).

According to the national accounts, income tax amounts to 224.3 billion in 2019 (262.7 in 2023). The CSG accounts for more than half of revenue (56% in 2019, and almost 66% in 2023), followed by the IRPP, which accounts for more than a third of revenue (almost 34% in 2019, and 39.5% in 2023). The other direct levies are, in order of importance: the Social contribution on capital income and other social contributions (between 4.5% and 6%), the contribution to the repayment of the social debt (between 3% and 4%), and the Capital income tax (around 2%).

The EUROMOD micro-simulation model provides good coverage of Personal Income Tax (almost 90% of the national accounts aggregate with the 2019 model and 2019 data), and of its main components, the CSG and the

IRPP (respective coverage rates of 90% and 94% in 2019). On the other hand, the social contribution on capital income and other social contributions are largely underestimated, and the capital income tax is overestimated.

Indexation practices

Most benefits in France are indexed every year to take account of inflation (particularly for social minima). In the same way, tax brackets and the amounts involved in tax computation are reevaluated to take account of inflation.

Static results

The estimated overall tax-to-base elasticity for France is 1.54%. As expected, it reflects heterogeneous elasticities between the different components of the personal income tax. The elasticity associated with the IRPP is much higher (2.54%), reflecting the progressivity of this tax. It should also be noted that only about half of individuals are subject to the IRPP. On the other hand, the tax elasticity for the CSG is only 1.02%, as it is almost a flat tax paid by almost all individuals.

The TTB elasticity shows an inverted U-shaped pattern across the income distribution, which is not often observed in the other countries, with the TTB elasticity close to or above 2 for deciles 6 and 7.

There is also some heterogeneity by source of income. Without indexation of tax parameters, a 1% increase in capital income is associated with a 1.64% increase in the corresponding tax revenue. The elasticity is slightly lower for salaries (1.53%), and for self-employment income and benefits (around 1.5%).

The fiscal drag effect is mainly explained by the IRPP brackets (37% of the effect) and to a lesser extent by the "décote" of the IRPP and the CSG ceilings (6% for each). When these parameters are indexed to income growth, tax-to-base elasticity falls from 1.54% to 1.06%. The residual is fully offset when accounting for the remaining tax deductions and ceilings of the IRPP and of the *Quotient Familial* and for the thresholds associated with the exceptional contribution on high incomes.

Italy (IT)

Description of the PIT

Irpef, the Italian Personal Income Tax, is the main tax in the national welfare system in terms of revenues ([180 billion euros, more than one-fifth of revenues, about 10 percent of the 2019 GDP]). Originally introduced in the 1970s as an almost all-encompassing income tax, it now mainly affects employment and pension income due to a significant process of regulatory layering. *Irpef* plays a crucial role in making the Italian tax system progressive, thanks to the rising tax rates defined by income brackets and the deduction system (Curci et al., 2020). Capital income, and income from business activities (self-employment) are subject to proportional taxation, with few exceptions in which cases they enter the tax base of *Irpef*. The gross income from these sources is reduced by a series of deductible expenses, such as a deduction for social security contributions payable by the employee, which then determine the taxable income.

After those deductions have been applied, taxable income is taxed by a progressive schedule. The resulting tax is reduced for a tax credit specific for each source of income (employment, pension and self-employment). Also, individuals are allowed to deduct fiscal expenditures (a given share of health expenditures or insurance premiums for example). The Italian PIT features as well an in-work refundable tax credit (so called "bonus *Irpef*") directly paid to taxpayers with nonzero tax capacity below a given threshold of income. Finally, Regional authorities can impose (limited) a surcharge to each rate of the schedule.

Indexation practices

The regulation of the Italian PIT does not feature any form of indexation. Between 2019 and 2023 however, the personal income tax has faced several changes. The 2022 budget law modified the structure of the income brackets, reducing their number from five to four, and the corresponding legal rates. The rate of the second bracket (from 15'000 to 28'000 euros) was reduced by 2 percentage points (from 27 to 25 percent) and the one of the third bracket (from 28'000 to 55'000 euros) by 3 points (from 38 to 35 percent), while its upper limit was lowered to 50,000 euros. Incomes higher than 50,000 now fall in the highest bracket previously starting at 75'000 euros), to which a 43 percent rate applies. Incomes between 50'000 and 55'000 euros therefore experienced a 5-points rate increase, while those between 55,000 and 75,000 euros had a 2-points increase. For incomes above 75,000 euros, the legal rate remained unchanged.

The budget law also changed the structure of deductions based on income source (employees, pensioners, and self-employed workers), which implicitly define the no-tax area. The main novelty concerns the deductions for employees, which have been revised to include the the *Irpef* bonus. For taxpayers with incomes up to 15,000 euros, the so-called "integrative treatment" (**see note X**) continues to be paid as a transfer under the previous rules (the amount is 1,200 euros for a worker employed throughout the year). For employees with total income between 15,000 and 28,000 euros, favored under the previous system by fully benefiting from both deductions (given the tax capacity) and the "integrative treatment", the deduction amount is increased.[1]

[1] Decree-Law No. 3/2020 had introduced two mechanisms to reduce the tax burden (extended by the 2021 budget law). The first is the integrative treatment, a monetary transfer (100 euros per month) reducing the tax wedge for employees with a total income of up to 28,000 euros annually, replacing the previous tax bonus (the so-called 80-euro bonus) paid to a more limited pool of beneficiaries. The integrative treatment was granted based on the number of months worked to employees whose gross tax, calculated on employment income alone, exceeded the deductible amount on that income

In March 2022 the Universal Child Allowance came into effect, replacing many limited measures that supported families with children (family allowances, bonuses, and deductions). In particular, this reform eliminated *IRPEF* deductions for dependent children, which provided no or partial benefits to individuals with little or no taxable income.

Since 2023 Social Security contributions follow a specific schedule as well. The standard rate (19.9 percent) now applies only to incomes higher than 35'000 euros. The contributory rate is 6 points lower instead for incomes between 25'000 and 35'000 euros and 7 points lower for incomes lower than 25'000.

Finally, after 2019 an optional flat tax regime for self-employed workers has been introduced. To opt for the flat tax regimes self-employed workers must have revenues lower than 85'000 euros (65'000 before 2022). Pre-determined costs for different sectors are then deducted from revenues producing an income which is taxed flat at a 15 percent rate.

Static results

The tax-to-base elasticity estimated for Italy is 1.89, in line with the EU average. The elasticity is larger for labor incomes (1.97) and for pensions and benefit incomes (1.86) which represent the largest tax base for the progressive schedule of *Irpef*. Pension and benefit incomes are taxed by the same progressive schedule as labor, but have a smaller elasticity because of the composition of pensioners and benefit earners in terms of their location along the income distribution, their income sources and their demographic characteristics. The same elasticity is much smaller for self-employment incomes (1.5) which is mostly taxed with an optional flat rate regime ("*forfettario*") for businesses with revenues lower than 85'000 euros. The elasticity on capital income is instead equal to 1 as this is taxed at a flat rate. For a small fraction of worker declaring their rental income in within the tax base of the PIT, the estimated elasticity is the larger one, equal to 2.0.

This tax-to-base elasticity is explained partly by the effect of tax credits and tax deductions loosing relative value (around 52 **points** of the fiscal drag effect) and partly by the progressivity of the tax brackets (29 basis points). The remaining 8 points is a residual component that cannot be offset with the updating of the nominal tax parameters included in the microsimulator.

These mechanisms differ markedly along the income distribution, which also displays significant variation in the tax-to-base elasticity. The lowest decile has an elasticity of zero, as these individuals have a zero tax liability both before and after the increase in their income. The remaining low and middle income deciles display a larger elasticity, explained primarily by the loss of relative value of their tax deductions and credits, which play a significant role in the calculation of their tax liability. Top incomes display a lower and decreasing elasticity, in which bracket progressivity is the dominant force.

The tax deductions and credits with a bigger impact on the tax-to-base elasticity (denoted "Deduction/credit 1" in Figure 3 panel (m)) are the deductions based on income source (employment, pension, and self-

(a condition met for incomes above approximately 8,145 euros for employees working the entire year). To ensure a gradual reduction of the tax benefit as income increased, the same decree had provided for a second mechanism: an "additional deduction" for the second half of 2020 (later made permanent by the 2021 budget law) for employees with total income between 28,000 and 40,000 euros. This deduction amounted to 100 euros at an income of 28,000 euros, slowly decreased to 80 euros at 35,000 euros, and then more quickly phased out entirely at 40,000 euros. The budget law of 2022 introduced a potential transfer as a 'safeguard clause' equal to the difference between the total deductions (in addition to those from employment) and the gross tax, up to a maximum of 1,200 euros (in the case of a full-year employment contract). Finally, the additional deduction for employment income benefiting those with incomes between 28,000 and 40,000 euros has been abolished.

employment). This is a deduction applied to all individuals with positive labor income, and its size decreases as income increases, which is one of the reasons why it generates a particularly large elasticity on the lower part of the distribution of taxable income, as it is there were an increase of income not only reduced the relative value of this tax benefit but it causes it to reduce its size. The second tax deductions and credits in terms of their impact on the ERTI is the so called "integrative treatment" or *Irpef bonus* (denoted "Deduction/credit 2"). This is a transfer applicable to all tax payers with income lower than 15'000 euros that depends on the months of employment within the year. These two tax deductions explain most of the effect on the elasticity that can be attributed to tax deductions and credits. The last big chunk of the TTB elasticity is explained by fiscal expenditures.

Something comparing own TTB elasticity to OECD (wait until new comparison graphs is available across countries to decide if it is necessary to say something).

Something on inequality and progressivity results. (wait until new comparison graphs is available across countries to decide if it is necessary to say something)

Dynamic results

To be done

Latvia (LV)

Description of the Personal Income Tax

Personal income tax in Latvia is imposed on various types of income, including wages, income from individual economic activities (such as self-employment), capital gains, reduced license fees, micro-enterprise tax shares, seasonal agricultural worker income, and other income received by individuals, such as intellectual property, inheritance, and lottery prizes.

In 2019, Latvia had a three-tier progressive personal income tax (PIT) system for income earned through employment agreements. Employers withheld PIT at a rate of 20% for monthly incomes up to 1,667 euros and 23% for the portion of monthly income exceeding 1,667 euros. If an employee did not submit their tax book to the employer, a 23% rate was applied regardless of the salary amount. The highest progressive rate of 31.4% was set for monthly salaries exceeding 5,233 euros (or 62,800 euros annually), aligning with the maximum amount of state social insurance contributions. There were several deductions applied, the most significant being the differentiated non-taxable minimum. The maximum non-taxable minimum was set at 230 euros, applicable to incomes up to 440 euros per month, gradually decreasing to zero at gross wage of 1,100 euros per month. For pensioners, the non-taxable minimum was fixed (not differentiated) at 270 euros per month. Additionally, the allowance for a dependent person was 230 euros per month, primarily for children but also applicable to a non-working spouse under certain conditions[2]. If the tax deductible could not be fully used due to low income, no compensation mechanism was applied.

By 2023, the PIT system for earned income had undergone only minor changes compared to 2019. The top personal income tax rate was reduced from 31.4% to 31%. The parameters for the differentiated non-taxable allowance were adjusted, with limits increased to 500 euros for both employees and pensioners. The income threshold for the maximum non-taxable minimum was set at 500 euros per month in 2020 and has remained unchanged since then. The income threshold above which the non-taxable minimum is not applicable was increased from 1,200 euros in 2020 to 1,800 euros in 2021 and has remained unchanged since then. The allowance for a dependent, amounting to 250 euros, has not changed since 2020, although its scope has been limited, excluding spouses.

Other types of income, including capital gains, have been excluded from the progressive PIT system, setting a fixed tax rate of 20%, which has not changed during the horizon of theses analyses. Several discounts (at 50%) were applied to certain types of income from economic activities, including rent and gains from forest sales, aimed at reducing the shadow economy within these activities.

Indexation practices

Indexation of PIT brackets and income is not used in Latvia. Thresholds are adjusted based on government decisions without a clear reference indicator. Changes introduced in the system, as mentioned above, are accounted for in the EUROMOD and our analyses.

[2] Applicable also to a non-working spouse if the spouse had a child under 3 years old, or three or more children under 18 years old (or under 24 years old if the child continued secondary, professional, special, or higher education), with at least one child under 7 years old, or if the spouse had five children under 18 years old (or under 24 years old if the child continued secondary, professional, special, or higher education).

Static results

In 2019, a hypothetical increase of all income sources by 1% results in the TTB elasticity of 1.44 for Latvia, placing it in the lower range compared to other EU countries. Despite a flat tax rate, the elasticity on capital income is the highest at 1.5, followed by labour incomes at 1.46 and self-employment incomes at 1.43, both of which are taxed under a progressive schedule. Pensions and benefit incomes, also taxed progressively like labour incomes, have a smaller TTB elasticity of 1.33.

This tax-to-base elasticity is primarily attributed to the diminishing relative value of tax deductions and credits, accounting for approximately 87% of the fiscal drag effect, and to a lesser extent, the progressivity of the tax brackets, which accounts for 11%. The first two deciles exhibit the highest elasticity, around 5. Around 60% of income in these two deciles derived from pensions and benefits, and 78% of the taxpayer in the first decile had zero tax liability . As income of these individuals exceed the maximum non-taxable minimum, they faced larger relative increase in the paid income tax on average.

In 2023, due to overall increase in income and only marginal adjustment in the tax policy (mainly by increasing non-taxable amounts) the average elasticity increased to 1.55. The average effect of tax progressivity increased to 13.4% as more tax payers fell into 23% tax bracket due to the hypothetical 1% increase in income. This effect is observed in all deciles except the richest two.

Since the main increase in non-taxable allowance was attributed to pensioners (the fixed non-taxable income allowanced increased from 270 euro to 500 euro), the share of taxpayers with zero tax liabilities in the first decile increased to 89% and the elasticity declined to 3.5. At the same time, the pick of elasticity shifted to the second decile.

For employees, the maximum progressive non-taxable allowance increased (from 230 to 500 euro) gradually declining to zero for income exceeding 1800 euro (previously 1100 euro, with a 203 euro non-taxable amount applied in full for income below 440 euro). Thus, non-taxable allowance was applied to a wider range of income categories with higher nominal non-taxable amounts for all groups. As a result, theoretical increase in income in 2023 affected a broader range of income categories compared to 2019.

Implementation Notes

(WIP list of things to mention here)

Portugal (PT)

Description of the PIT

The Portuguese PIT is levied on labour, self-employment income, pensions, capital, and property income, but not on other social transfers. This implies that taxable income does not include a significant share of disposable income, namely unemployment benefits, child subsidies, sickness, and paternity allowances.

Capital and property income are taxed at a flat rate of 28%, which is much higher than the average tax rate (around 13%), but they can be included in the PIT declaration in order to be taxed as other incomes (following a progressive tax schedule). For simplicity, EUROMOD taxes all capital income at 28% and includes all property income in the PIT declaration.

For determining collectable income, a series of tax deductions are applied accounting for around 28% of taxable income (according to tax authority data for 2019). Each employee or pensioner is allowed to a deduction amounting to the maximum between the social contributions paid and a minimum threshold. There is also a deduction for self-employment income and income earned by people with disabilities.

In 2019 there were 9 tax brackets (including the solidarity surcharge) with marginal rates ranging from 14.5% to 53%. Tax rates are lower in the insular regions of Azores and Madeira, and there is also a municipality tax deduction where municipalities can decide to return to the taxpayer a part or the whole 5% participation on PIT revenue levied on their inhabitants. Only the rates for insular regions are modeled in EUROMOD.

After the application of the tax schedule to collectable income, there is a vast number of tax deductions, accounting for 4% of taxable income (according to tax authority data for 2019). The most relevant are the general expenses deduction, but there are also deductions for dependents and for health, education, and housing expenditures. There is also a provision of minimum untaxed income that in 2019 ensured that the application of PIT was not leading to a disposable income below a certain threshold.

In all the simulations the minimum wage and social support index were treated as parameters, which are fixed with income but change in scenarios of full indexation. In 2023, details of the minimum untaxed income are modelled as off 2024 and not considering the transitory regime. A small correction was introduced regarding the computation of this tax benefit, to include taxpayers whose total gross income is equal or less than the reference value.

Main changes to the tax between 2019 and 2023 include a new tax schedule, with lower tax rates and different brackets, the reform of the minimum untaxed income scheme to avoid very high marginal rates applied to taxpayers just above the minimum wage and the inclusion of a tax deduction for the youth. Currently the minimum untaxed income is designed as an alternative to the general tax deduction available for low-medium income households, which are therefore, in most cases, no longer affected by the general personal tax deduction.

For uprating the data from 2020 EU-SILC to 2023, we used the uprating factors from EUROMOD version j.0.1, because wages growth between 2019 and 2023 was clearly underestimated in the upratings from version i.6.0.

For more details on the Portuguese PIT and its modeling on EUROMOD see Riscado, Sazedj and Wemans (2024).

Indexation practices

There were no indexation rules in place until 2025. In the last two decades, the updating of tax parameters was more the exception than the rule. There have been constant changes to the tax legislation, but a significant across the board update of tax brackets occurred only in 2023 (5%) and 2024 (3%), with all major tax deductions cut offs being fixed in nominal terms, except for the basic amount for the personal tax deductions which was updated by 6% in 2024. The only nominal reference which has been typically updated is the minimum untaxed income threshold, which has been indexed to the minimum wage or the social support index. The minimum wage changes are negotiated between the Government and social partners, while the social support index is updated according to CPI (excluding housing) from November of t-1.

Static results

The TTB elasticity estimated for Portugal is 1.99, which is very similar to the OECD estimate (Price et al, 2015), especially after excluding pensions. By income source the elasticity is larger for capital and labour income and lower for pensions. Capital income faces a high elasticity despite a proportional rate being applied, because the rate applied is much higher than the average PIT rate, so a similar increase in income generates more PIT revenue if it is concentrated on capital income. Pension and employment income are taxed similarly, but the underlying distribution of pensions is tilted to lower incomes, so pensions face a lower average tax rate and that induces a lower elasticity.

Around half of the elasticity is driven by tax brackets (44%), while the rest is related to tax deductions and credits nominal thresholds and a small residual of 6% arises from the fact that some tax deductions are related to the amounts of expenditures incurred by families in specific areas such as education and health: These expenditures were kept fixed in our simulations. There is one single parameter explaining 29% of the elasticity, and that is the basic amount for the personal deduction applied on collectable income ("Tax deductions and credits 1"). Other tax deductions and credits, each explaining around 7% of the elasticity each are the minimum untaxed income ("Tax deductions and credits 2") and the deduction for general household's expenses ("Tax deductions and credits 3"). Much of the effect coming from the other tax deductions and credits is related to the tax credits for children.

The tax-to-base elasticities are vary greatly across the income distribution, reaching very high levels in the first part of the distribution. One should take into account that the percentage of people paying taxes in the first deciles is very low and results are therefore very sensitive to sampling, as the distance of a particular observation income from the relevant nominal threshold can heavily influence the results for the first deciles. Tax deductions and credits are much more relevant as a source of elasticity for taxpayers in lower deciles than tax brackets, which is related to the fact that these deductions represent a higher proportion of taxable income for taxpayers with low income. Still, it is important to note that only around 10% of the households in the first decile and 20% in the second decile pay PIT, so the vast majority of households in the first quintile are not affected by these elasticities.

Pre-tax income inequality as measured by the GINI coefficient in Portugal is particularly high (0.37 if considering all income and 0.39 in terms of taxable income), and the PIT has a relatively high redistributive capacity, reducing this inequality by 16% when considering disposable income and 13% in terms of disposable income. The redistributive capacity of the tax increases with income growth, via an increase in the average tax rate, as the progressivity of the tax (measured by the Kakwani index) is reduced because tax becomes more concentrated in the lower part of the distribution.

Dynamic results

Spain (ES)

Description of the Personal Income Tax

The Spanish Personal Income tax is levied on different sources of revenue, including labor income, capital income, pensions and income from business activities (self-employment). Each of these types of income is reduced by a series of deductible expenses, such as a deduction for social security contributions payable by the employee, or a reduction applicable to labor income earners.

The resulting income is grouped into two categories: general taxable income, mainly including income earned by employees or the self-employed and property income; and savings taxable income, mainly including capital income (e.g. realized capital gains, dividends and interest). A number of deductions are applied to the general taxable income (e.g. deductions for filing a joint return and for contributions to private pension schemes). If these deductions exceed general taxable income, the unused portion is applied to savings taxable income.

After those deductions have been applied, general taxable income is taxed by a progressive schedule, while savings taxable income is taxed with a much flatter schedule. There is also variation at the regional level in the tax schedules, as well as in some specific tax deductions and credits.

Lastly, various tax credits, such as the minimum personal and family allowance and the maternity allowance, are deducted from the amount resulting from applying the State and regional tax rates to general and savings taxable income to obtain the final tax payable.

For more details on the Spanish Personal Income Tax see García-Miralles, Guner and Ramos (2019).

Indexation practices

Tax parameters are adjusted on a discretionary basis, both when deciding which parameters to change and in the choice of the updating index. While adjustments have been made with a frequency that has kept average effective tax rates constant over time, in the recent period these adjustments have not been made with enough frequency or intensity to prevent effective tax rates from increasing due to fiscal drag. Over this period, we consider that there has been one type of discretionary measure that could be considered as indexation: some regions, in some years, decided to increase the nominal parameters that determine the tax brackets of the regional rates or of tax deductions. We note however that in some cases these changes went beyond updating nominal parameters and also changed the structure of the brackets, making them difficult to classify. However, given the clear motivation to offset fiscal drag effects, and to preserve certain consistency, we consider them all together as a discretionary measure of indexation.

Structural reforms

In 2023, the tax deduction that is applied to all labor income earners and that is larger for low-income earners (*reducción por rednimentos del trabajo*) was increased. This involved both a change in its nominal parameters but also in its structure (with a three-step phase-out rather than a two-step one). The goal of this reform was that, following an increase in minimum wage, individuals who only earn this income would remain zero-tax payers. While this has a resemblance of avoiding fiscal drag, this was not an explicit motivation and the reform included changes beyond parameter updating, so we classify this as a non-indexation structural measure.

Static results

The TTB elasticity estimated for Spain is 2.04, which is slightly in the upper range of other EU countries, but not far from the mean and median values. The elasticity is larger for labor incomes (2.11) and self-employment incomes (2.07), which are both taxed by a more progressive schedule while it is lower for capital incomes (1.71), which are taxed by a flatter schedule. Pension and benefit incomes are taxed by the same progressive schedule as labor and capital but have a smaller elasticity of 1,71 given the composition of pensioners and benefit earners in terms of their location along the income distribution, their income sources and their demographic characteristics.

This elasticity is explained partly by the effect of tax deductions and credits loosing relative value (around 58% of the fiscal drag effect) and partly by the progressivity of the tax brackets (35%). The remaining 7% is a residual component that cannot be offset with the updating of the nominal tax parameters included in the microsimulator.

These mechanisms differ markedly along the income distribution, which also displays significant variation in the elasticity. The lowest decile has an elasticity of zero, as these individuals have a zero tax liability both before and after the increase in their income. The remaining low and middle income deciles display a larger elasticity, explained primarily by the loss of relative value of their tax deductions and tax credits, which play a significant role in the calculation of their tax liability. Top incomes display a lower and decreasing elasticity, in which bracket progressivity is the dominant force.

The tax benefit with a bigger impact on the elasticity (denoted "Deduction/credit 1" in Figure 3 panel(g)) is the deduction for labor income earners. This is a deduction applied to all individuals with positive labor income, and its size decreases as income increases, which is one of the reasons why it generates a particularly large elasticity on the lower part of the distribution of taxable income, as it is there were an increase of income not only reduced the relative value of this tax deduction but it causes it to reduce its size. The second tax deduction and credit in terms of their impact on the elasticity is the family allowance (denoted "Deduction/credit 2"). This is a tax credit applicable to all tax payers that depends on their personal and family characteristics. These two tax deductions and credits explain most of the effect on the elasticity that can be attributed to tax deductions and credits.

Something comparing own elasticity to OECD (wait until new comparison graphs is available across countries to decide if it is necessary to say something).

Something on inequality and progressivity results. (wait until new comparison graphs is available across countries to decide if it is necessary to say something)

Dynamic results

Over the period 2019 – 2023 revenue from PIT in Spain increased as a share of GDP (by around xx%). This increase was to a large extend due to the lack of indexation of nominal parameters that remained broadly unchanged. Compared to a contrafactual of 2019 legislation without indexation, tax collection was only slightly lower (due to the two previously mentioned measures), while counterfactual PIT revenue under 2019 legislation with full indexation would have been significantly lower (around 0.x p.p. of GDP). This is shown in Fig 6 panel (b). Indexation with respect to concurrent HICP would have led to the lowest revenue collection and it would have decreased the average effective tax rate with respect to 2019, suggesting that this reference would cause over-indexation during the period considered.

More specifically, as shown in Figure 7 panel (b), around 70% of potential fiscal drag actually happened, while 30% was offset by the two measures described. Around half of this offsetting can be attributed to the indexation measures by regions and the other half to the structural measure of the labor income deduction by the central government.

References for Appendix B

García-Miralles, Esteban, Nezih Guner, and Roberto Ramos. "The Spanish personal income tax: facts and parametric estimates." SERIEs 10.3 (2019): 439-477. https://doi.org/10.1007/s13209-019-0197-5

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