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* Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank.

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

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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 progressive tax legislation are not updated accordingly—across 21 European countries using a microsimulation approach. First, we estimate tax-to-base elasticities, showing that the progressivity built in each country's personal income tax system induces elasticities around 1.7–1.9 for many countries, indicating a potential for large fiscal drag effects. We unpack these elasticities to show stark heterogeneity in their underlying mechanisms (tax brackets or tax deductions and credits), across income sources (labor, capital, self-employment, public benefits), and across the individual income distribution. Second, we extend the analysis beyond these elasticities to study fiscal drag in practice between 2019 and 2023, incorporating observed income growth and legislative changes. We quantify the actual impact of fiscal drag and the extent to which government policies have offset it, either through indexation or other reforms. Our results provide new insights into the fiscal and distributional effects of fiscal drag in Europe, as well as useful statistics for modeling public finances.

Keywords: Personal income tax, inflation, indexation, bracket creep
JEL Classification: D31, H24, E62

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Non-technical summary

When inflation drives up wages and other incomes, taxpayers may find themselves paying higher taxes even though their real purchasing power has not increased. This effect is particularly pronounced in the case of Personal Income Taxation (PIT), a progressive tax instrument where tax brackets, deductions, and credits are usually defined in nominal terms that are not always adjusted in line with income growth. The phenomenon, commonly referred to as fiscal drag or "bracket creep", results in additional government revenue, and it can also alter the distribution of the tax burden across different groups of taxpayers.

In the European Union (EU), personal income tax remains at the discretion of each EU Member State, which can give rise to potentially large and heterogeneous fiscal drag effects across countries. As a consequence, uniform shocks may hit Member States asymmetrically, which can pose a risk to macroeconomic stability in the absence of a centralized fiscal capacity.

This paper offers a comprehensive analysis of fiscal drag in Europe in the recent period, covering 21 countries, including all members of the euro area and Hungary. By relying on harmonized household survey data and detailed tax legislation of each country, our study provides new evidence on both the potential for fiscal drag inherent in the design of PIT systems in each country and the extent to which it materialized in practice during the period 2019 to 2023, a period characterized by unusually high inflation.

The first part of the analysis assesses the sensitivity of tax revenues to income growth under the assumption of unchanged tax rules and homogenous income growth. This allows us to measure the degree of progressivity embedded in each country's tax system, which in turn allows us to quantify the scope for potential fiscal drag. The results show that in most countries, a one per cent increase in the tax base would lead to an increase of close to two per cent in personal income tax revenues if the tax parameters were not updated. Despite the diversity of PIT designs across Europe, tax-to-base elasticities tend to range between 1.7 and 2.0, although some countries exhibit considerably higher or lower values. Importantly, fiscal drag is not only driven by progressive tax brackets, but also by the design of deductions and credits, with both mechanisms contributing about the same as bracket progressivity on average, although with large variation across countries. The analysis also reveals differences across income sources: fiscal drag is generally stronger for labor income, while pensions and capital income are less affected, reflecting exemptions or flatter rate structures. Within countries, fiscal drag tends to be more pronounced for low- and middle-income groups than for top earners, thereby reducing the progressivity of the system when incomes rise. We stress, however, that many low-income earners who have a zero tax liability remain so, and

are therefore unaffected by fiscal drag. This causes an inequality-reduction effect in about two-thirds of the countries considered.

The second part of the study evaluates how fiscal drag evolved in practice during the recent period of high inflation. In this analysis, we account not only for the progressivity of the tax design of each country but also for the policy actions taken during the period, such as the updating of nominal tax parameters. To do so, we compare the actual tax collection in 2023 with counterfactual scenarios in which tax brackets were either fully indexed or not updated at all since 2019. The results show that all countries took some measures that dampened the impact of fiscal drag, but the extent of offsetting varied substantially. About one-third of the countries only partially offset fiscal drag, leading to noticeable increases in effective tax rates (of around 1 percentage point) and revenue (of around 0.5 percent of GDP). Another group of countries largely neutralized fiscal drag, either through systematic indexation or other reforms. Finally, a number of countries went further, adopting reforms that more than compensated for fiscal drag, so that revenues in 2023 were lower than would have been the case under a fully indexed system. It is worth emphasizing that a large share of these policy actions was not based on updating nominal parameters, but on other reforms such as introducing new tax deductions or modifying tax rates. Without these other measures, fiscal drag would have been much more pronounced.

These results contribute to a more comprehensive knowledge of the PIT systems in Europe, providing relevant information on issues such as their progressivity, the distributional impacts of inflation through its interaction with the tax system, the potential stabilization properties of PIT systems, and their effect on public finances. Our results underline the quantitative importance of fiscal drag, especially in periods of high inflation, and the large variation in policy responses to it.

1 Introduction

Fiscal drag refers to the increase in tax revenue that occurs when there is nominal growth of the tax base, whereas 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 tax deductions and credits.[1,2] 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, 2025), and for the analysis of behavioral responses to and distributional consequences of taxation as well as optimal tax design (e.g., Saez, 2003; Immervoll, 2005; Sutherland et al., 2008; Heer and Süssmuth, 2013; Paulus et al., 2020). Fiscal drag can also play a role as an automatic stabilizer (Auerbach and Feenberg, 2000; Immervoll, 2006; Dolls et al., 2012) or as a discretionary revenue measure.[3]

The recent spike in inflation that started in 2021 and the consequent growth in household income has triggered a renewed interest in fiscal drag from analysts and policymakers interested in estimating its budgetary effects and distributional implications.[4] In the European Union (EU), personal income tax remains at the discretion of each EU Member State, which can give rise to potentially large and heterogeneous fiscal drag effects across countries. As a consequence, uniform shocks may hit Member States asymmetrically, which can pose a risk to macroeconomic stability in the absence of a centralized fiscal capacity (Farhi and Werning, 2017; Bilbiie et al., 2021).

This paper provides a comprehensive characterization of fiscal drag across 21 European countries (all euro area and Hungary) in the recent period. 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, allowing for the simulation of individual tax liabilities under different counterfactual scenarios of income

[1] In the long term, PIT's nominal tax base can grow for two reasons: inflation and productivity. In this paper, we generally refer to fiscal drag as the effect stemming from both sources, although we will consider indexation scenarios based on both CPI and nominal tax base growth.

[2] Note that fiscal drag could occur in other tax instruments as long as they have a progressive nature and are based on nominal tax parameters. Alternatively, tax instruments that are based on quantities, such as some excise duties, could see a reduction in revenue defined in real terms if the nominally defined tax is not updated.

[3] For an example of explicit use of fiscal drag as a discretionary measure in the U.K., see Waters and Wernham (2022). In the European Union, revenue induced by fiscal drag will be explicitly considered as a discretionary measure under the new fiscal framework.

[4] 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).

growth and tax policies.[5,6] Our results provide detailed and comparable estimates of tax progressivity across Europe in terms of tax-to-base (TTB) elasticities and their potential impact on fiscal drag, including 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 either through indexation measures or through other reforms, so as to provide a data-driven characterization of indexation practices across Europe within a unified modeling framework, as opposed to existing qualitative overviews (e.g., OECD, 2023; Balasundharam et al., 2023).

Two different determinants give rise to fiscal drag effects: 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 degree of updating of tax parameters for a given growth of the tax base determines the actual fiscal drag that occurs *in practice*.

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 tax revenue following a nominal homogeneous 1% increase in the tax base with no change in tax legislation. These elasticities, which are equivalent to the average marginal tax rate divided by the average tax rate, have a direct use in models of fiscal projections as they indicate what would happen to tax revenue in a no-indexation scenario.[7] Across the set of countries studied, two-thirds have tax systems that produce relatively 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. We also find, however, some outlying elasticities as big as 2.4 or as small as 1.1, in line with the characteristics of those tax systems. In general, 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,

[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. For examples of research that leverages EUROMOD, see Dolls et al. (2012), Paulus and Tasseva (2020), Doorley et al. (2021), or Amores et al. (2025).

[6]We follow the methodology of Balladares and García-Miralles (2025), who use administrative tax data for Spain. This allows for a validation of our survey-based results for that country (see Online Appendix C).

[7]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. We focus the first part of the analysis on 2019 so as to maintain consistency between the microdata and the legislation, but we also compute elasticities given the 2023 legislation based on updated data according to observed growth of aggregate income concepts.

tax revenue, and effective average tax rates would grow markedly.

We document, however, substantial heterogeneity in the origins of these elasticities across three dimensions. First, we unpack these elasticities by exploring the underlying mechanisms, as we decompose the contribution to the elasticity that stems from bracket progressivity as well as from each tax deduction or credit present in the tax legislation. We find that on average, around half of fiscal drag is driven by bracket progressivity and half is driven by tax deductions and credits, with the latter often concentrated in just one or two large tax deductions. Second, we further explore the drivers of these elasticities by estimating heterogeneity by income source. We document larger elasticities for labor income and smaller elasticities for capital income and for pensions and benefits (the two latter being often subject to a flatter schedule or to exemptions and large allowances). These elasticities and their heterogeneity by income source can be useful tools for modeling and projecting tax revenues, especially in times when there are large differences in the growth rate of each type of income. Third, we compute TTB elasticities across decile groups of the individual tax base distribution to provide a non-parametric illustration of the heterogeneous elasticities across individuals and their mechanisms. We uncover wide within-country variation, with higher elasticities for the low and middle incomes, which can be as high as 40% for some taxpayers, as these individuals are often more affected by the relative loss of tax deductions or credits that in some cases are very rapidly phased-out as nominal income increases.

We also document how these elasticities would affect the progressivity of the system and income inequality if income grows homogeneously and tax parameters remain unchanged. We find that the tax system becomes less progressive in all countries (tax rates grow more for low-income taxpayers, as illustrated in our distributional 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 the share of low-income zero-tax payers remains broadly unchanged, while tax rates increase for all positive taxpayers, even if they increase less for the top incomes. However, for around a quarter 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 to 2023. To do so, 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 either concurrent HICP, lagged HICP or nominal tax base growth. The difference between these two polar counterfactuals of no-indexation and full-

indexation provides an estimation of the *potential* impact of fiscal drag: 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 it also depends on the potentially heterogeneous income growth observed.

We then calculate the difference between the actual tax collection of 2023 and the full-indexation counterfactual to obtain an estimate of the *actual* impact of fiscal drag during the period. The difference between actual tax collection and the no-indexation scenario then provides an estimate of *offset* fiscal drag. Conveniently, by expressing actual fiscal drag and offset fiscal drag as ratios of the potential fiscal drag we obtain a normalized and comparable measure across countries that can be interpreted as a data-driven characterization of fiscal drag and recent indexation practices.

The first insight from this analysis is that all countries have offset fiscal drag to some extent during the period considered. That is, revenue collection in 2023 has been below that of a no-indexation counterfactual where the 2019 PIT legislation has been kept constant until 2023. This is because all countries have done some form of tax reform that has lowered revenue. However, there is a huge variation in the extent to which fiscal drag has been offset. We document that around one-third of the countries considered have offset less than 80% of the potential fiscal drag, and in some cases, as little as 20% was offset. Another third of countries can be considered to have largely offset fiscal drag, which we define as deviating by less than 20% above or below perfect offsetting. That is, their revenue in 2023 is close to that of a full-indexation scenario where the 2019 PIT legislation was updated according to the average growth of the three indices considered. Finally, the remaining third of countries have overcompensated fiscal drag, meaning that their revenue collection has been significantly lower than that expected under full-indexation. This was mainly due to other reforms, rather than indexation.

The second insight is that the type of policy measures adopted to achieve the different degrees of offsetting has been remarkably heterogeneous between and within the three groups of countries considered. Some countries have relied on indexation measures, by updating nominal parameters broadly in line with income or price growth,[8] while other countries have relied on other forms of PIT reform unrelated to indexation. There are also countries that have implemented a mix of these two. We note that a stricter definition of offsetting policies based only on indexation measures would indicate larger fiscal drag effects during this period.[9]

[8]Note that we classify as indexation measures both statutory indexation that is well defined and occurs more systematically, and discretionary indexation that is implemented ad-hoc, often with less clear guidelines. We further document which countries use each, and find that they are both used with a comparable frequency.

[9]We note that the distinction between these two types of policies, indexation and other reforms, is often

Literature review and our contributions. In line with our conceptual distinction, a first strand of the literature on fiscal drag has focused on studying tax-to-base (TTB) elasticities that measure the effect of tax base growth on tax revenue, such as the pioneering work of Immervoll (2005) and more recent contributions of Price et al. (2015) or Boschi and d'Addona (2019).[10] A second strand now places more emphasis on studying the effects of fiscal drag in practice, as in Paulus et al. (2020), Waters and Wernham (2022) or Moriana-Armendariz (2023) shifting the focus from potential fiscal drag embedded in tax systems to the actual fiscal drag that can prevail despite government actions, whether through indexations or other tax reforms.[11]

A major contribution of this paper is that it provides estimates of fiscal drag based on microdata for 21 European countries, while previous studies that use microdata have been limited to a few countries.[12] We therefore provide micro-based estimates that are novel for many countries and that allow us to extract richer and updated insights from a wider cross-country comparison. The second contribution of our paper is to use two complementary methodological approaches within a consistent and homogeneous framework, providing estimates that map fiscal drag from its origin (the progressivity of each tax system that we capture through TTB elasticities) to its final impact (which involves accounting for policy changes and observed income growth, as well as the estimation of counterfactuals). Our different estimates have implications for policymakers interested in fiscal developments as well as for optimal tax design. Finally, we go beyond other cross-country studies by thoroughly unpacking TTB elasticities across income sources, across the income distribution, and through its mechanisms.[13]

difficult. Furthermore, they can interact with each other and are often adopted jointly by policymakers.

[10]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 parameters. Other works in this spirit include Sutherland et al. (2008), Zhu (2014) and Shahir and Figari (2024).

[11]The focus of this paper is on fiscal drag and personal income taxation, but our analysis relates to the more general concept of tax buoyancy (e.g., Lagravinese et al., 2020; Cornevin et al., 2023) and the related concept of benefit erosion (e.g., Paulus et al., 2020; Leventi et al., 2024). Altig et al. (2024) further consider the impact of fiscal drag on consumption.

[12]For example, Immervoll (2005) studies Germany, the Netherlands and the U.K., Paulus et al. (2020) study Belgium, Bulgaria, Estonia, Greece, Hungary, Italy and the UK and Shahir and Figari (2024) considers Ethiopia, South Africa, Tanzania, Uganda, Mozambique, and Zambia. Related work has considered a large set of countries like us, but to answer a different question: the impact 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 (e.g., Boschi and d'Addona, 2019; Mourre and Princen, 2019; Hayo et al., 2023) or based on calculations for representative households (Price et al., 2015).

[13]Balladares and García-Miralles (2025) do a similar exploration of TTB elasticities in Spain, and Waters and Wernham (2022) explore impacts in nominal terms across decile groups in the U.K. We also add to the analysis of Paulus et al. (2020) by complementing the focus on inequality with a more fiscal view that estimates revenue impacts as well as implications on effective tax rates.

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 two conceptual approaches. 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 (PIT) 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 both between countries and, in some cases, also within them due to both state and regional tax policies. Personal income taxes enable governments to raise revenue and reduce inequalities, as their design is often progressive, with average effective tax rates growing with income. Typically, tax systems include tax rates and brackets, which determine the amount levied based on individual incomes, as well as tax deductions and credits designed to relieve some individuals of fiscal pressure based on their personal characteristics. Given the wide variety of tools and objectives associated with personal income tax, tax systems differ significantly across European countries.

Indexation practices in personal income taxation aim to adjust tax brackets, deductions, and credits to account for inflation, thereby preventing taxpayers from facing higher average tax rates despite no real increase in purchasing power. Some tax systems implement statutory or automatic indexation, linking nominal tax parameters to indicators of price or income growth. Others apply discretionary adjustments, where tax authorities periodically revise tax parameters based on economic conditions or policy decisions. In addition, other types of policy reforms might compensate for the increase in tax revenue due to fiscal drag, even if not formally implemented as indexation policies. It is worth emphasizing that it is often unclear what type of indexation policy is followed by a given country, as these indexation policies can change over time, and different measures are sometimes implemented simultaneously.

We provide in Appendix Table A.1 a qualitative classification of indexation practices during our period of analysis. Between 2019 and 2023, a significant majority of the countries considered (the Euro Area and Hungary) implemented some form of response to fiscal drag through personal income tax (PIT) adjustments. Out of the 21 countries considered, 16 introduced some type of indexation —either statutory or discretionary. Among these, six countries (Austria, Belgium, Germany, France, the Netherlands, and Slovakia) applied statutory indexation, which is defined as automatic or quasi-automatic adjustments embedded

in the tax code. Ten countries (Estonia, Spain, Finland, Ireland, Lithuania, Luxembourg, Latvia, Malta, Portugal, and Slovenia) opted for discretionary indexation measures, often ad hoc and partial in scope. Germany implemented both statutory and discretionary indexation during this period. In contrast, five countries did not adopt any form of indexation during this period: Cyprus, Greece, Croatia, Hungary, and Italy.

In addition to indexation, all countries implemented other PIT reforms that were not primarily aimed at addressing fiscal drag. These are structural or one-off measures such as new deductions, changes in tax brackets, or rate adjustments. These findings suggest that while indexation mechanisms are not uniformly adopted across EU member states, governments frequently resort to alternative reforms —especially in response to exceptional economic conditions like the recent inflation surge. We provide further country-specific details on each country's institutional framework in Online Appendix B. For recent qualitative overviews of indexation practices across countries, see OECD (2023) and Balasundharam et al. (2023).

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. Online Appendix B provides further details on how these concepts map into each country's specific concepts.

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

Tax base: The tax base includes all gross incomes subjected to PIT, before any exemptions, allowances, or deductions are applied.

Taxable income: The taxable income is obtained from the tax base by exempting, partially or fully, some types of income (e.g., pensions or some types of benefits) and subtracting deductions or allowances (e.g., social insurance contributions paid by the employee). The PIT tax schedule is applied to the tax base.

Personal income tax revenue or *tax liability*: Personal income tax revenue refers to the amount effectively collected by the government from the tax base of the taxpayers. While in some countries there is one single personal income tax instrument, in others there is more than one, sometimes as a result of supplementary tax instruments, in which case, we treat them together as long as we consider them economically equivalent.[14]

Tax credits and deductions: are allowances that directly reduce the household's gross tax liability. In some countries, these tax credits can result in a tax refund.

[14]Our decision to group tax instruments is often guided by the modeling structure embedded in EUROMOD itself, which also aims for a definition that allows meaningful comparison across countries.

Social security contributions: 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.[15]

Nominal tax parameters: are monetary amounts defined in the tax legislation that characterize tax deductions and credit amounts and thresholds, as well as tax bracket thresholds, influencing the marginal or average tax rate.

3 Data and the microsimulation tool

Our empirical analysis is based on Eurostat's Survey on Income and Living Conditions (EU-SILC) and uses EUROMOD, a microsimulation tool maintained by the European Commission. In the context of our study, both EU-SILC and EUROMOD have the unique advantage of providing a fully harmonized framework across all EU countries.

While other country-specific microsimulation tools might be able to provide a more detailed modeling of the tax legislation or better coverage of the tails of the distribution, the combination of EUROMOD and EU-SILC data has proven successful at modeling fairly detailed recent policy changes (Amores et al., 2025). Furthermore, we validate our results for Spain with those derived from administrative tax records (see Online Appendix C).

Data. The cross-sectional version of the European Union Survey on Income and Living Conditions (EU-SILC), produced by Eurostat, covers all EU countries and has an annual frequency. The survey collects individual and household-level information on disposable income components such as earnings, social contributions, taxes, pensions, and other social transfers, as well as other socio-demographic information.

All simulations in this paper are based on the EU-SILC 2020 survey, whose income reference period is 2019. Often, these variables and aggregates are defined in nominal terms (e.g., average wage, average pension, statutory minimum wage). For simulations conducted for 2023, we update each of these income variables according to their aggregate growth between 2019 and 2023. These growth rates are calculated for each income source based on the latest available official statistics. As a result of this updating process, individual income growth differs as long as there are individual differences in income composition.

Note that the simulated tax revenue from these simulations might differ from that reported in official statistics in the period 2019 to 2023 for a number of reasons (see Maier and Ricci, 2022). First, total revenue might differ because survey data fail to capture the

[15]EUROMOD already incorporates these types of automatic adjustments, which we preserve and account for when calculating TTB elasticities, as detailed in section 4.1.

very top earners who have a large impact on revenue collection. Second, EUROMOD might induce small biases due to features of the tax code that cannot be modeled given the available information or that are simplified in the calculations. And third, the updating of the 2019 microdata done within EUROMOD is based only on nominal growth of the tax base and therefore fails to incorporate real growth (e.g., number of taxpayers), which can induce a growing divergence with respect to official statistics. We discuss these potential sources of error and how we evaluate their impact and address them in each of the methodological subsections 4.1 and 5.1 of the paper.

Microsimulation tool. EUROMOD is an open-source microsimulation model for the EU developed and maintained by the Joint Research Center of the European Commission (see Sutherland and Figari, 2013; Bornukova et al., 2024). 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 on EU-SILC data. EUROMOD calculates taxes and benefits accounting for their complex interactions, enabling an accurate calculation of individual and household disposable income. We use version I6.0+ of EUROMOD, which incorporates modeling information up to June 2023. In some cases, we have updated or corrected some policies that were modeled only partially or that changed throughout the year. These updates and small divergences from the publicly released model are mentioned for each country in Online Appendix B. Note that EUROMOD does not incorporate behavioral responses to tax-benefit changes, therefore, it is static and delivers so-called "morning-after" effects.

EUROMOD allows us to simulate baseline scenarios under actual legislation and given the income observed in the microdata, as well as the estimation of counterfactual scenarios under changes in the tax-benefit legislation or in the underlying data. We rely heavily on the construction of these counterfactual scenarios to estimate different measures of fiscal drag and its underlying mechanisms, as detailed in our methodology subsections 4.1 and 5.1.

4 Potential fiscal drag as tax-to-base elasticities

4.1 Methodology: estimating TTB elasticities

We aim to characterize the progressivity embedded in each country's PIT systems, which we see as a measure of potential fiscal drag. Our main instrument to measure this progressivity is the estimation of a tax-to-base (TTB) elasticity, which captures the relative change in

PIT revenue following a homogeneous 1% increase in the tax base for all taxpayers across all income sources. Formally, we define the TTB elasticity for each taxpayer as:

$$\frac{\frac{\partial t}{t}}{\frac{\partial y}{y}} = \frac{y}{t} \cdot \frac{\partial t}{\partial y} = \frac{\partial t / \partial y}{t/y} = \frac{MTR}{ATR}, \tag{1}$$

where y denotes tax base, and t represents PIT revenue. Note that the TTB elasticities are equivalent to the ratio of the average marginal tax rate (MTR) and the average tax rate (ATR). In a progressive system, marginal rates are generally higher than average tax rates across the income distribution, giving rise to TTB elasticities that are larger than 1. This over-proportional effect is what we identify as potential fiscal drag and can be seen as an upper bound of fiscal drag in the absence of any indexation or changes in the PIT parameters and under homogeneous income growth. Note also that these elasticities are *static* because they are calculated under a *ceteris paribus* assumption, where all parameters outside the PIT system remain fixed, and there are no behavioral responses. The size of the elasticity, therefore, depends on the design of the PIT legislation (e.g., brackets, deductions, and credits) as well as on the underlying distribution of income and personal characteristics of the taxpayers relevant to the calculation of their tax liability.

We estimate the elasticity by simulating a 1% increase in all sources of income that enter the tax base of all individuals and then calculating the resulting tax liability, keeping the PIT legislation constant, including the value of nominal tax parameters. We then compute the TTB elasticity as the percentage growth in PIT revenue divided by the percentage growth in the tax base, with the latter being 1%.

This very simple approach needs to address a number of methodological choices related to how the PIT system interacts with other tax instruments, benefits, and social security. The choices are often country-specific and require careful consideration of each tax benefit system. We guide our choices by the idea of estimating TTB elasticities that isolate the effect of not indexing PIT parameters while other parameters and features of the tax-benefit systems are allowed to adjust freely in response to the simulated growth of the PIT tax base, in line with each country's standard practice. Two examples of this are the following. First, as a result of increasing labor income, social security contributions (SSCs) paid by the employee also grow, and in many countries, these are tax-deductible in the PIT. We allow this to happen. Furthermore, in cases where there is a minimum or maximum contribution defined as a nominal parameter, we also increase these by 1%, contrary to the PIT parameters. We do this because these are not PIT parameters and because it is a more frequent practice to update these SSC thresholds in line with income growth. Another example is a few countries where PIT includes nominal values of statutory minimum wage or average wage as

parameters, which generally have the effect of reducing TTB elasticities, as they are indexed to income growth. These cases are detailed and discussed in Online Appendix B.

4.1.1 Unpacking TTB elasticities

Mechanisms. An advantage of our microsimulation approach is that it allows for a thorough exploration of the mechanisms that give rise to these elasticities. We decompose TTB elasticities by isolating the effects of the different tax parameters 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 in the income included in the tax base 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 for 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.

Heterogeneity by income source. We also explore the determinants of our TTB elasticities by calculating specific elasticities for the different income sources: labor, self-employment, capital income, and benefits and pensions. We increase each income source separately and calculate the elasticity as the relative change in revenues divided by the relative change in the tax base (with this change in the tax base being solely driven by a 1% increase in the income source of interest).

4.1.2 Distributional Analysis

Elasticities across the individual tax base distribution. We further calculate separate TTB elasticities for each decile group across the individual tax base distribution. This non-parametric approach enables a granular view of how the progressivity of the tax system affects different income levels, revealing the distinct impacts of potential fiscal drag on redistribution and inequality. We further document, for each decile group, the mechanisms driving the elasticities.

Specifically, we calculate the elasticity of each decile group as the ratio of the change in total taxes paid by individuals in that group to the change in their tax base. Note that, as a result of this procedure, we obtain elasticities that are a weighted average of the individual elasticities within each decile group, with weights corresponding to their tax liability. This is consistent with the aggregate elasticity we estimate for all taxpayers (where those with higher tax liabilities have a greater impact on the TTB elasticity) and ensures that the elasticities of each decile group add up to the aggregate elasticity. However, this also means that zero-tax payers, whose elasticity is undefined (a 1% increase in their income leads to no

change in their tax liability), have a null weight and do not impact the estimated elasticity. We present our results together with the distribution of zero-tax payers to provide a more complete and nuanced picture.

Progressivity and inequality. Our microsimulation approach allows for an examination of the potential impact of fiscal drag on redistribution and inequality. We assess inequality by calculating the Gini index, as well as the 90:10 and 80:20 ratios, which compare the income levels of the top 10% and 20% of the distribution, respectively, with the bottom 80% and 90%. 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 the income distribution.

4.2 Results: TTB elasticities across countries, its determinants and heterogeneity

4.2.1 TTB elasticities and their determinants

This section presents our estimated TTB elasticities for all countries considered. Figure 1 graph (a) shows that the estimated TTB elasticities induced by PIT legislation in 2019 range around 1.9, with twelve out of the twenty-one countries ranging from 1.7 to 2. These results suggest that despite the wide variety of tax designs across countries, elasticities tend to converge to these values. We also document, however, some outlying cases with elasticities varying from 1.1 for Hungary to 2.4 for Croatia in line with specific features of their tax system that we discuss below.

When breaking down the TTB elasticities by the mechanisms that give rise to them, we uncover wide heterogeneity across countries. A first and important insight is that while bracket progressivity plays a large role in fiscal drag, the combination of tax deductions and tax credits is of similar importance. Furthermore, among these tax deductions and credits, it is often one or two specific ones that have a meaningful impact on the elasticity, such as the often present family allowance or other types of large tax deductions.[16]

Looking more closely at the variation across countries, in graph (b) of Figure 1, we find that some elasticities are driven almost entirely by bracket progressivity (such as in Austria, Luxembourg, Malta, and Cyprus) whereas others are driven almost entirely by tax deductions and credits (such as Hungary, Estonia, Slovakia and Croatia). In many other countries, the elasticities are driven by these two types of mechanisms with varying intensity.

[16]For a detailed characterization of these types of tax deductions and credits across Europe, see Turrini et al. (2024) and Online Appendix B.

We note that the lowest elasticities correspond to countries with flat tax schedules, where bracket progressivity does not contribute to their TTB elasticity. Countries with the highest elasticities are often influenced by very progressive tax schedules, although Croatia, the country with the highest elasticity, has a flat schedule while displaying the largest elasticity because of a very prominent tax deduction, as explained in Online Appendix B. We report all the estimates that underlie Figure 1 in Appendix Table A.2.

While we focus our detailed analysis of TTB elasticities on 2019 to maintain consistency between the observed microdata and the legislation, we also estimate elasticities based on 2019 microdata updated to 2023, under the assumption of homogeneous growth within each of the different income sources that form the tax base. The comparison and the 2023 values are presented in Appendix Figure A.1 and Appendix Table A.3. We find that the elasticities are generally stable across these years. This suggests that despite the recent inflation spike and reforms of the tax legislation, there have not been major changes affecting the progressivity of the PIT legislation in this period as measured by TTB elasticities, except for a meaningful reduction in the elasticity of Croatia, and increase in Greece, and a few other smaller changes that can be mainly explained by changes in the tax legislation, as described in the relevant cases in Online Appendix B. Note that slight differences in elasticities may also arise due to composition effects from differential growth rates across income sources as we show in the next subsection.

4.2.2 Tax-to-base elasticities by income source

We document significant differences when we calculate the elasticities specific to each income source in some countries, as documented in graph (a) of Figure 2 and in Appendix Table A.2. The elasticity for labor income is close to the overall elasticity by construction, as labor income is the main component of households' overall income, as shown in graph (b). In general, we note that pensions and benefits have lower TTB elasticities in many countries, with nine countries reporting an elasticity close to or lower than one due to exemptions or tax allowances affecting this type of income. Capital income also tends to induce a lower elasticity than labor income across the countries, although to a lesser extent than pension and benefits. This is consistent with the design of PIT in these countries, where capital income is generally subject to less progressive tax brackets or is only subject to a flat tax rate. However, there are a few exceptions where capital income elasticity is higher, either because it is taxed at higher marginal rates (even if these rates are flat) or because it interacts with specific tax deductions and tax credits. Country-specific details are provided in Online

Appendix B.[17]

It is worth noting that these differences in elasticities by income source have important implications for revenue projections if different income sources grow at different paces, as using a single aggregate elasticity may under- or over-estimate revenue forecasts. Our disaggregated elasticities allow for refined projections that could incorporate these differences and reduce forecast error. Note that different elasticities by income source also have implications for the distributional impact of fiscal drag across the individual distribution, as we illustrate next.

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

We report, for each country, the estimated TTB elasticities by decile groups of the tax base distribution as well as their underlying mechanisms in Figure 3 and Appendix Table A.4. This non-parametric display of heterogeneity across decile groups, as opposed to computing single indices of volatility or dispersion, has the advantage of identifying jumps or kinks in the distribution of elasticities, of importance to evaluate the tax design of each country with more granularity. Importantly, Figure 3 also shows the share of zero-tax payers within each decile for each country, whose elasticities are undefined and do not affect the elasticities of each decile group, as explained in subsection 4.1.[18]

Notably, we estimate that elasticities at specific parts of the income distribution can be very large, which suggests large marginal tax rates for those taxpayers. This indicates that fiscal drag would have a large impact in the absence of parameter updating. 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, we pin down the specific features of the tax that drive these inefficiencies, often related to tax deductions and credits. Further details are provided for each country in Online Appendix B, including explanations for some of the extreme values observed that can be as large as a TTB elasticity of almost 40 in Austria.

Despite the large variability in cross-country results, some common trends emerge, which we summarize in Figure 4. Graph (a) shows the difference in the TTB elasticities of the bottom 80% and top 20% and of the bottom 90% and top 10% of the tax base distribution,

[17]Note that the nature of our survey data might be more prone to misreporting of some income sources, such as capital, which warrants more caution in the interpretation of these results.

[18]In more than half of the countries analyzed, over 90% of taxpayers in the first decile group do not pay PIT, indicating that the elasticity calculated for this group is representative of only a small fraction of taxpayers within the decile group. We report in graph (d) of Figure 4 a cross-country overview of zero-tax payers.

showing that the top elasticities are systematically lower. Graph (b) shows the TTB elasticities in the lower and upper halves of the distribution. In all countries studied, elasticities are higher in the lower half of the distribution. These two findings suggest that fiscal drag reduces the progressivity of the PIT, as we explicitly document later. Graph (c) shows the maximum and minimum values of the elasticities across deciles of each country. 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, as their peak elasticity is placed towards the middle of the distribution.

Impact on inequality and progressivity. We begin by examining the effect of fiscal drag on the progressivity of the tax system in our setting of homogeneous income growth and unchanged tax parameters.[19] The impact of fiscal drag on progressivity is theoretically ambiguous, as formally shown in Immervoll (2005).[20] To measure its empirical impact, we compute the Kakwani index, which quantifies the degree of progressivity of the tax system, before and after the 1% increase in incomes. Graph (a) of Figure 5 shows this difference. 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 relates to the distribution of TTB elasticities shown in Figure 3 and Figure 4, as the effective tax rates are increasing less for top income earners than for middle and low ones. This finding generalizes, for a larger set of countries, the empirical findings of Immervoll (2005) for Germany, the Netherlands, and the United Kingdom.

We then study the effect on inequality through two inequality indicators (the Gini index and the Ratio 80:20) calculated for the net-of-tax income before and after the 1% 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 diamond-shaped markers in graph (b) of Figure 5 show these differences, and we observe that they take negative values for around two-thirds of countries, meaning that inequality would be reduced. These results generally hold both for the Gini index (which puts more weight on inequality in the middle part of the distribution) and for the Ratio 80:20 (which puts more weight on the extremes of the distribution). We observe, however, that in the remaining countries, the impact on inequality is more sensitive to the specific measure considered and in some cases shows an increase in inequality.

[19] For reference, Appendix Figure A.2 shows a description of the progressivity of each country's PIT system, measured as the share of tax revenue paid by individuals in the top 20% of the tax-base distribution relative to the share of total tax-base they earned.

[20] Immervoll (2005) shows that the erosion of tax credits unequivocally reduces progressivity, while the effects of eroded deductions and bracket thresholds are theoretically ambiguous.

It should be noted that income growth per se already impacts inequality (either based on gross incomes or 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% increase in incomes.[21] To filter out the effect of income growth from that of fiscal drag on inequality, we compute an alternative measure: the percentage change in a given inequality indicator (Gini or Ratio 80:20) between gross income and net income, both in the scenario 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 because of fiscal drag. The round-shaped markers in graph (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 before.

Overall, our results indicate that fiscal drag tends to reduce inequality in most, though not all, countries, and that this finding is robust to alternative measures. We find that tax-to-base elasticities are generally larger for low- and middle-income individuals, implying a reduction in progressivity. Yet inequality still falls, because the tax liability of very low-income individuals remains zero even as their incomes rise, and this effect more than offsets the decline in progressivity. It is worth emphasizing that the inequality-reduction effect of fiscal drag is a common result in the literature (e.g., Immervoll, 2005; Paulus et al., 2020). However, our results show that this is not a universal result, as a non-negligible proportion of the countries we analyze display an increase in inequality.[22]

5 Fiscal drag in practice through counterfactual microsimulations

In this section, we turn to our assessment of fiscal drag "in practice" over the period 2019–2023, by incorporating observed 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 other changes in the design of the tax. As in the previous section, we use a microsimulation approach to estimate aggregate PIT revenue over this period, as well as to construct counterfactual scenarios of full and no indexation that allow us to quantify the potential revenue collected from fiscal drag in 2023 and how

[21] 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.

[22] Our results add to the work of Zhu (2014), who documents nonlinearities in bracket-creep effects in Germany for different levels of income growth. We show that even for a constant and small growth rate, there are differences across countries in the impact on inequality.

much of it was effectively offset by policy measures. Our methodology follows closely that of Balladares and García-Miralles (2025).

5.1 Methodology: defining counterfactual scenarios

The first step of the analysis consists of estimating baseline scenarios for each of the years of interest, based on the actual PIT legislation of those years. The estimation of the baseline year 2019 is the same as in the previous section and also relies on 2019 microdata. For the following years up to 2023, which is the focal year for this analysis, we incorporate the corresponding legislation and we update the 2019 microdata using disaggregated growth rates for the different components that form the tax base, such as average wage growth, pension growth, or growth in capital income, and which vary by country.

Note that, as a result of our updating procedure, there is heterogeneous income growth across individuals due to the different sources and composition of their income, but we lack information on individual heterogeneity within each of these income sources. This is, however, a relatively small limitation for the aggregate results that are presented in this section, since these are mainly driven by the top earners, who in turn drive the aggregate growth rates we use.

Note also that the simulated tax revenue from these baselines might differ from that reported in official statistics in the period 2019 to 2023 for several reasons (as discussed in section 3), which we attempt to correct by rescaling our estimates. Specifically, we rescale our baseline and counterfactual simulations according to the ratio between the simulated tax revenues and the official ones for each year of analysis.[23]

In a second step, we estimate different counterfactual scenarios in 2023 under alternative legislation that allows us to estimate the revenue collected as a result of fiscal drag, as well as the effect of policy measures in offsetting it. We further distinguish between indexation policies and other policies that also affected PIT revenue during this period, as detailed below.

We estimate five different counterfactuals in 2023, as well as the 2023 baseline, as summarized in Table 1. In Scenario (1), the 2023 baseline is simulated by updating the 2019 microdata to 2023 and applying the 2023 legislation. Scenario (2) updates the data to 2023 but keeps the tax system of 2019 unchanged with PIT parameters maintained at their 2019 values. Scenarios (3), (4), and (5) also update the data to 2023 but apply the 2019 legislation with PIT parameters fully indexed according to one of three alternative indices: tax base growth in Scenario (3), lagged HICP in Scenario (4), or concurrent HICP in Scenario

[23] We illustrate in subsection 5.2 the size of this divergence for each country.

(5). Finally, Scenario (6) considers the baseline 2023, as in (1), but without the indexation measures that were actually implemented over the period, reverting those PIT parameters back to their 2019 values. This scenario helps to disentangle the effects of indexation reforms from those of other reforms that affected PIT revenue.

Table 1: Counterfactual scenarios for year 2023

	2023 Baseline	No indexation	Full-indexation			2023 without indexation
	(1)	(2)	(3)	(4)	(5)	(6)
Indexation practice	–	None	Tax-base growth	lagged HICP	concurrent HICP	–
PIT legislation	2023	2019	2019			2023
Nominal PIT parameters	2023	2019	2019, indexed			2019

Notes: This table summarizes the alternative simulations we run for the year 2023. Column (1) shows our baseline simulation that aims to replicate observed tax collection for that year. Columns (2) to (6) show different counterfactual scenarios we consider for the year 2023 under different indexation practices and different PIT legislation. All simulations are based on the same microdata (EU-SILC 2020) updated to incomes of 2023.

We define **potential fiscal drag** as the difference in PIT revenue collected in the two polar scenarios of no indexation (2) and full indexation (3), (4) or (5) or the average of these three full-indexation scenarios. The potential fiscal drag is a measure of the additional revenue that would have been collected in 2023 if the tax legislation remained unchanged since 2019, compared to a fully indexed scenario. We define **actual fiscal drag** as the difference between the actual PIT revenue collected in 2023, corresponding to scenario (1), and the PIT revenue collected in (2), (3), (4), or the average of these three. We then define the **offset fiscal drag** as the difference between the PIT revenue collected under the no indexation scenario (2) and the actual PIT revenue collected of scenario (1). This is equivalent to the potential fiscal drag minus the actual fiscal drag.

Importantly, we can compute ratios of actual and offset fiscal drag relative to the potential fiscal drag. This allows comparisons across countries that abstract from the magnitude of potential fiscal drag (which is closely linked to the progressivity of each country's tax system) and focus on the impact of government action through tax reforms and indexation. Specifically, we define:

$$\text{Offset Fiscal Drag Ratio} = \frac{\text{offset fiscal drag}}{\text{potential fiscal drag}} = \frac{(2)-(1)}{(2)-(3\,\text{or}\,4\,\text{or}\,5)} \tag{2}$$

This ratio provides us with a data-driven characterization of fiscal drag offsetting practices

for a given period and can be used for meaningful cross-country comparisons, as we will show in the subsection 5.2.

Finally, we decompose each offset fiscal drag ratio by whether it is driven by indexation or other tax reforms. For this calculation, we use use the PIT revenue collected under scenario (6), where the tax legislation of 2023 is revised to revert indexation policies (but not other reforms) back to their 2019 levels. We do not further distinguish between statutory and discretionary indexation measures in this decomposition, given that virtually all countries have followed either one or the other over the period studied, as we document in Appendix Table A.1.

5.2 Results: actual and offset fiscal drag across countries

This section presents the results of our assessment of fiscal drag in practice over 2019-2023 across all 21 countries considered. We begin by displaying detailed results of the evolution of PIT revenue between 2019 and 2023, as well as the revenue in 2023 under each counterfactual scenario considered. We first focus on the four largest countries studied (Germany, Spain, France, and Italy), reported in Figure 6 and show the results for all other countries in Appendix Figure A.3. Underlying numbers to these figures are reported in Appendix Table A.5. We then show a cross-country overview of our results for all 21 countries by reporting all 2023 results for each country in Figures 7 and 8. A more detailed discussion of each country's institutional context and results is presented in Online Appendix B.

Each graph of Figure 6 displays, for a given country, the revenue collected yearly between 2019 and 2023 according to official aggregates and according to our baseline and counterfactual simulations. The gray markers correspond to our baseline EUROMOD simulations, the dashed line shows the official aggregates, and the black markers correspond to our baseline EUROMOD simulations rescaled to match the official aggregates in 2019 and 2023. We use the same 2023 rescaling factor for all counterfactuals estimated in 2023. The five counterfactuals estimated for 2023 under different indexation policies correspond to those explained in the previous methodology section: the red marker simulates revenue collection in scenario (2) without indexation, that is, tax revenue in 2023 if the 2019 legislation was kept without any indexation or reform. The green, yellow, and blue markers correspond to scenarios (3) to (5), which estimate the revenue collection in 2023 if the 2019 legislation was kept with fully indexed parameters, according to the growth rate of the nominal tax base, the lagged HICP index, or the concurrent HICP index. Finally, the flat gray marker corresponds to simulation (6), which estimates the revenue collection of 2023 for the 2023 legislation if indexation measures that have taken place since 2019 were reverted. This allows us to decompose the

effect of indexation measures from other reforms on 2023 revenue.

Focusing on each country's results, we observe that for the case of Germany, PIT revenue in 2023 has not only been lower than the no-indexation counterfactual but even lower than any of the three full-indexation counterfactuals. This indicates that meaningful reforms have occurred between 2019 and 2023 that overcompensated for potential fiscal drag. Our analysis suggests that more than half of the decrease in revenue with respect to the no-indexation counterfactual is due to indexation policies, while the remaining is due to other reforms. For the case of Spain, observed tax collection has been only slightly lower than the no-indexation counterfactual, suggesting a large fiscal drag effect. Indeed, we observe that tax collection is significantly higher than any of the three full-indexation counterfactuals. We further document that the partial offset of fiscal drag in Spain has been driven by indexation policies. In France, we show that fiscal drag has been entirely compensated, with results ranging slightly depending on the full-indexation counterfactual considered. This complete offsetting, however, has been mainly driven by policies other than indexation measures. Finally, in Italy, as in Spain, fiscal drag has only been partially offset, but in this case, the offsetting has been driven by other policies, rather than by indexation. We note that in the case of Italy, the index used for the counterfactual of full-indexation has a very large impact, as the growth rate of HICP was much higher than that of nominal tax base growth.[24]

Looking at all 21 countries, Figure 7 reports all 2023 estimates as in Figure 6, but reports PIT revenue as a ratio over GDP, and normalizes all counterfactual estimations with respect to the observed ratio of PIT to GDP in 2023. Therefore, the observed PIT/GDP ratio is set to zero, and the different counterfactuals show deviations with respect to it. The numbers that underlie Figure 7 are reported in Appendix Table A.6.

The first takeaway from graph (a) is that all countries have offset potential fiscal drag at least to some extent. This can be seen because the no-indexation counterfactual (red marker) is above zero in all countries, indicating that observed tax collection has been lower than if the 2019 legislation had been kept constant without any indexation.

However, when looking at the full-indexation counterfactuals (green, yellow, and blue markers), we observe clear differences in the extent to which fiscal drag has been offset. In some cases, the offsetting has only been partial, corresponding to those countries where the full-indexation counterfactuals are below zero. This means that keeping the 2019 legislation

[24]Note that our paper focuses on the fiscal drag effect induced by incomplete updating of PIT parameters. Extending the analysis to other taxes and benefits goes beyond our focus. However, we note that governments can counteract fiscal drag effects through other policy reforms. For example in Italy, the government implemented significant cuts to Social Security Contributions rates to reduce the tax burden for dependent employees during a period of high inflation, which counteracted the increase in PIT revenue due to incomplete offset of fiscal drag. Online Appendix B shows these results for Italy.

fully indexed to one of the three indices considered would have led to lower tax collection. For example, countries such as Spain, Italy, or the Netherlands stand out for the size of the tax collection that was due to fiscal drag, which varies depending on the indexation reference considered but ranges around 0.5% of GDP. Other groups of countries have largely offset fiscal drag, as their observed tax collection is around the same level as the full-indexation counterfactuals. These include countries such as Finland, Ireland, France, Portugal, and Greece. Finally, there is a third group of countries where observed tax collection is smaller than the counterfactuals of full-indexation, indicating that reforms have led to an overcompensation of fiscal drag, either because indexation has been paired with other reforms that reduced tax collection or because indexation has been overdone. Countries where this overcompensation is more sizable include Latvia and Slovakia (by more than 0.5% of GDP) and Slovenia, Croatia, and Germany to a lesser extent. Again, these results show some variation depending on the specific index used for the counterfactuals of full-indexation. Generally speaking, indexation counterfactuals based on concurrent HICP lead to the lowest tax collection in most countries, as the growth rate of this index between 2019 and 2023 was higher than that of lagged HICP or nominal tax base growth. See Appendix Table A.7 for a summary of the growth rates used for each counterfactual.

While graph (a) of Figure 7 is informative of the absolute impact of fiscal drag on revenue collection as share of GDP, the results are determined by the interaction of different elements: the TTB elasticity of each country (that is, the level of progressivity of their tax legislation, which, in turn, determines the potential fiscal drag), the growth rate of the different sources of income that form the tax base, and the government actions adopted over the period. To isolate the effect of government action over the period in a way that allows a more meaningful comparison across countries, we show in graph (b) the results in relative terms with respect to each country's potential fiscal drag, which is normalized to 100. Remember that we define potential fiscal drag in subsection 5.1 as the difference between revenue under no indexation and revenue under full indexation. Because we consider three different counterfactuals of full indexation, for this graph, we compute the average of these three counterfactuals. Appendix Figure A.4 shows the results based on each of the three counterfactuals separately.

The black markers in graph (b) of Figure 7 then represent the amount of fiscal drag that has been offset relative to the potential fiscal drag, as defined in equation 2. Values at 100, therefore, indicate that fiscal drag has been fully offset, while values at zero mean a total lack of offsetting. The most striking result is the wide heterogeneity in the degree of offsetting, in line with the results anticipated in graph (a). We observe that in 8 out of the 21 countries considered, fiscal drag has been offset by less than 80% of its potential effect. The countries where fiscal drag has been offset the least are Cyprus, Spain, Malta,

and Italy (with less than 50% offset), followed by Estonia, the Netherlands, Belgium, and Hungary (with less than 80% offset).[25] A second group of countries has offset fiscal drag, with deviations below 20% with respect to full offsetting. These include Finland and Ireland, just below full offset, and France, Portugal, and Greece, just above. Finally, a large number of countries have overcompensated fiscal drag, meaning that revenue has been lower than in the full-indexation counterfactual. These include Luxembourg, Lithuania, Austria, Germany, Hungary, Croatia, Slovenia, Slovakia, and Latvia.

Graph (b) further decomposes the type of policies that have been implemented and which drive the different degrees of offsetting of fiscal drag. We distinguish between indexation policies (increasing nominal parameters broadly in line with price or income growth) and other reforms that affect PIT. We find large heterogeneity along these offsetting mechanisms, even within countries with similar levels of overall offset. We observe that among countries that only partially offset fiscal drag, this is sometimes done through indexation measures (e.g., in Spain or the Netherlands) and sometimes through other measures (e.g., in Cyprus, Malta, or Italy), while others display a mix (e.g., Estonia). The same can be seen for countries that largely offset fiscal drag (driven by indexation measures in Finland and Ireland and by other measures in France, Portugal, and Greece). Finally, we observe that among countries that overcompensate for fiscal drag, it is often the case that other policies are either driving the result or adding up to indexation policies to reach the overcompensation. There are exceptions, however, as Lithuania overcompensated for fiscal drag mainly through indexation. Appendix Figure A.5 shows the relative weight of each of these two types of offsetting mechanisms to the overall degree of offsetting in each country.

At this point, it is worth emphasizing again that the consideration of 'other reforms' as offsetting policies (in addition to indexation measures) is not obvious, which is why we report them separately. Still, we tend to consider both types as offset mechanisms for the following three reasons. First, the classification of a given measure between these two types of policies is sometimes very unclear. Second, the two types of policies interact with each other and are sometimes implemented as part of a joint reform. Third, policymakers are aware of fiscal drag effects and can decide to offset them through policies that are not articulated as indexation but pursue the same goal.[26] Nevertheless, we stress that in our analysis for the period 2019–2023 more than half of the offsetting of fiscal drag has been driven by policies

[25]Here we emphasize again that the specific index used for the counterfactuals can affect the results. In the case of Belgium, for example, the counterfactual based on lagged HICP (which is very close to the index effectively used in Belgium) implies almost full offsetting.

[26]Appendix Table A.1 shows a qualitative assessment of the type of policies implemented in each country during the period, further distinguishing between statutory and discretionary indexation. In addition, Online Appendix B offers more details for each country considered and the types of policies that have taken place over this period.

that we do not classify as indexation. In the absence of these other policies, fiscal drag effects would have been much larger, pointing to a very limited effect of standard indexation practices.

Our final set of results explores the average effective tax rates in 2023 under our baseline and counterfactual estimations. Graph (a) of Figure 8 illustrates that the same results we document for PIT revenue carry over to the computation of tax rates. Indeed, we see that all countries have kept their average effective tax rates below those resulting from the no-indexation counterfactual, which could have led to effective rates up to 2.5 percentage points higher. We also document that countries where fiscal drag was not fully offset also experienced increases in their average effective tax rates with respect to full-indexation counterfactuals. In graph (b) of Figure 8, we further investigate the evolution of average effective tax rates, as we plot 2023 results relative to their 2019 observed value. The results resemble those shown in graph (b) of Figure 7, as we observe stark heterogeneity in the average effective tax rate of 2023 with respect to 2019. Countries where fiscal drag has been more prevalent display a larger increase in the effective tax rate observed in 2023, which was around 1 percentage point higher in Belgium, Estonia, Cyprus, and Spain. On the contrary, countries that overcompensated for fiscal drag have lower effective tax rates in 2023 by around 0.5–1 (e.g., Germany, Latvia, Slovakia, and Austria).

It is also reassuring to see that for every country, the average effective tax rate for the full-indexation counterfactual based on nominal tax base growth, returns an average effective tax rate that almost coincides with that observed in 2019. This is consistent with the idea that keeping the legislation constant over time and updating parameters according to the same rate as the growth of the nominal tax base achieves close to full offsetting of fiscal drag and keeps the effective tax rate constant. We observe as well that indexation based on other indices does not ensure that tax rates stay the same over the period considered, as they can lead to rates that are up to 1 or 1.5 percentage points higher or lower than those of 2019. In most cases, however, differences are below 0.5 percentage points.

6 Conclusion

This paper provides a comprehensive characterization of fiscal drag in Europe using microsimulation. By measuring the progressivity embedded in each tax system through tax-to-base elasticities, we find that many countries' tax systems induce elasticities of around 1.7–2.1, suggesting a significant potential for fiscal drag effects to occur if tax parameters are not updated in line with income growth. We uncover substantial heterogeneity in these elasticities across mechanisms, income sources, and the individual income distribution. These

elasticities have direct implications for revenue collection and inequality.

Extending the analysis beyond these elasticities to estimate fiscal drag in practice over the recent period, we provide a data-driven characterization of fiscal drag and indexation practices in Europe. Our findings reveal large differences ranging from partial compensation to overcompensation of fiscal drag, with significant heterogeneity in the type of policies that have offset it. These variations have a meaningful impact on revenue and effective tax rates, underscoring the importance of fiscal drag for public finances.

These results contribute to a more comprehensive knowledge of PIT systems in Europe, providing relevant information on issues such as their progressivity, the distributional impacts of inflation through its interaction with the tax system, and the potential stabilization properties of PIT systems. Our results also have important implications for ongoing policy debates on the indexation of PIT systems and can provide relevant information on tax elasticities for projection exercises.

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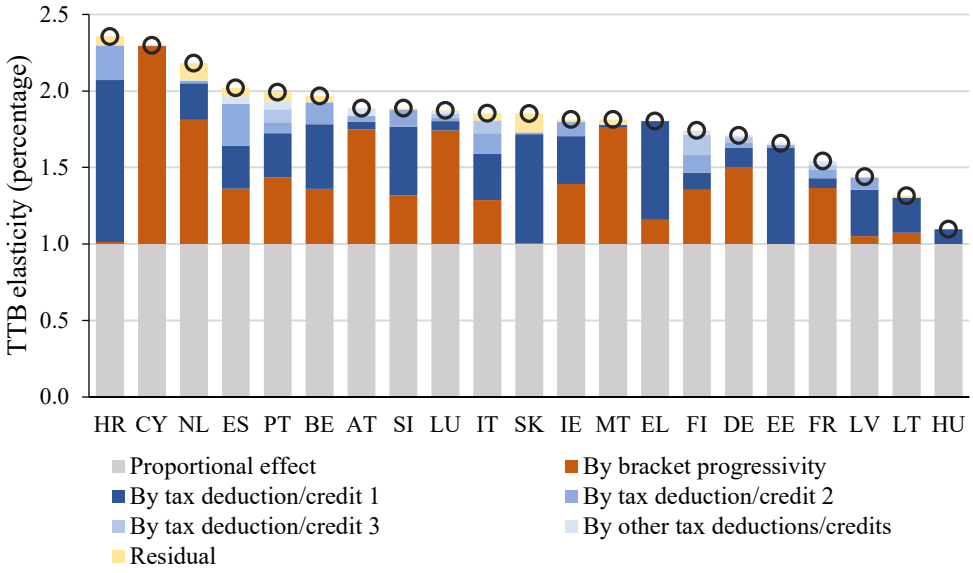
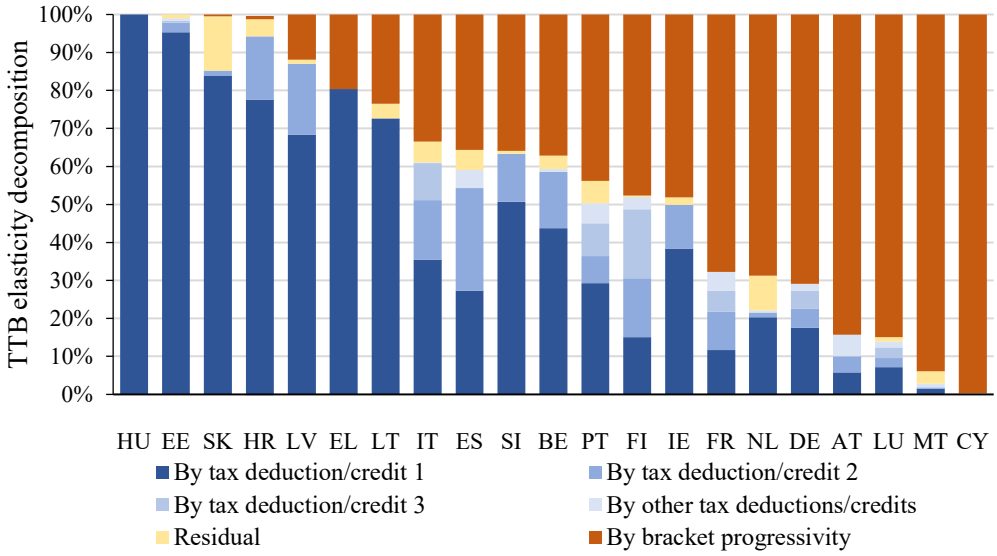
Figure 1: Cross-country comparison of 2019 tax-to-base elasticities and their mechanisms

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



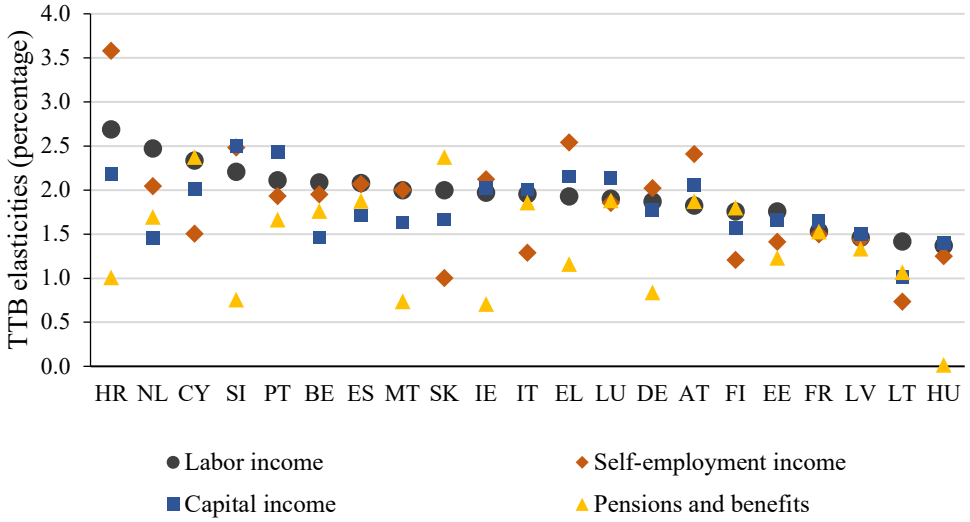
(b) Weight of each mechanism



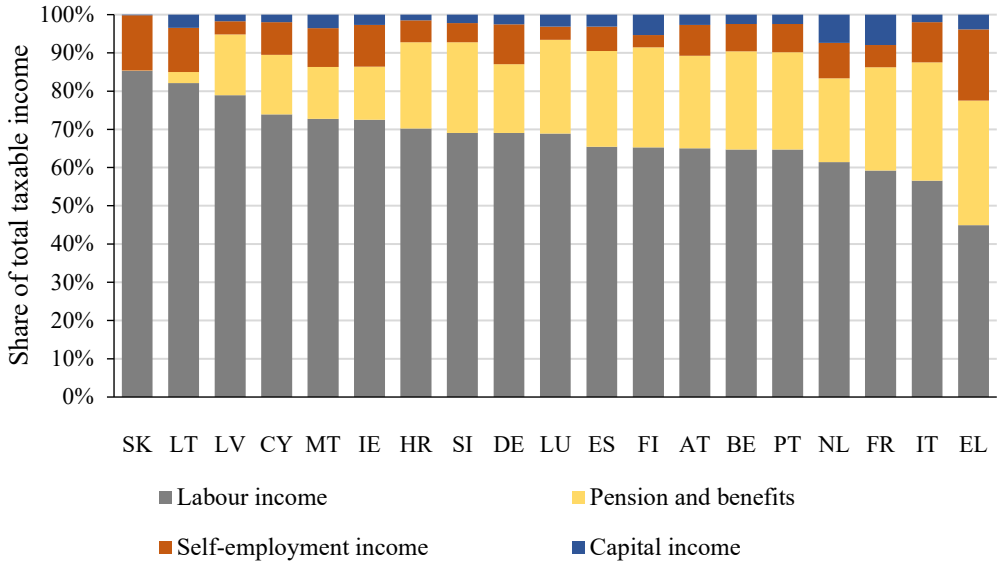
Notes: These graphs present a cross-country comparison of tax-to-base (TTB) elasticities and their underlying mechanisms. Graph (a) shows the estimated elasticity by country and its mechanisms. The elasticities are calculated by estimating the increase in tax revenue following a 1% increase in the tax base of each individual. Graph (b) shows the decomposition of the portion of the elasticity that is above one, normalizing its size to 100. This allows comparing the relative contribution of each mechanism across countries, independent of the size of the elasticity.

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

(a) Tax-to-base elasticities



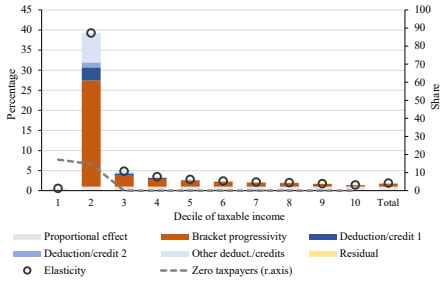
(b) Share of each income source



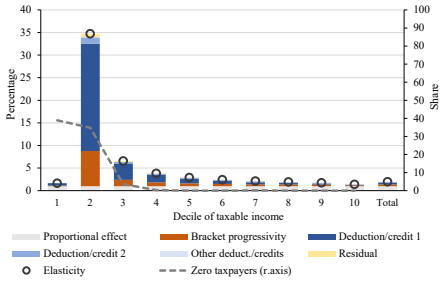
Notes: Graph (a) represents a cross-country comparison of 2019 tax-to-base elasticities by source of income: labor, pensions and benefits, self-employment, and capital income. Each elasticity is computed as the percentage growth in personal income tax revenue following a simulated 1% growth in each of the specific income sources, divided by the percentage growth in the overall tax base. Graph (b) shows the share of each income source in the total tax base.

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

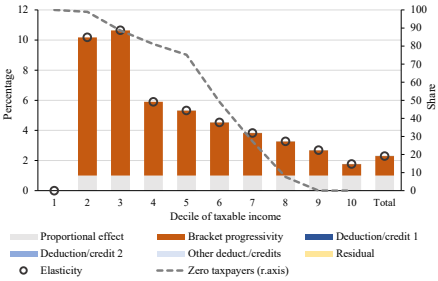
(a) Austria (AT)



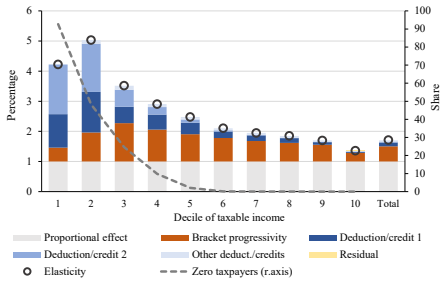
(b) Belgium (BE)



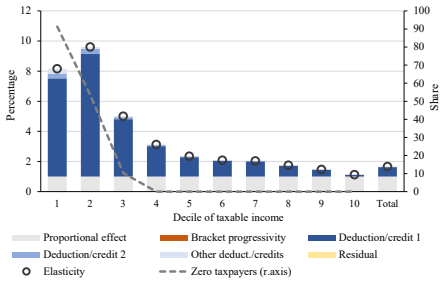
(c) Cyprus (CY)



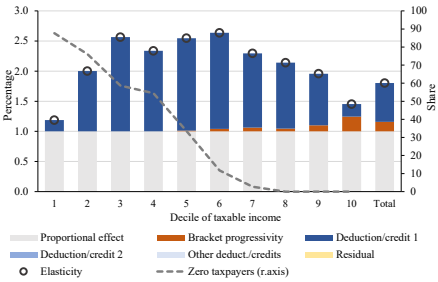
(d) Germany (DE)



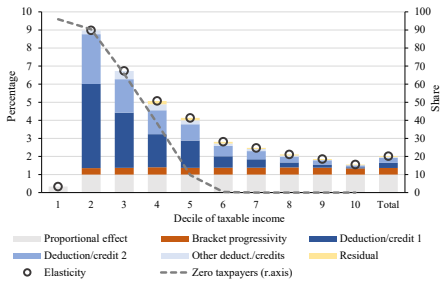
(e) Estonia (EE)



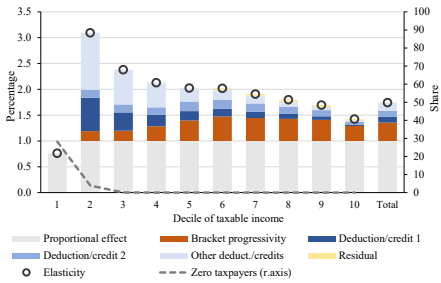
(f) Greece (EL)



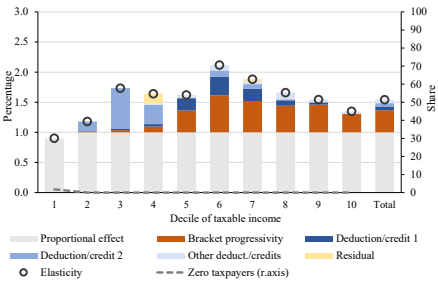
(g) Spain (ES)



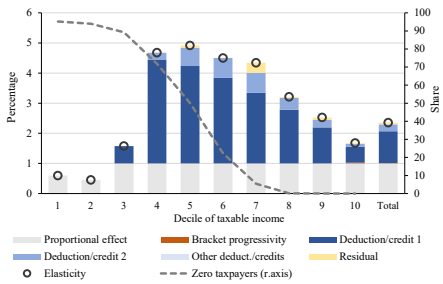
(h) Finland (FI)



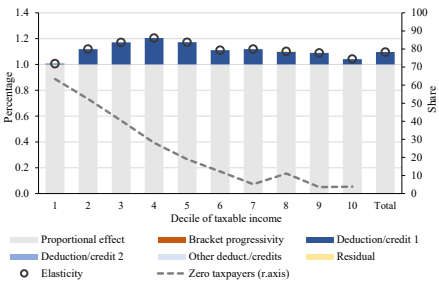
(i) France (FR)



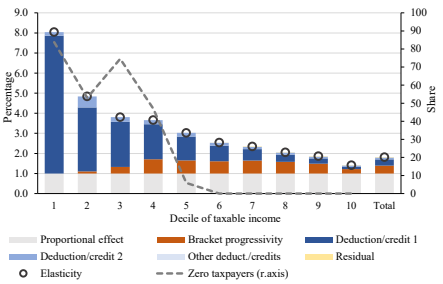
(j) Croatia (HR)



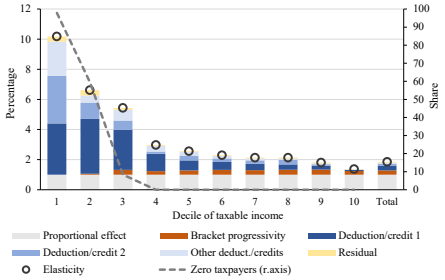
(k) Hungary (HU)



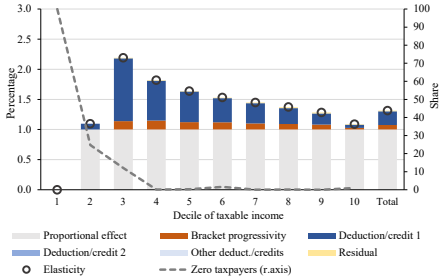
(l) Ireland (IE)



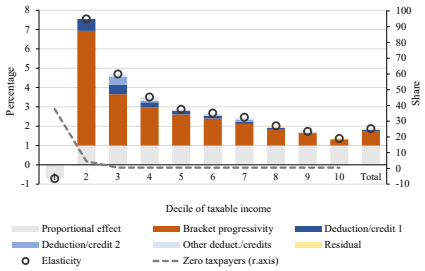
(m) Italy (IT)



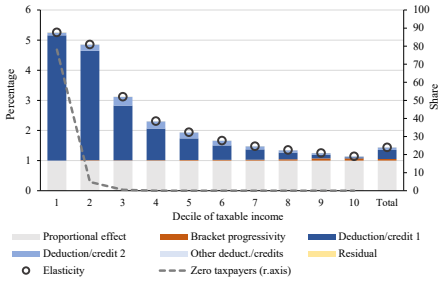
(n) Lithuania (LT)



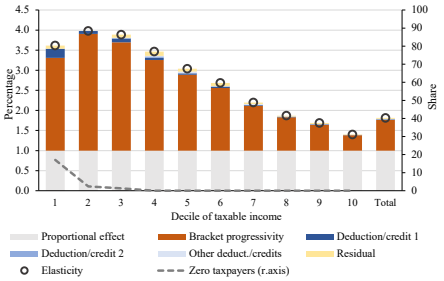
(o) Luxembourg (LU)



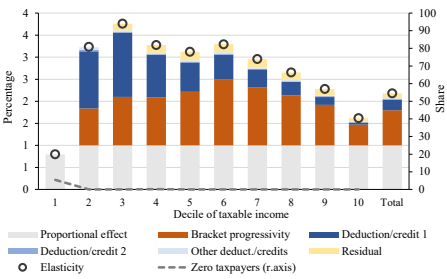
(p) Latvia (LV)



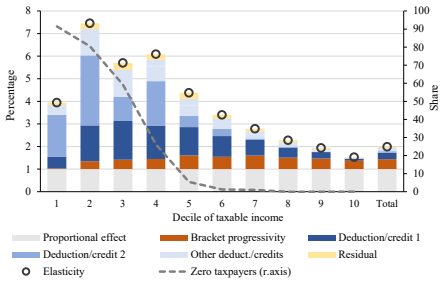
(q) Malta (MT)



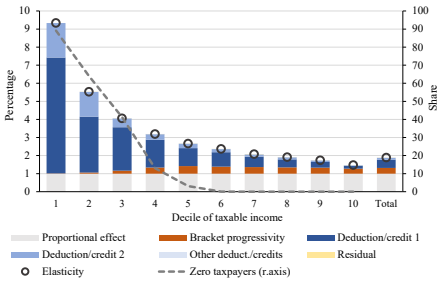
(r) Netherlands (NL)



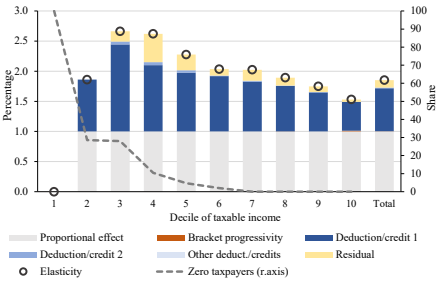
(s) Portugal (PT)



(t) Slovenia (SI)



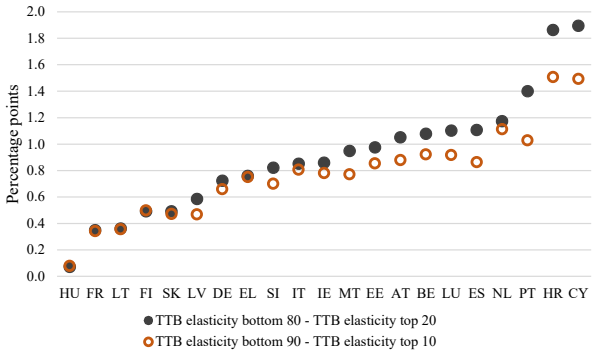
(u) Slovakia (SK)



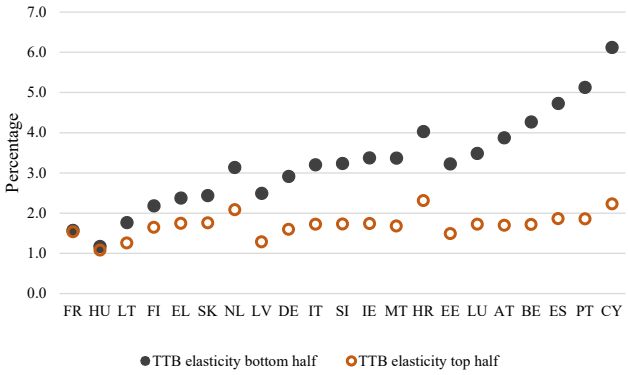
Notes: Each of these graphs shows the distribution of tax-to-base elasticities across the individual distribution of taxable income by decile groups. Each elasticity is broken down by its underlying mechanisms. Each graph also shows the share of individuals with zero tax liability. These individuals have an undefined tax-to-base elasticity (a 1% increase in their income leads to no change in their tax liability) that does not impact the elasticity of their decile group nor the aggregate elasticity. Country-specific details are provided in Online Appendix B.

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

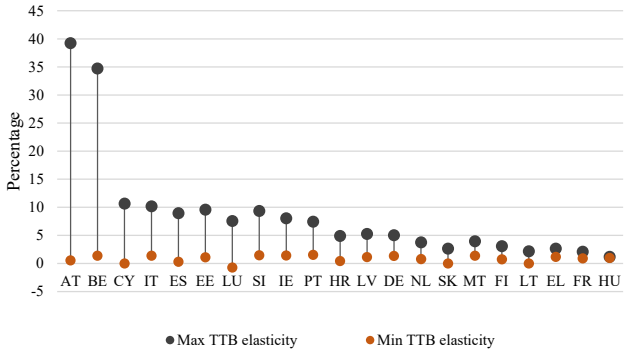
(a) Bottom to top elasticities (80:20 and 90:10)



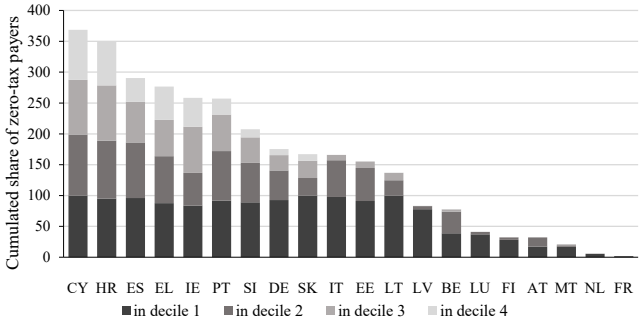
(b) Bottom and top half elasticities



(c) Maximum and Minimum TTB elasticity



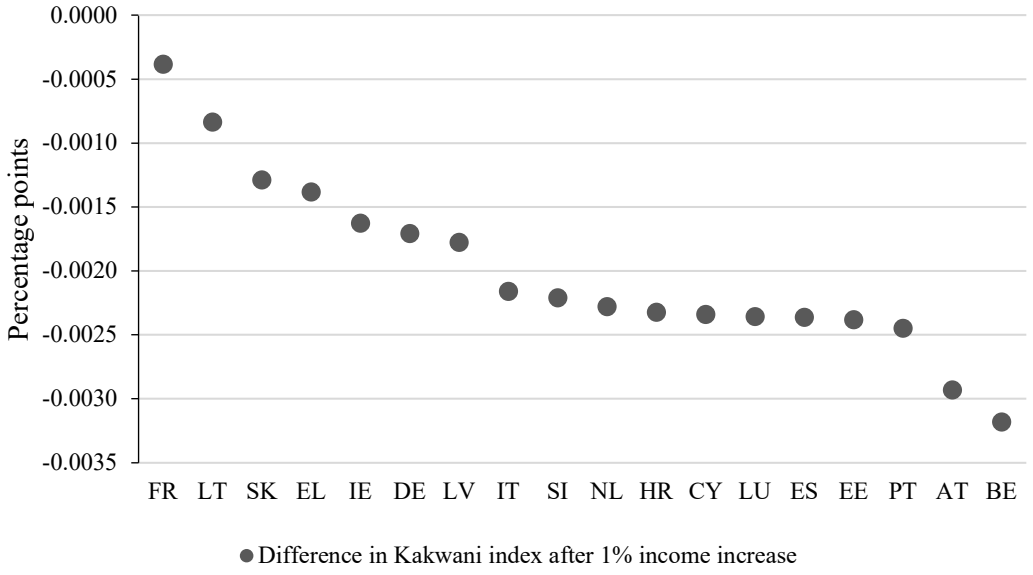
(d) Cumulated share of zero taxpayers



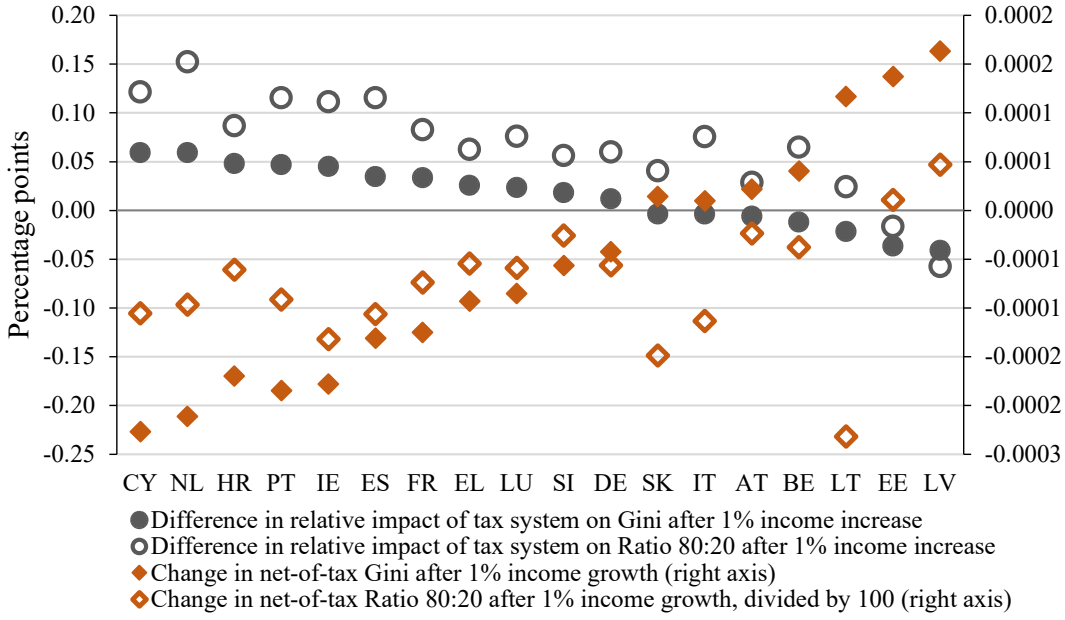
Notes: Graph (a) shows the differences between the weighted tax-to-base elasticity of the top 20 percent (respectively 10 percent) of individuals according to their taxable base, and the weighted tax-to-base elasticity of the bottom 80 percent (respectively 90 percent). Each weighted elasticity is computed 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. Graph (b) shows the same weighted averages of the tax-to-base elasticity for the top and bottom half of the distribution. Graph (c) shows the dispersion in elasticities by plotting the highest and the lowest elasticity across decile groups. Graph (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: Inequality and progressivity

(a) Impact on progressivity

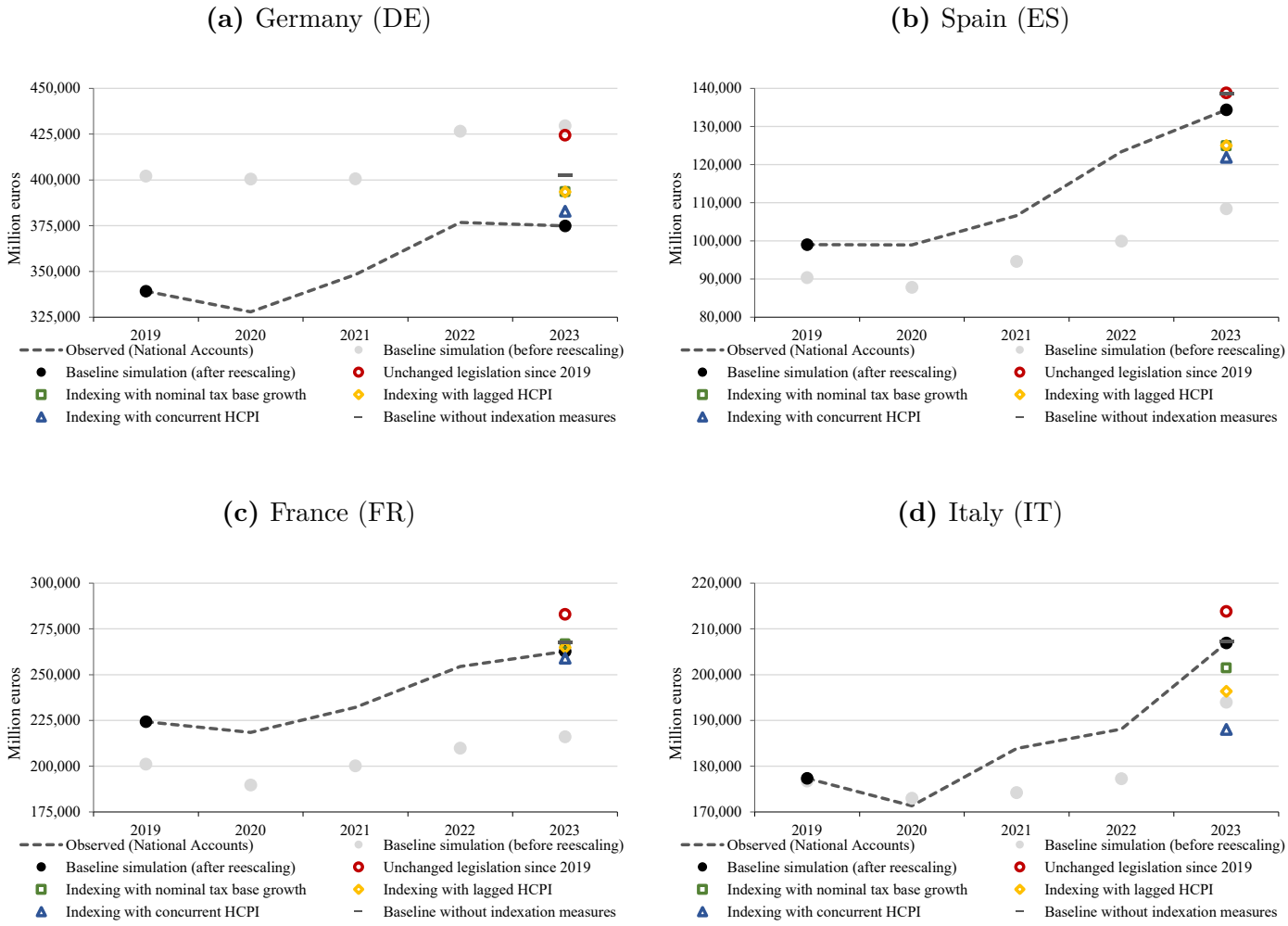


(b) Impact on inequality



Notes: This figure shows the impact of fiscal drag on progressivity and on inequality in a setting where incomes grow homogeneously by 1%. Graph (a) 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. Graph (b) shows the effect on inequality through the lenses of four different metrics. The diamond-shaped markers show the change in a given inequality indicator (either Gini or Ratio 80:20) for net-of-tax incomes after income growth. Therefore, negative values indicate that inequality is reduced. The circle-shaped markers show the difference in the 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.

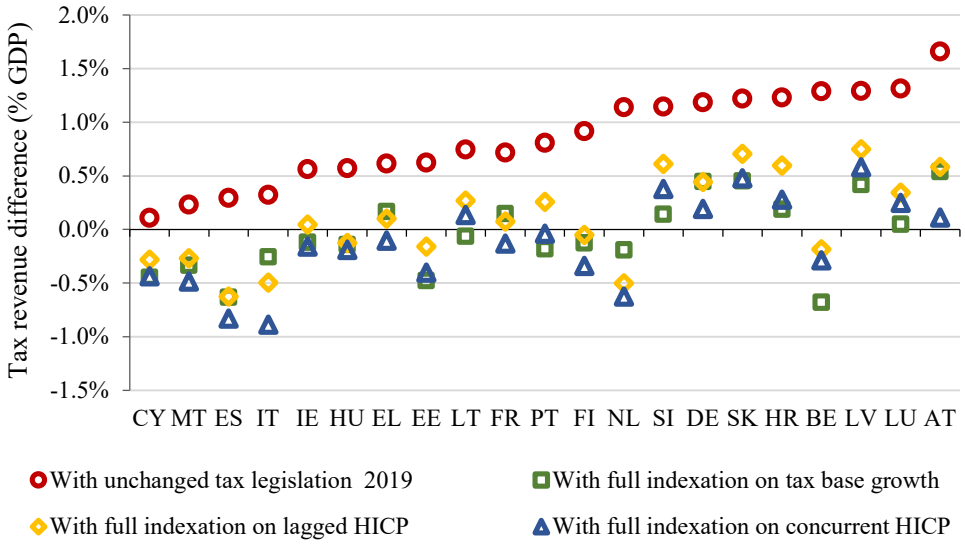
Figure 6: Tax revenue evolution from 2019 to 2023 and counterfactual simulations for 2023



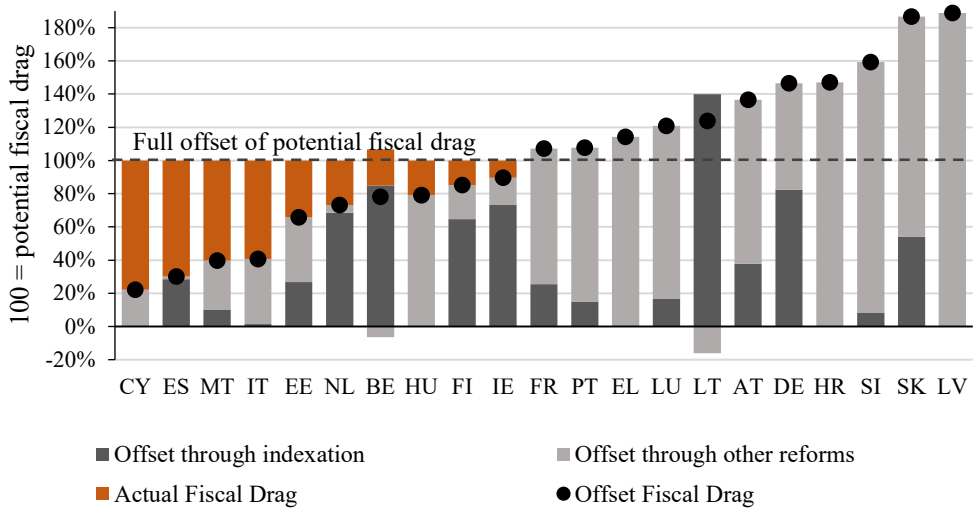
Notes: Results for all other countries are shown in Appendix Figure A.3. Each of these graphs shows, for a given country, the observed evolution of PIT revenue over time (dotted line), our baseline simulations for each key year (black markers), and different counterfactual simulations under alternative indexation policies (colored hollow markers). The flat gray marker corresponds to the 2023 baseline legislation with indexation measures reversed back to 2019. Note that all baseline and counterfactual simulations are rescaled to correct for the observed gap between the baseline simulation and the observed amount. Underlying data is reported in Appendix Table A.5.

Figure 7: Fiscal Drag in 2023 based on alternative indexation counterfactuals for the period 2019–2023

(a) Revenue counterfactuals with respect to observed revenue



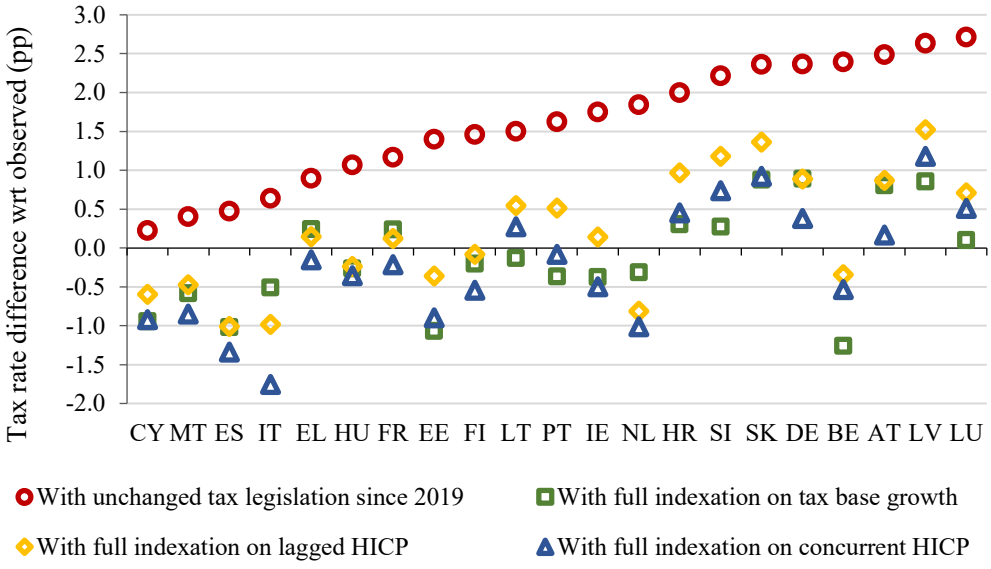
(b) Relative impact and decomposition



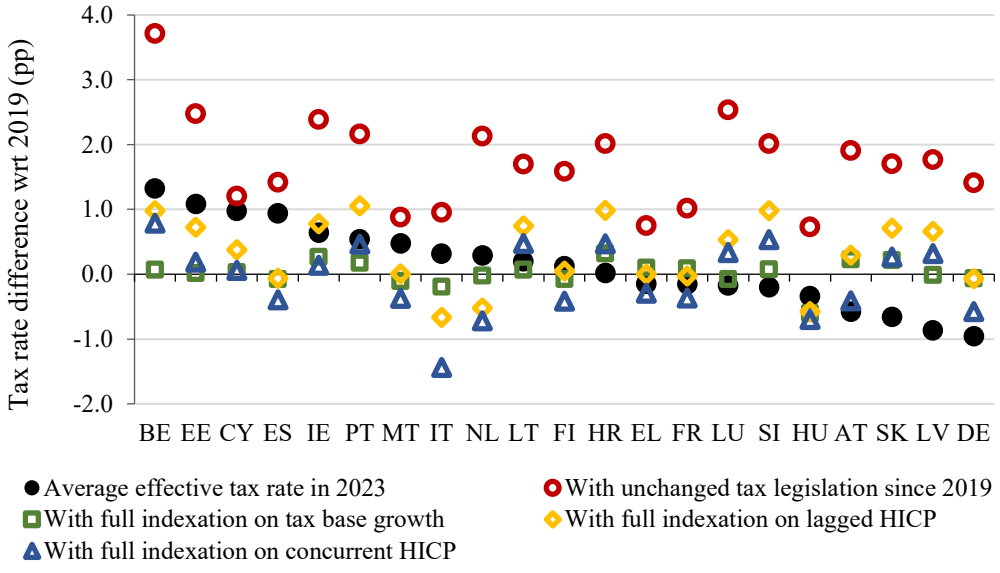
Notes: This figure illustrates the impact of fiscal drag in 2023 across countries and the extent to which it was offset through indexation or other reforms during the period 2019–2023. Graph (a) shows the results of alternative simulations for 2023 under different indexation counterfactuals. Results are expressed in terms of PIT revenue over GDP, normalized by the size of observed PIT revenue to GDP in 2023. Graph (b) expresses the results normalized by the estimated size of potential fiscal drag, which is defined as the difference between the no-indexation counterfactual and the full-indexation counterfactual, and in this graph is normalized to 100. Therefore, 100% corresponds to full offsetting of fiscal drag, values above 100% correspond to an over-compensation of fiscal drag, and values below 100% correspond to partial offsetting. The graph is built based on the average of the three indexation counterfactuals considered. Separate results for each of these three counterfactuals are shown in Appendix Figure A.4. Underlying data is reported in Appendix Table A.6.

Figure 8: Average effective tax rate counterfactuals

(a) Counterfactuals with respect to 2023 observed average effective tax rates



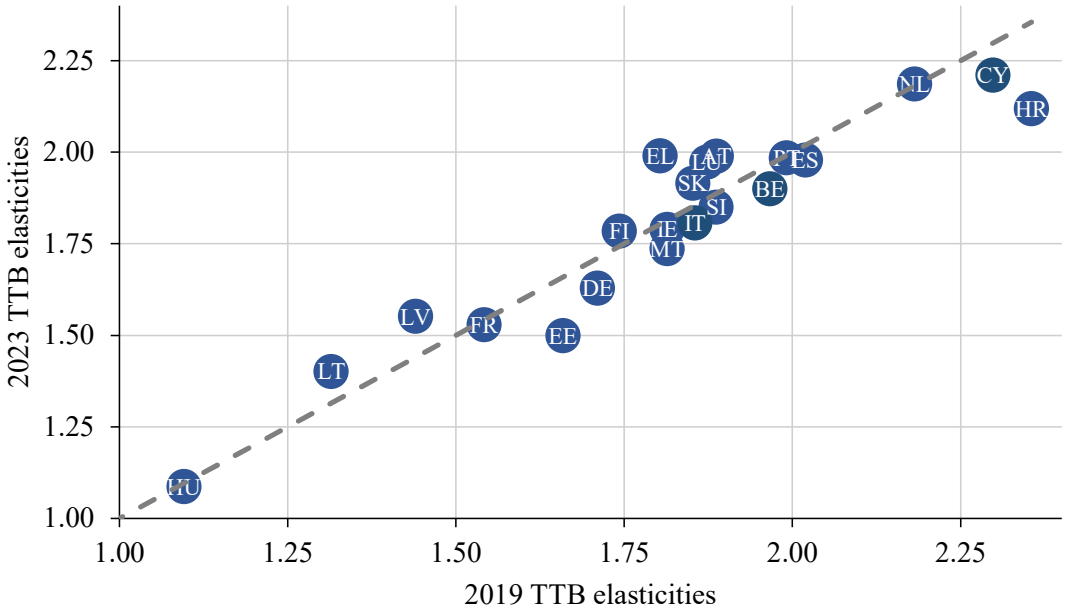
(b) Baseline and counterfactual simulations with respect to 2019 observed average effective tax rates



Notes: This figure shows average effective tax rates across all countries considered for different baseline and counterfactual simulations. Graph (a) shows the tax rate in 2023 under different indexation counterfactuals with respect to the observed tax rate of 2023. Graph (b) shows the 2023 baseline tax rate and the indexation counterfactuals with respect to the 2019 observed rate. Underlying data is reported in Appendix Table A.6.

Appendix A Supplementary Figures and Tables

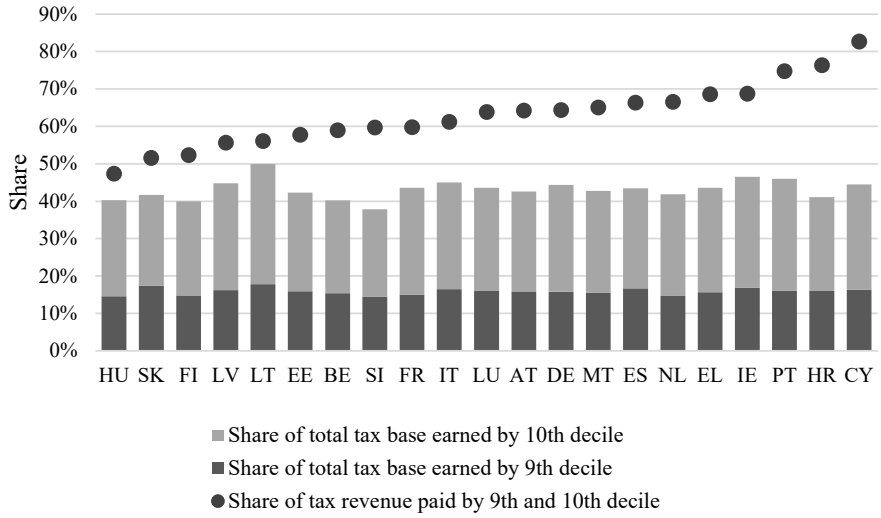
Figure A.1: Comparison between 2019 and 2023 TTB elasticities



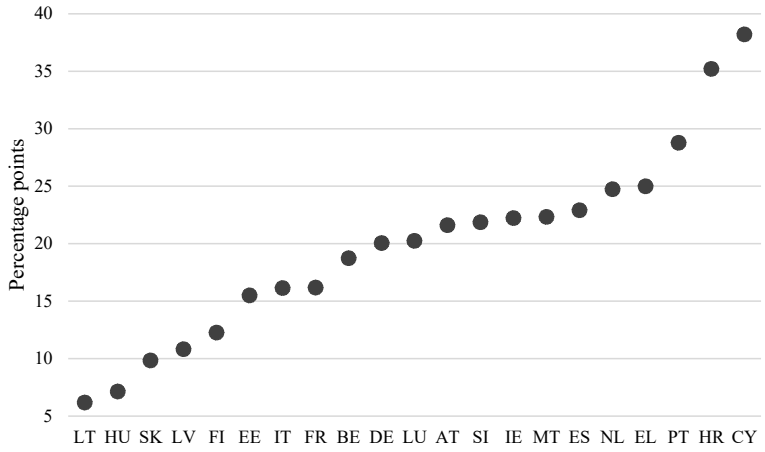
Notes: This figure compares the TTB elasticities calculated with 2019 legislation and 2019 data with those calculated with 2023 legislation and 2019 data updated to 2023. The differences between these two elasticities are mainly due to tax reforms between these two years. A secondary driver of the differences is composition changes due to the differential growth of alternative income sources between 2019 and 2023. Appendix Table A.3 reports the underlying data and estimates by income source.

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

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



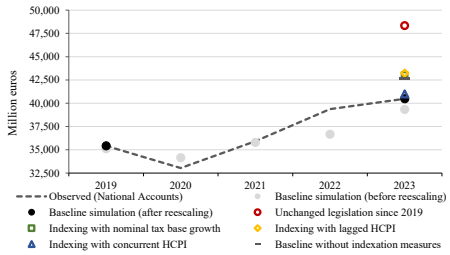
(b) Difference between share of income tax paid and share of income earned by the top 20



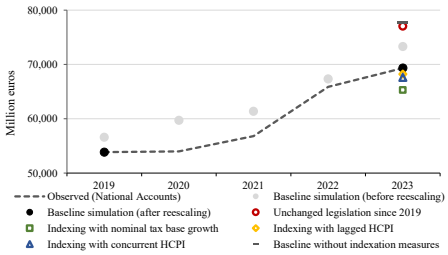
Notes: This figure illustrates the concentration of the tax base and tax liabilities at the top of the distribution. Graph (a) shows the share of the total tax base coming from the top two deciles and the share of tax revenue coming from these two deciles. Graph (b) shows the difference between the share 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 marker and the cumulated bar in graph (a). The results show considerable heterogeneity across the countries studied in line with the different progressivity of each tax system.

Figure A.3: Tax revenue evolution, 2019-2023,
Results for all countries other than big 4

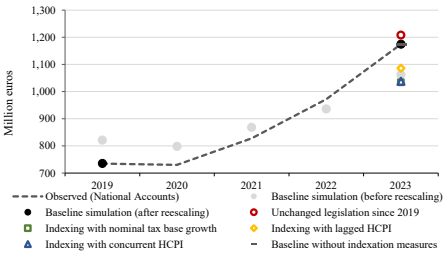
(a) Austria (AT)



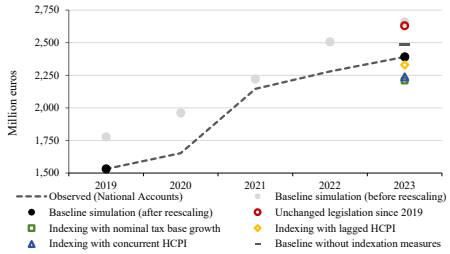
(b) Belgium (BE)



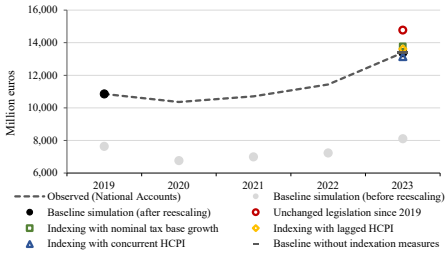
(c) Cyprus (CY)



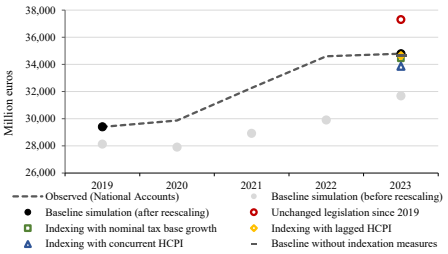
(d) Estonia (EE)



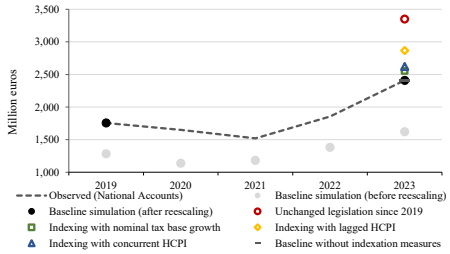
(e) Greece (EL)



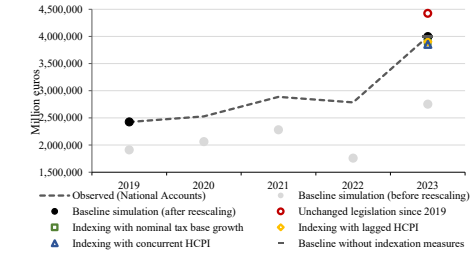
(f) Finland (FI)



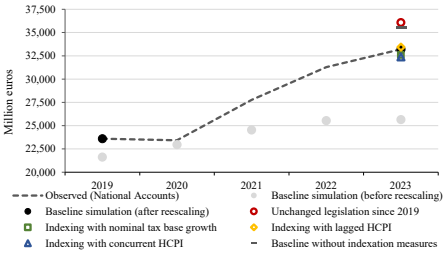
(g) Croatia (HR)



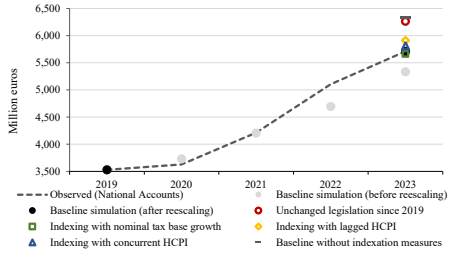
(h) Hungary (HU)



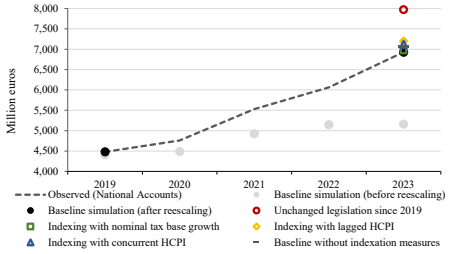
(i) Ireland (IE)



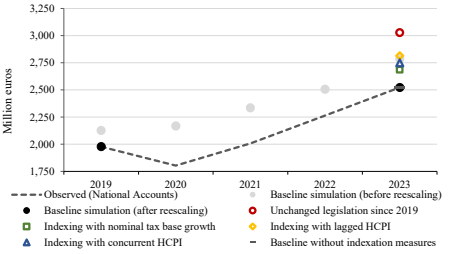
(j) Lithuania (LT)



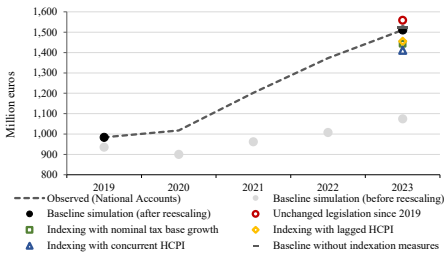
(k) Luxembourg (LU)



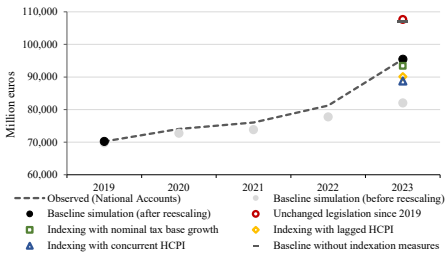
(l) Latvia (LV)



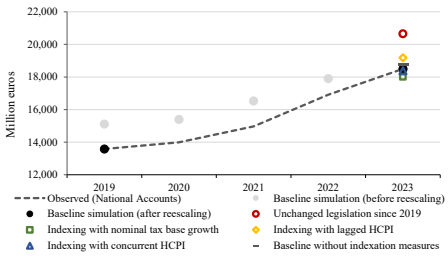
(m) Malta (MT)



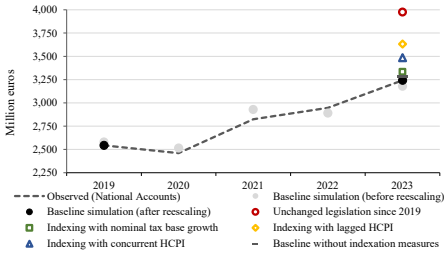
(n) Netherlands (NL)



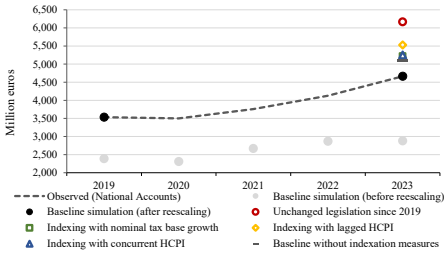
(o) Portugal (PT)



(p) Slovenia (SI)



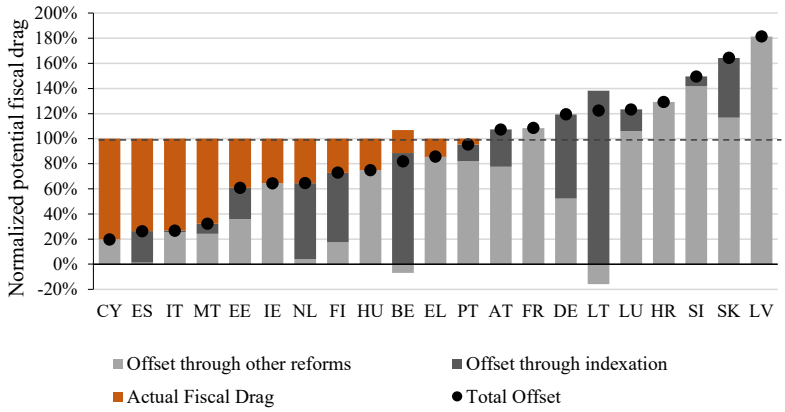
(q) Slovakia (SK)



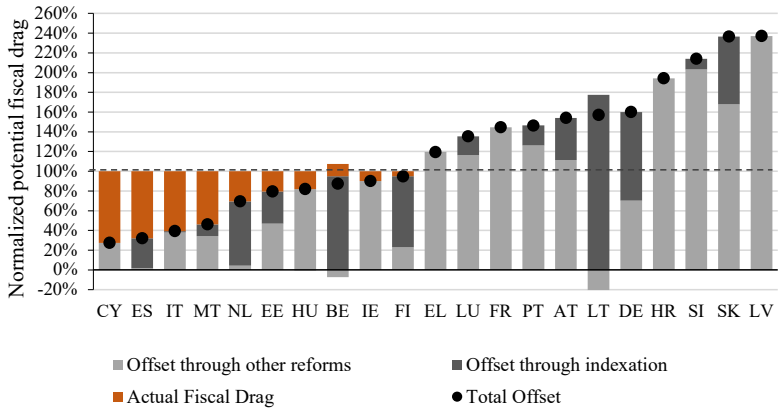
Notes: This figure is a complement of Figure 6 with results for all other countries studied. See notes of Figure 6.

Figure A.4: Actual, potential, and offset fiscal drag through indexation or tax reform measures for each of the indexation scenarios studied

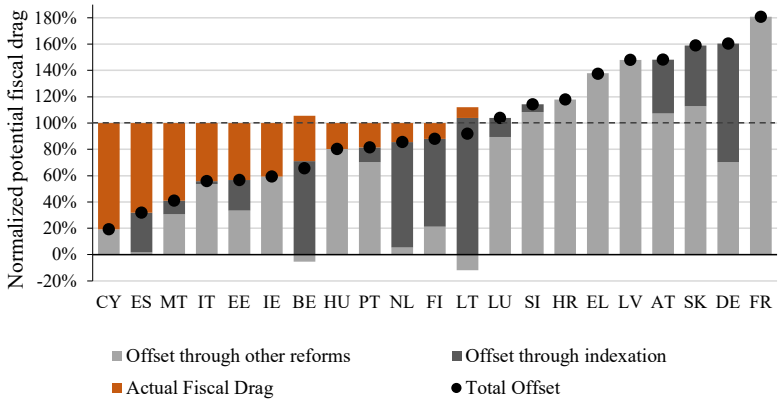
(a) Concurrent HICP indexation



(b) Lagged HICP indexation

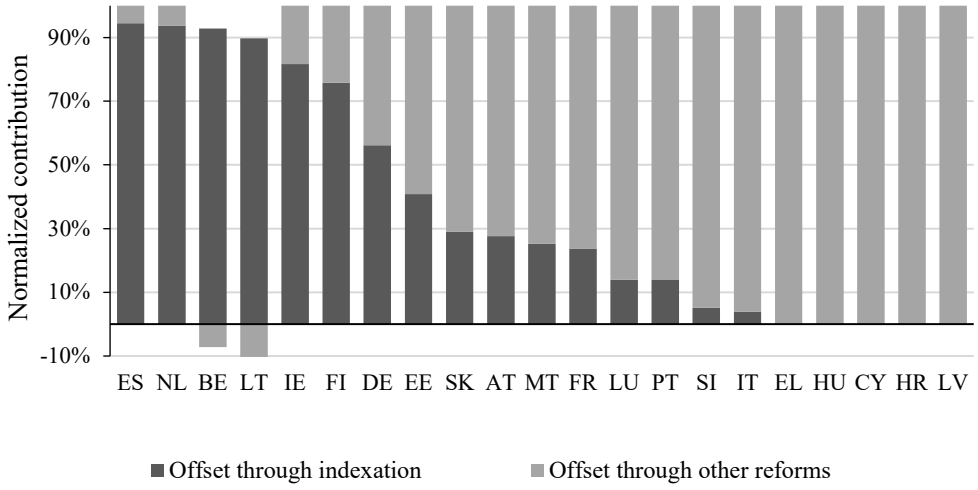


(c) Tax base growth indexation



Notes: These three graphs are equivalent to graph (b) of Figure 7, but each of them is based on a specific full-indexation counterfactual, rather than on the average of the three counterfactuals considered. See notes of Figure 7

Figure A.5: Relative contribution of each type of offsetting measures



Notes: The graph shows the contribution of each type of offsetting measure to the overall offsetting of fiscal drag. The figure is a normalization of the effects shown in Figure 7.

Table A.1: Own classification of policy changes in PIT systems between 2019–2023

Considering PIT changes/reforms that have happened between 2019 and 2023.
How would you classify each of those changes?

	Statutory indexation	Discretionary indexation	Other reforms
	(1)	(2)	(3)
Austria (AT)	Yes	No	Yes
Belgium (BE)	Yes	No	Yes
Cyprus (CY)	No	No	Yes
Germany (DE)	Yes	Yes	Yes
Estonia (EE)	No	Yes	Yes
Greece (EL)	No	No	Yes
Spain (ES)	No	Yes	Yes
Finland (FI)	No	Yes	Yes
France (FR)	Yes	No	Yes
Croatia (HR)	No	No	Yes
Hungary (HU)	No	No	Yes
Ireland (IE)	No	Yes	Yes
Italy (IT)	No	No	Yes
Lithuania (LT)	No	Yes	Yes
Luxembourg (LU)	No	Yes	Yes
Latvia (LV)	No	Yes	Yes
Malta (MT)	No	Yes	Yes
Netherlands (NL)	Yes	No	Yes
Portugal (PT)	No	Yes	Yes
Slovenia (SI)	No	Yes	Yes
Slovakia (SK)	Yes	No	Yes

Notes: (1) Statutory indexation includes automatic indexation of all parameters by law, or also semi-automatic, frequent indexation that affects all or most of the parameters, even if not compulsory by law. (2) Discretionary indexation includes infrequent/occasional changes introduced that are very similar to indexation. They were implemented with the aim of preventing fiscal drag (or compensating for the effects of income growth). They can affect some types of parameters, not necessarily all, and they might even be implemented together with some reforms in the structure of the tax. (3) Other reforms include other tax changes over the period that were not designed to address fiscal drag (new tax deductions or tax credits, new brackets, an increase in rates, etc.). These reforms are either structural or could be one-off tax measures to answer the recent inflation surge in the Euro area.

Table A.2: 2019 TTB 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
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Austria (AT)	1.89	84%	6%	4%	6%	0%	1.82	1.87	2.41	2.06
Belgium (BE)	1.97	37%	44%	15%	1%	3%	2.09	1.76	2.37	1.46
Cyprus (CY)	2.30	100%	0%	0%	0%	0%	2.34	2.37	1.50	2.01
Germany (DE)	1.71	71%	18%	5%	7%	0%	1.87	0.84	2.02	1.78
Estonia (EE)	1.66	0%	95%	3%	1%	1%	1.76	1.23	1.41	1.66
Greece (EL)	1.80	20%	80%	0%	0%	0%	1.93	1.16	2.54	2.15
Spain (ES)	2.02	36%	27%	27%	5%	5%	2.08	1.88	2.07	1.71
Finland (FI)	1.74	48%	15%	15%	21%	0%	1.76	1.80	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%	100%	0%	0%	0%	1.37	0.02	1.25	1.40
Ireland (IE)	1.81	48%	38%	11%	0%	2%	1.97	0.71	2.12	2.03
Italy (IT)	1.86	33%	35%	16%	10%	6%	1.95	1.86	1.29	2.00
Lithuania (LT)	1.31	24%	73%	0%	0%	4%	1.42	1.07	0.73	1.01
Luxembourg (LU)	1.87	85%	7%	2%	4%	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)	1.81	94%	1%	0%	1%	3%	2.00	0.74	2.00	1.63
Netherlands (NL)	2.18	69%	20%	1%	1%	9%	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: These TTB estimates are derived from simulations where the tax base grows homogeneously by 1% and tax parameters are kept unchanged. The TTB elasticity of 2019 is based on EU-SILC data corresponding to the incomes received during 2019 and on the corresponding 2019 tax legislation. The share explained by each column (2) to (6) refers to the component of the 2019 TTB elasticity above the proportional effect of 1.

Table A.3: 2023 TTB elasticities and heterogeneity by income source

	2023 TTB elasticities by income source					Difference w.r.t. 2019				
	All incomes (1)	Labor (2)	Benefits & pensions (3)	Self-employment (4)	Capital (5)	All incomes (6)	Labor (7)	Benefits & pensions (8)	Self-employment (9)	Capital (10)
Austria (AT)	1.99	1.94	1.94	2.51	2.25	0.10	0.11	0.07	0.10	0.19
Belgium (BE)	1.90	1.97	1.78	1.74	1.12	-0.07	-0.12	0.02	-0.21	-0.34
Cyprus (CY)	2.21	2.26	2.19	1.49	1.88	-0.09	-0.08	-0.18	-0.02	-0.12
Germany (DE)	1.63	1.69	0.95	2.11	1.84	-0.08	-0.18	0.11	0.09	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)	1.99	2.17	1.04	3.07	2.21	0.19	0.25	-0.12	0.53	0.06
Spain (ES)	1.98	2.05	1.83	2.01	1.60	-0.04	-0.03	-0.04	-0.05	-0.11
Finland (FI)	1.79	1.80	1.87	1.21	1.58	0.04	0.04	0.07	0.01	0.00
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)	1.09	1.41	0.01	1.26	1.05	-0.01	0.04	0.00	0.01	0.00
Ireland (IE)	1.79	1.92	0.70	2.16	1.98	-0.02	-0.05	-0.01	0.03	-0.05
Italy (IT)	1.81	1.87	1.82	1.39	2.01	-0.05	-0.09	-0.04	0.11	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)	1.97	2.00	1.87	2.03	2.18	0.10	0.10	-0.01	0.18	0.04
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	0.36	2.01	1.46	-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	2.35	2.55	-0.04	-0.03	-0.07	-0.13	0.05
Slovakia (SK)	1.92	1.89	2.59	2.06	1.50	0.06	-0.10	0.22	1.06	-0.16

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

Table A.4: 2019 TTB elasticities across the income distribution and mechanisms

	TTB elasticity by decile:										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
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Austria (AT)	0.55	39.26	4.83	3.48	2.80	2.40	2.16	2.00	1.76	1.40	0%	69%	72%	77%	79%	83%	86%	87%	90%	92%	1.05	0.88
Belgium (BE)	1.65	34.73	6.56	3.81	2.90	2.42	2.11	1.93	1.75	1.40	15%	23%	25%	30%	33%	36%	37%	40%	44%	47%	1.08	0.92
Cyprus (CY)	0.00	10.17	10.64	5.90	5.32	4.53	3.83	3.27	2.69	1.77	0%	100%	100%	100%	100%	100%	100%	100%	100%	99%	1.90	1.49
Germany (DE)	4.22	5.03	3.52	2.91	2.48	2.10	1.95	1.85	1.70	1.36	14%	24%	51%	55%	61%	71%	72%	73%	80%	81%	0.72	0.66
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)	1.19	2.00	2.56	2.34	2.55	2.64	2.29	2.14	1.96	1.45	0%	0%	0%	0%	1%	3%	5%	4%	11%	54%	0.76	0.75
Spain (ES)	0.33	8.97	6.73	5.07	4.13	2.81	2.48	2.11	1.86	1.55	0%	4%	7%	10%	12%	21%	26%	36%	45%	61%	1.11	0.86
Finland (FI)	0.76	3.10	2.38	2.13	2.02	2.02	1.91	1.80	1.69	1.42	0%	9%	14%	25%	39%	47%	49%	53%	59%	69%	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)	0.60	0.45	1.58	4.68	4.92	4.50	4.34	3.21	2.43	1.68	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	1.86	1.51
Hungary (HU)	1.01	1.12	1.17	1.20	1.17	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)	8.04	4.84	3.81	3.66	3.02	2.54	2.35	2.05	1.86	1.41	0%	3%	12%	27%	32%	39%	48%	55%	56%	53%	0.86	0.78
Italy (IT)	10.18	6.61	5.44	2.97	2.56	2.29	2.13	2.13	1.81	1.37	0%	1%	7%	12%	18%	24%	27%	30%	42%	64%	0.85	0.81
Lithuania (LT)	0.00	1.10	2.19	1.82	1.64	1.53	1.45	1.37	1.28	1.09	0%	0%	12%	18%	19%	23%	23%	25%	29%	30%	0.36	0.36
Luxembourg (LU)	-0.71	7.55	4.70	3.51	2.87	2.68	2.46	2.02	1.73	1.36	0%	91%	72%	78%	86%	83%	77%	84%	86%	87%	1.10	0.92
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)	3.62	3.98	3.89	3.46	3.04	2.68	2.20	1.87	1.69	1.40	88%	96%	93%	91%	93%	93%	93%	95%	93%	96%	0.95	0.77
Netherlands (NL)	0.80	3.23	3.76	3.28	3.12	3.29	2.96	2.65	2.28	1.62	0%	39%	41%	48%	58%	66%	68%	70%	73%	78%	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	2.66	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: Estimates are derived from simulations where the tax base of individuals in each decile group grows homogeneously by 1% and tax parameters are kept unchanged. The elasticity of each decile group is computed as the relative increase in tax liability from all individuals in a decile group divided by the relative increase in their tax base. Note that individuals whose tax liability remains zero do not impact the elasticity of their decile group. The individual elasticity of these individuals is zero.

Table A.5: PIT revenue observed and simulated in baseline and counterfactual scenarios

	PIT Revenue (Millions Euros)								
	2019	2023							
	Observed	Observed	With 2019 legislation	With 2019 legislation indexed tax base	With 2019 legislation indexed lagged	With 2019 legislation indexed contemp.	Potential FD (wrt average of 3 ind.)	Actual FD (wrt average of 3 ind.)	With 2023 legislation w/o indexation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria (AT)	35,424	40,477	48,323	43,003	43,229	41,006	5,900	-1,946	42,644
Belgium (BE)	53,858	69,325	77,011	65,284	68,224	67,613	9,970	2,285	77,654
Cyprus (CY)	735	1,174	1,208	1,034	1,086	1,038	155	122	1,174
Germany (DE)	339,185	374,828	424,413	393,500	393,429	382,837	34,488	-15,097	402,688
Estonia (EE)	1,532	2,391	2,629	2,209	2,329	2,237	371	132	2,488
Greece (EL)	10,855	13,385	14,768	13,762	13,610	13,153	1,260	-123	13,385
Spain (ES)	99,033	134,371	138,799	124,910	124,993	121,926	14,856	10,428	138,556
Finland (FI)	29,401	34,788	37,290	34,445	34,650	33,856	2,973	471	36,686
France (FR)	224,304	262,680	282,897	266,823	264,787	258,935	19,382	-835	267,482
Croatia (HR)	1,755	2,409	3,349	2,552	2,865	2,621	669	-270	2,409
Hungary (HU) (a)	2,424,565	3,996,321	4,424,433	3,891,185	3,901,761	3,853,066	542,429	114,317	3,996,267
Ireland (IE)	23,599	33,200	36,069	32,587	33,428	32,380	3,271	402	35,544
Italy (IT)	177,340	206,920	213,788	201,479	196,355	188,019	18,503	11,636	207,184
Lithuania (LT)	3,529	5,710	6,259	5,662	5,909	5,810	465	-84	6,330
Luxembourg (LU) (b)	4,479	6,926	7,968	6,965	7,198	7,122	874	-169	7,072
Latvia (LV)	1,978	2,522	3,027	2,686	2,814	2,749	277	-227	2,522
Malta (MT)	984	1,511	1,558	1,442	1,455	1,411	122	74	1,523
Netherlands (NL)	70,225	95,443	107,596	93,996	90,087	88,765	16,846	4,694	106,834
Portugal (PT)	13,580	18,495	20,649	18,008	19,177	18,839	2,125	-30	18,793
Slovenia (SI)	2,544	3,242	3,974	3,333	3,632	3,484	491	-241	3,280
Slovakia (SK)	3,534	4,662	6,164	5,219	5,529	5,250	831	-670	5,098

Notes: (a) Results for Hungary are shown in the national currency (Forint). (b) Observed values for Luxembourg are estimated to reflect taxes paid by residents only, in line with Euromod simulations.

Table A.6: PIT revenue observed and simulated in baseline and counterfactual scenarios

	PIT Revenue (% GDP)									Average Tax Rate (%)					
	2019	2023								2019	2023				
	Obs.	Obs.	With 2019 legislation	With 2019 legislation indexed tax base growth	With 2019 legislation indexed lagged HICP	With 2019 legislation indexed contemp. HICP	With 2023 legislation no indexation since 2019	Potential FD (wrt average of 3 ind.)	Actual FD (wrt average of 3 ind.)	Obs.	Obs.	With 2019 legislation	With 2019 legislation indexed tax base growth	With 2019 legislation indexed lagged HICP	With 2019 legislation indexed contemp. HICP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Austria (AT)	8.95	8.55	10.21	9.09	9.14	8.67	9.01	1.25	-0.41	13.39	12.82	15.30	13.62	13.69	12.98
Belgium (BE)	11.23	11.63	12.91	10.95	11.44	11.34	13.02	1.67	0.38	20.25	21.57	23.96	20.31	21.23	21.04
Cyprus (CY)	3.14	3.75	3.85	3.30	3.46	3.31	3.75	0.50	0.39	6.93	7.90	8.13	6.96	7.31	6.98
Germany (DE)	9.60	8.96	10.14	9.40	9.40	9.15	9.62	0.82	-0.36	18.86	17.90	20.27	18.79	18.79	18.28
Estonia (EE)	5.38	6.26	6.89	5.78	6.10	5.86	6.52	0.97	0.35	12.92	14.00	15.40	12.94	13.64	13.10
Greece (EL)	5.86	5.94	6.56	6.11	6.04	5.84	5.94	0.56	-0.05	8.82	8.68	9.57	8.92	8.82	8.53
Spain (ES)	7.90	8.97	9.26	8.34	8.34	8.14	9.25	0.99	0.70	13.50	14.44	14.92	13.43	13.43	13.11
Finland (FI)	12.33	12.73	13.64	12.60	12.68	12.39	13.42	1.9	0.17	20.17	20.30	21.76	20.10	20.22	19.75
France (FR)	9.22	9.31	10.02	9.45	9.38	9.17	9.48	0.69	-0.03	15.32	15.17	16.34	15.41	15.29	14.95
Croatia (HR)	3.13	3.15	4.38	3.34	3.75	3.43	3.15	0.88	-0.35	5.10	5.11	7.11	5.42	6.08	5.57
Hungary (HU)	5.06	5.32	5.89	5.18	5.20	5.13	5.32	0.72	0.15	10.31	9.97	11.04	9.71	9.73	9.61
Ireland (IE)	6.49	6.51	7.07	6.39	6.56	6.35	6.97	0.64	0.08	19.58	20.22	21.97	19.85	20.36	19.72
Italy (IT)	9.83	9.72	10.05	9.47	9.23	8.84	9.74	0.87	0.55	18.91	19.23	19.87	18.72	18.25	17.47
Lithuania (LT)	7.17	7.74	8.48	7.67	8.01	7.87	8.58	0.63	-0.11	15.41	15.61	17.11	15.47	16.15	15.88
Luxembourg (LU)	7.17	8.73	10.05	8.78	9.08	8.98	8.92	1.10	-0.21	18.18	18.00	20.71	18.10	18.71	18.51
Latvia (LV)	6.69	6.46	7.75	6.87	7.20	7.03	6.46	0.71	-0.58	14.01	13.15	15.78	14.00	14.67	14.33
Malta (MT)	6.74	7.35	7.59	7.02	7.08	6.87	7.41	0.59	0.36	12.37	12.85	13.25	12.27	12.38	12.00
Netherlands (NL)	8.46	8.94	10.08	8.75	8.44	8.31	10.01	1.58	0.44	14.18	14.47	16.32	14.16	13.66	13.46
Portugal (PT)	6.33	6.92	7.72	6.73	7.17	6.88	7.03	0.79	-0.01	13.39	13.93	15.55	13.56	14.45	13.85
Slovenia (SI)	5.28	5.07	6.21	5.21	5.68	5.45	5.13	0.77	-0.38	10.02	9.82	12.03	10.09	11.00	10.55
Slovakia (SK)	3.74	3.79	5.01	4.25	4.50	4.27	4.15	0.68	-0.55	7.99	7.34	9.70	8.21	8.70	8.26

Table A.7: Growth rate of alternative indexation indices considered. 2019–2023

	Growth rate		
	Nominal tax base	Lagged HICP	Concurrent HICP
	(1)	(2)	(3)
Austria (AT)	17.07%	14.86%	21.89%
Belgium (BE)	21.59%	15.80%	16.98%
Cyprus (CY)	13.37%	9.92%	13.61%
Germany (DE)	12.56%	14.13%	19.34%
Estonia (EE)	38.04%	26.82%	35.31%
Greece (EL)	7.84%	9.09%	13.06%
Spain (ES)	12.16%	12.07%	14.99%
Finland (FI)	11.95%	11.05%	14.57%
France (FR)	8.51%	10.08%	14.82%
Croatia (HR)	25.88%	14.56%	23.19%
Hungary (HU)	49.03%	29.65%	46.71%
Ireland (IE)	14.89%	11.11%	15.83%
Italy (IT)	7.95%	11.41%	17.15%
Lithuania (LT)	48.87%	28.49%	36.59%
Luxembourg (LU)	18.16%	13.76%	15.19%
Latvia (LV)	39.60%	24.46%	32.11%
Malta (MT)	10.62%	9.37%	13.71%
Netherlands (NL)	15.19%	19.18%	20.83%
Portugal (PT)	17.48%	9.31%	14.72%
Slovenia (SI)	25.76%	13.14%	19.28%
Slovakia (SK)	31.60%	20.87%	30.53%

Notes: Growth of the nominal tax base is calculated from EUROMOD. HICP is computed from EUROSTAT.

Online Appendix B for "Fiscal Drag in Theory and in Practice: a European Perspective"

Detailed Country Results and Methodological Notes

This Appendix contains relevant information about each country's institutional background, their indexation practices, recent reforms and a detailed discussion of results and methodological details.

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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). Additional payments 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). (Austrian Federal Ministry of Finance, 2025).

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 1 million euros). On top of this calculated tax, taxpayers can claim various tax deductibles which directly reduce the income tax paid. The most important are: children-related deductibles ("family bonus"), deductibles for employees and pensioners, sole earners, single parents, and an additional (partly distance-based) commuter deductible.

For low-income earners, a negative tax system exists that refunds a certain share of social security contributions. This is paid out of the overall PIT revenue. In addition, some of the tax deductions are payable and are thus paid out cash. Others are complemented by extra payments ("Kindermehrbetrag" complements "family bonus") in case the tax deductible could not be paid out (in full) due to too low-income tax. Our analysis period covers various policy-changes related to these positions that can strongly affect elasticities, especially for lower decile groups (see "Other reforms").

Special payments are only reduced by their associated SSC (at lower rates) and taxed according to a simplified progressive tax tariff with no tax deductibles applicable.

Capital gains are for the largest part taxed by a separate capital gains tax. This 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 favorable in cases where this rate lies below the standard capital gains tax rate of 27,5% (25% in certain cases). This is only the case for low incomes.

The Austrian tax system includes a progression adjustment ("Progressionsvorbehalt"). This includes certain incomes into the calculation of the taxable base that are not subject to the PIT per se. Such incomes are not taxed but increase the tax rate on all other incomes. For our simulations we increase these special incomes such that their effect remains close to neutral on our results. 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 minor negative elasticity effects in our analysis. These do not change the final country results qualitatively.

Indexation practices

Since 2023 limits in the PIT are partly indexed to previous inflation. This includes the tariff itself (except the topmost backet above 1 million euros, brackets for special payments also remain fixed) and most of the tax deductibles. A notable exception is the sizable "family bonus". A yearly "progression report" calculates the nominal aggregates for fiscal drag that should be reimbursed in the following year based on the 1 ½ year lagged inflation from July t-2 to June t-1 (see Ertl et al., 2024). Two thirds of this amount are then automatically distributed by raising brackets, major deductibles and associated income limits (by 2/3 of the reference inflation). The remaining third is distributed through discretionary measures by the government.

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 and a different period of reference. These two systems may thus interact in various unpredictable ways, especially in phases of high inflation/wage increases.

Other reforms

One of the major reforms was the introduction of indexation per se in 2023. On top of that, the COVID pandemic has triggered a multi-year reform path that especially targeted the PIT ("eco-social tax reform"). The reform lowered the first income tax bracket from 25% to 20%, effective retroactively from 2021. The second bracket was reduced from 35% to 32.5% in 2022 and further to 30% in 2023. Additionally, the third bracket was decreased from 42% to 41% in 2023 and to 40% in 2024 for incomes between 31,000 and 60,000 euros. Additional measures are the introduction of an investment allowance and an increase in the basic allowance for profits.

2022 implemented a tax code fix that increased eligibility for the negative tax component of the family bonus for low-income earners. For 2023 the negative tax component of the family bonus ("Kindermehrbetrag") has been increased substantially (250 to 550 euros, 2023) and eligibility conditions have been loosened. While this change was relatively small in budgetary terms, the effects are clearly visible for households with children in our elasticities in the second decile group. The restrictive eligibility before 2023 is thus a major reason for the very high elasticities for low incomes in 2019.

Tax-to-base Elasticities

The most notable effect for 2019 is the high TTB-elasticity of decile 2 for Austria. This effect then declines markedly for the following decile groups. A higher elasticity around the 20th percentile is generally not surprising, as for many households this marks the transition from the negative-tax system into regular taxation following the bracket-based tariff. The most important factor at this point is the "family bonus" (regular taxation) which is complemented by the "additional child benefit" ("Kindermehrbetrag") in the negative tax system. Both lead to complex interactions since the family bonus can be further split between partners. Most importantly, until 2022 the additional child benefit was not paid, even if the family bonus could not be used in full due to too low income. This oversight in the tax code has been fixed, so that the 2023 elasticity is much smaller.

The two major tax credits that are separately modeled are the family bonus including negative tax component ("deduction/credit 1") and the commuter's deductible ("Verkehrsabsetzbetrag", "deduction/credit 2").

The classification of AT as "bracket-driven" progressivity is partly misleading due to the strong negative tax component. Technically, the effects from moving from the negative tax to the regular tax system are associated

with the first bracket in our analysis. From a narrative perspective these effects are however arguably driven by the large benefits received in the negative tax system and could be thus classified either way.

The elasticity for self-employed incomes is rather high which is due to two parameters that influence PIT progression for this category: A tax allowance ("tintatb") for employees with additional self-employed income. An increase past this allowance (730 euros) will trigger full taxation for the whole amount, otherwise it remains tax free. The second specific is a profit allowance ("Gewinnfreibetrag", "tintase") that allows for a specific amount (2023: 30,000 euros) to be tax exempt.

For capital incomes it is important to note that the PIT only covers a small part of these, namely property income (rents and similar, "ypr") and a small part of investment income (opt-in, "yiy"). Other capital incomes are taxed at a flat rate and not subject to PIT but technically to a "special method of collection for income tax", e.g. the capital gains or real estate transfer tax. They are thus disregarded in this paper for AT.

Counterfactual scenarios

For counterfactual scenarios we treat changes to PIT items that are subject to indexation starting from 2023 as "manual indexation" if they were changed before 2023. Changes to deductibles that are not subject to regular indexation as of 2023 are always treated as policy changes. For example, the increase of the family bonus in 2022 is considered a policy change, since it is not an indexed part of the PIT-system as of 2023. For some items this distinction is ambiguous as the "remaining third" (that is distributed manually) sometimes increases PIT-elements that are not subject to yearly indexation. New regulations that have not been part of the tax code in 2019 (base year) are always considered policy changes when compared to 2023, even if they have been subject to indexation in previous years (e.g., increased commuter's deductible introduced in 2020, also the extended eligibility for the "additional child benefit"). Our estimates for fiscal drag that was captured by indexation is thus a lower bound, as we may over-estimate the changes caused by policy-changes.

For Austria it is in addition crucial to keep in mind the numerous policy-changes that have been implemented since 2019, which complicates the isolation of a "pure" fiscal drag effect somewhat. Results for the counterfactual scenarios show that in AT tax revenue would have increased substantially if the tax code was frozen on the 2019 regime. Part of this effect is driven by tax measures with very high elasticities, some of which have been faded out shortly after 2019 (e.g., eligibility for the "Kindermehrbetrag"). Conversely, indexing the tax code with concurrent HICP would have left revenue almost unchanged, despite these high elasticities caused by the 2019 tax code. Contributing to this effect is that concurrent HICP is larger than the uprating used for income. Followingly indexed parameters rise more strongly than income and compensate for the high elasticities.

Comparing the effective tax code in 2023 to 2019, we find that average tax rates have marginally decreased as Austria has compensated more revenue than our fiscal drag measure would have implied. However, less than third of this effect effectively comes from indexation measures. The reasoning behind this result is twofold: First, indexation in Austria was only implemented in 2023 which is a major policy change. Since our period of analysis uses cumulative fiscal drag effects since 2019 where no indexation measures were in effect, their contribution remains low. Second, the period since COVID was marked by major shifts in the PIT. These were most prominently driven by the "eco-social tax reform" that, among other things, lowered tax rates following a multi-year path (outlined in chapter "Other reforms" above). In our results these reforms are captured under "other reforms" and these make-up for the largest share of the "over-compensation". Concluding, we find that fiscal drag in Austria was indeed more than accounted for by tax code changes, while only a small part of this was actually driven by "indexation measures".

Belgium (BE)

Description of the Personal Income Tax

In Belgium, the social security system and tax system are both almost entirely coordinated at the national level. However, a number of taxes and benefits do not belong to the national system and vary across the regions and across local authorities within regions (municipalities and provinces).

In the personal income tax system, taxes are calculated by applying a progressive rate structure to the net taxable income of an individual person. Net taxable income equals gross income minus the sum of social insurance contributions, professional expenses (only for working persons, in general this is a standard allowance amount), and deductible expenses. There are also exceptions, with different types of incomes that are taxed at a specific rates (13 different rates, see CSF(2020)).

The tax base is relatively broad, covering most types of income. Replacement incomes (such as pensions) are taxable with the exception of social assistance, war pensions and benefits in case of a work-related accident or sickness for a person without any other income. Furthermore, child benefits and study allowances are not included in the concept of taxable income.

Social insurance contributions are deducted from gross income. For employees they are computed based on flat rate. Exemptions/reductions exist for low earners. For self-employed, a flat rate also applies but with a minimum and a maximum amount. Professional expenses can also be deducted from gross income (only for working persons). In general, this is a standard allowance amount. Paid alimonies are also deductible from gross income (at 80%).

The rate structure is progressive, and the maximum rate is relatively quickly reached. For 2023 revenues, the rates were 25% below 15.200 EUR, 40% between 15.200 and 26.830 EUR, 45% between 26.830 and 48.320 EUR, and 50% above that last threshold.

In the case of couples with a single earner, the so-called 'marital quotient system' applies (until 2024). This consists of treating 30% of the total earnings of the couple as the income of the non-earning spouse (with a certain maximum that is relatively low).

A number of tax reductions apply. First there is a base tax-free amount. The tax on the amount of income corresponding to the tax-free amount is exempt from tax. Furthermore, a number of deductions for dependent children (and dependent adults) are applied, also accounting for disability.

Replacement incomes (unemployment benefits, early retirement benefits, sickness and disability benefits, pensions), give right to a tax credit, and total taxes on replacement income can be reduced to zero if they are below a given threshold and are the sole source of income. Moreover, specific refundable tax credit (on low activity incomes or in specific cases related to deductions for dependent children) can result in a negative tax (i.e. a payment from the authorities).

A relatively large share of existing homeowners benefit from the deductibility of mortgage interest payments for their primary residence, reducing their taxable income. This advantage is not available to recent new homeowners (also depending on the region). A number of other tax deductible expenses (not simulated in Euromod) can also be declared such as charitable donations, life insurance premiums, contributions to private pension plans and childcare costs.

Capital income is usually taxed at the moment of remittance. This liberates the recipient from the obligation to declare the amounts in the tax return. If the capital income was not taxed at the moment of remittance, it has to be declared. It will then be taxed at a flat tax rate of 30%, except if it is beneficial for the recipient to treat capital income as regular income and to tax it at the standard rates (and brackets).

For this project, the definition of the income tax is aligned with the National Accounts definition, which includes (Euromod's) national income tax (tin_s) and capital income tax (tinkt_s). For more detailed information on the Belgian income tax schedule and its simulation in Euromod see Assal et al (2025).

Indexation Practices

Indexation mechanisms are widespread in the Belgian economy. Belgium is one of the few countries where wages and most benefits are automatically indexed. As a result, it is no surprise that all tax brackets and tax parameters are also automatically statutory indexed. However, it is worth mentioning that the reference indexes used are not the same for wage/benefits indexation and for the tax legislation indexation. Wages and benefits are indexed according to various mechanisms that are all based on a four months average of the so-called health index (this is the national consumer price index that excludes alcoholic beverages, tobacco products and motor fuels). This implies that even if the basis for the indexation is the same, there is some heterogeneity in the speed of indexation within the economy, between the different sectors. As regard the tax legislation, automatic indexation to previous year "total" national consumer price index (which is different from the HICP) is compulsory and applied at the beginning of the new calendar year. In some cases, the government took the explicit decision not to index, for instance fiscal expenses thresholds have not been updated for the revenue years 2020 to 2023.

Other Reforms

No major tax reforms took place between 2019 and 2023, but several minor adjustments occurred as the non-indexation of fiscal expenses between 2020 and 2023 mentioned above.

Tax-to-base Elasticities

The tax to base elasticity estimated for Belgium in 2019 is 1.97, not far from the EU median, but in the upper range. The elasticity is higher for labor incomes (2.09) and for pensions and benefit incomes (1.98) which represent the largest share of the tax base of the personal income tax. Pension and benefit incomes are taxed by the same progressive rates as labor income but have a smaller tax to base elasticity mainly because of differences in the income level, and because of specific deductions. Capital income, which represent a very limited fraction of PIT revenues, is taxed at a lower rate. Its elasticity is smaller because it mainly affects taxpayers in the higher deciles of the income distribution for which the tax to base elasticity is lower.

The tax to base elasticity estimated for Belgium can be explained by the diminishing relative value of tax deductions and credits, accounting for approximately 59% of the fiscal drag effect. Another factor is the progressive nature of the tax brackets, which contributes for 37%. The remaining 4% is a residual component that cannot be offset with the updating of the nominal tax parameters included in euromod.

The mechanism with the biggest impact on the tax to base elasticity (denoted "Tax deduction/credit 1" in the corresponding figure in the paper) is the "tax allowance" defined here as including the base tax-free amount as well as specific tax deductions (kids, disabled, low income) and tax credits (for replacement income). It accounts for about 44% of the tax to base elasticity. The base tax-free amount, which can also be seen as a first bracket taxed at 0%, accounts for about ¾ of that effect, whereas other allowances account for about ¼.

The second tax benefit mechanism in terms of impact on the tax to base elasticity (denoted "Tax deduction/credit 2" in the corresponding figure in the paper) is the so called "standard allowance for professional expenses". It accounts for about 15% of the tax to base elasticity.

These mechanisms differ markedly along the income distribution, which also displays significant variation in the elasticity. The elasticity is particularly high for taxpayers in the second decile of taxable income. It then decreases strongly from the 3rd to the 5th deciles and then decreases more slowly down to the 10th decile. The first decile is characterized by the lowest elasticity and a 40% share of households that pay zero taxes. About the same share of zero taxes payers is observed in the second decile. Households benefiting from negative taxes (tax credit) are also found mainly in these first two deciles. Furthermore, it is striking that the second decile faces one of the highest tax to base elasticity of the countries analysed in the paper, at 34,7. This is mainly explained by the tax allowance (base and specific) and to a lesser extent by bracket progressivity. It is typically in this second decile that specific thresholds are reached, which imply a transition between negative or zero taxes to some positive taxes (sometimes very low), leading to very large computed elasticities. This finding highlights the strong potential progressivity of the tax system around some specific thresholds / level of revenues in Belgium. However, because the tax amounts concerned are relatively small this high elasticity has a limited impact on the total elasticity. In practice, the systematic indexation of the tax brackets and tax parameters allows for some cushioning of these effects. When inflation is stable, the system aims to ensure that the share of wage/benefit increases resulting from wage and benefit indexation does not result in fiscal drag.

Counterfactual simulations

Over the period 2019 – 2023 revenue from PIT in Belgium remained broadly stable as a share of GDP (from 11.2% to 11.6% in 2023). This stability can be attributed to the indexation of nominal parameters of the tax system and the absence of major tax reforms. Without indexation, tax collection would have been higher, as illustrated by the contrafactual simulation for 2023 based on the 2019 legislation without indexation. The counterfactual PIT revenue under 2019 legislation with alternative scenarios of full indexation would have been somewhat lower than observed (by an average around 0.4 p.p. of GDP), as shown in Figure A.3 panel (b). The Indexation with respect to lagged HICP is the closest to the observed baseline, it is also the closest concept compared to the actual parameters that are officially used for indexing the tax parameters in Belgium, which is the lagged (previous year) national CPI (an index established using slightly different definitions/methodology than the HICP). When computing a counterfactual PIT revenue with full indexation scenario using lagged national CPI (additional computations not shown in the paper), the results is indeed even closer to the baseline.

More specifically, as shown in Figure 7 panel (b), about 80% of potential fiscal drag was offset by indexation of the parameters, and actual fiscal drag is estimated at about 20% of the potential, according to this measure. However, when measured according to the lagged national CPI, 100% of the potential fiscal drag is offset by the indexation of tax parameters. Other factors, including tax increases by freezing selected tax deduction indexation, contribute slightly negatively to the offsetting of the fiscal drag.

Croatia (HR)

Description of the 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.

Indexation practices

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

Other reforms

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.

Tax-to-base Elasticities

The TTB elasticity estimated for Croatia is 2.36 in 2019. The largest elasticity is associated to self-employment income (3.58), 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 taxpayers fall on the first tax bracket, bracket indexation has a minimal impact on the TTB 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 TTB elasticity from 2.34 to 1.28 overall. The indexation of the tax allowance for supported family members further reduces it to 1.06.

TTB elasticities vary greatly across the income distribution, and they are especially high in the middle of the income distribution (deciles 4-7). TTB 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 elasticity is also lower for individuals in the highest decile of the income distribution. This is explained by the fact that richest 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 TTB elasticity itself (from 2.36 to 2.12), resulting from the general reduction of the tax rates. The impact of the latter is most obvious in the deciles where most taxpayers are located, i.e. at the middle/upper part of the income distribution.

Counterfactual simulations

Over the period 2019 – 2023 we see very little change in revenues from PIT as a share of GDP. This stability was primarily driven by the substantial drop in PIT's rates. Keeping the PIT legislation unchanged (i.e. as of 2019) throughout the period in question would have led to a significantly higher tax collection (1.2 percentage points higher). Indexing parameters with respect to the actual tax base growth would have resulted in the lowest revenue collection (i.e. just a 0.2 percentage points increase).

Figure 7 panel (b) shows that potential fiscal drag was more than offset by the measures implemented over the period. Since there were no indexation rules in place, the offsetting was fully due to the remaining of PIT reforms implemented in 2019 – 2023.

Cyprus (CY)

Description of the Personal Income Tax

The income tax is calculated on an *individual basis* (spouses are assessed independently). *Taxable income* is total income minus various *exemptions*, which cannot simulated[1]. Hence, taxable income is the sum of employment, self-employment, pension, and property income. The *tax base* is taxable income minus *tax allowances*, mainly various expenditure items and social insurance contributions. Due to data limitations, the only allowances taken into account are those for social insurance contributions, contributions to individual private pension plans up to an amount that cannot exceed 1/6 of taxable income, as well as a 20% deduction on property income. Income taxation is progressive, with higher marginal tax rates applying to higher income brackets. *Tax credits* exist in case of double taxation and are not considered in the simulations.

For more details on the Cypriot Personal income tax see Nearchou and Stavrakis (2022) and Markides and Nearchou (2023).

Indexation practices

Indexation of PIT brackets and income is not used in Cyprus. Tax parameters are adjusted on a discretionary basis.

Other reforms

The scaled reduction in wages of public sector employees and pensioners, implemented in 2012-22, was abolished in 2023.

In 2023, a National Minimum Wage was established in Cyprus. This has been set at €885 upon recruitment, and after the completion of six months of employment in the same employer it increases to €940 monthly (for full-time employment). In previous years, Cyprus did not have a national minimum wage, as the relevant legislation only covered specific occupations.

The maximum social insurance contribution base has increased in the period 2019-2023 for both employees and self-employed, as have the basic insurable earnings (the lower limit of earnings upon which contributions are paid), which are also used are used for determining the eligibility and the level of statutory pensions and other social insurance benefits.

Tax-to-base Elasticities

The estimated TTB elasticity for Cyprus is 2.30, which is in the upper range of other EU countries[2]. However, the elasticity is lower for self-employment income (1.50) and capital income (2.01), as these income sources benefit from potentially higher tax allowances related to social contributions[3] and the 20% deduction on income from rent respectively. Labor, pension and benefit incomes exhibit close to average elasticities given the composition of pensioners and benefit earners in terms of their location along the income distribution, their income sources and their demographic characteristics.

The only driving factor of the TTB elasticity is the progressivity of tax brackets as no tax credits are taken into account in the analysis.

These mechanisms differ markedly fairly along the income distribution, which also displays significant variation in the elasticity. The lowest income decile has an elasticity of zero, as individuals in this group have zero tax liability both before and after an income increase. Lower income deciles display higher elasticity, mainly due to

the diminishing relative value of key tax deductions, which significantly influence their tax liability. At middle- and higher-income levels, elasticity decreases as bracket progressivity becomes the dominant factor in determining tax liability.

Counterfactual simulations

Between 2019 and 2023, PIT revenues as a share of GDP increased from 3.1% to 3.7% of GDP, while the average effective tax rate increased by almost 1 pp to 7.9%. This increase was to a large extend due to the lack of indexation of nominal parameters that remained broadly unchanged. Compared to a counterfactual scenario of 2019 legislation without indexation, tax collection was virtually unchanged – marginally lower by 0.1 pp of GDP. Applying alternative indexation scenarios under the 2019 legislation (lagged HICP, concurrent HICIP and tax base growth) would have led to a slightly bigger decrease in revenues, by 0.3, 0.4 and 0.5 pp of GDP, respectively.

More specifically, as shown in Figure 7 panel (b), only 22% of potential fiscal drag was offset by measures implemented over the period, with other reforms being the sole driver. The remaining 78% of potential fiscal drag was allowed to happen, leading to a significant rise in tax revenues.

[1] E.g. the benefit paid to public employees for service abroad, the pensions and benefits paid according to the Suffering Relief Law, widow pensions paid from Social Insurance etc.

[2] Similar to the OECD estimate (Price et al, 2015).

[3] The social insurance contribution rate for the self-employed is 15.6%, compared to 8.3% for employees.

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 tax allowance which can be claimed by all taxpayers, its amount is divided in three groups: it is €7,848 in 2023 for annual incomes up to €14,400, then it decreases gradually for incomes up to €25,200, and it is zero above this threshold. 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 from the agricultural sector. All the allowances are non-refundable and there are no tax credits.

Indexation practices

Tax parameters in Estonia are adjusted on a discretionary basis, as there are no indexation rules regulating their change over time. However, the basic of the main tax allowance changed significantly between 2019 and 2023, going from €6,000 to €7,848. Despite the change in the amount, the annual income thresholds of €14,400 and €25,200 did not change.

Other reforms

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 two children. Second, the tax allowance for individuals of pensionable age is no longer based on their income. Additionally, it is higher compared to the basic tax allowance, as it has been set at the estimated average pension amount, €8,448 in 2023.

Tax-to-base Elasticities

The TTB elasticity estimated for Estonia is 1.66 in 2019. The largest elasticity is associated to employment income (1.76) and the 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 predominantly found in the lower half of the income distribution, which results in lower average tax rates and reduced exposure to fiscal drag for these individuals. The same holds for self-employment incomes, whose TTB is also lower than average (1.44). Finally, the TTB of capital income is 1.66.

As the personal income tax system in Estonia is characterized by a flat rate, the TTB is primarily driven by the progressive loss of relative value of tax allowances. The basic allowance has the most significant impact on TTB, as it applies to all individuals with taxable income (even if its amount decreases as incomes increase). Our estimates suggest that the indexation of this tax allowance alone reduces the TTB from 1.66 to 1.03 overall.

The effect is even more pronounced when examining the lower deciles of the income distribution, where the TTB for the first decile decreases from 8.16 to 1.63 solely due to the update of the basic allowance's value.

TTBs vary greatly across the income distribution and are especially high in the first and second decile. This result can be attributed to the relatively low proportion of individuals paying income tax in these deciles (9% in the first decile, 47% in the second), making the results sensitive to sampling. In contrast, TTBs are much lower for individuals in higher deciles of the income distribution, reaching a minimum of 1.12 for the 10th decile. This discrepancy is largely due to the fact that richer taxpayers are more likely to be subject to a flat tax regime, with minimal or no allowances applicable.

Most of these results remain consistent when moving from 2019 to 2023. The most notable change is a substantial decrease in the TTB itself (from 1.66 to 1.51), 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 for taxpayers in the lower deciles of the income distribution. This outcome is consistent with the fact that individuals receiving pension income are the one who benefitted the most from the policy change.

Counterfactual simulations

Over the period 2019 – 2023 we see in Estonia a moderate increase in revenues from PIT as a share of GDP (by around 0.8 pp). This increase was primarily driven by the insufficient indexation of nominal parameters to inflation. However, the complete lack of indexation would have led to even higher tax collection, as we can see when we compare to a counterfactual of 2019 legislation without indexation. On the other hand, indexing parameters with respect to the actual tax base growth would have have resulted in the lowest revenue collection, maintaining almost constant the average effective tax rate of 2019 (with a small 0.02 pp increase).

Figure 7 panel (b) shows that 66% of potential fiscal drag was offset by measures implemented over the period, with indexation contributing for less than half of this amount (27 percentage points). The remaining 34% of potential fiscal drag was allowed to happen, leading to the increase in tax revenues observed between 2019 and 2023.

Finland (FI)

Description of the Personal Income Tax

Personal income taxation in Finland operates under a dual income tax system, categorizing incomes as earned or capital income, each taxed separately at different rates. Earned income includes wages, salaries, pensions, and benefits, while capital income encompasses returns on deposits, property and investments, dividends, interest, rental income, and gains from property sales.

Income from self-employment is split into earned and capital income to reflect contributions from both labor and capital, relevant for entrepreneurs and farmers.

Earned income is taxed progressively, while capital income is taxed at a flat rate. Municipal taxes, public broadcasting tax, and church tax (if applicable) are additional taxes on earned income. Deductions and tax credits apply to both earned and capital incomes, aiding in reducing the final tax payable. In this study we exclude the broadcasting and the church tax for simplicity.

Notably, three taxes apply to earned income: state tax, municipal tax, and church tax, with municipal and church tax rates decided independently. Social security contributions based on gross wages are also deductible in personal taxation.

Indexation

In Finland, personal income tax parameters are adjusted annually to account for inflation and changes in the cost of living. The adjustments, based on the Consumer Price Index (CPI), help maintain the purchasing power of taxpayers and ensure tax brackets and deductions remain relevant. Since 2019 to 2022 the brackets´ thresholds have been significantly updated, while in 2023 they were kept as in 2022.

While the national tax system follows a standardized indexation process, regional variations may exist, with some municipalities having their own rules for adjusting local taxes. Recent adjustments have focused on compensating for fiscal drag effects and ensuring low-income earners do not face increased tax burdens due to changes in the minimum wage.

Reforms

In 2023, Finland implemented several personal income tax reforms to address economic challenges and fiscal sustainability. These changes included further reductions in income tax rates for middle-income earners, aimed at increasing disposable income and boosting economic competitiveness. Social security contributions and the pension contribution system were adjusted, impacting overall tax burdens for employees and self-employed individuals. Increased tax deductions for childcare, education, and home services were introduced to ease the financial burden on families. Adjustments to wealth and capital gains taxation targeted higher-income earners to ensure a fairer distribution of the tax burden.

Moreover, Finland employs a progressive tax system with the following national tax brackets for 2023: up to €19,200 is taxed at 0%, €19,200.01 to €28,700 at 6%, €28,700.01 to €47,300 at 17.25%, €47,300.01 to €82,900 at 21.25%, and over €82,900 at 31.25%. These rates apply to taxable income after deductions.

Tax-to-base Elasticities

The TTB elasticity estimated for Finland is 1.74 in 2019, which is slightly in the average range of other EU countries. The elasticity is larger for social benefits (1.8) and labor incomes (1.76) which are both taxed by a more progressive schedule, while it is lower for capital incomes (1.58) which are taxed by a flatter schedule and for self-employment incomes (1.21), which combines capital and earned incomes and additional allowances. Pension and benefit incomes are taxed by the same progressive schedule as labor and capital but have a bigger elasticity of 1.8 given the composition of pensioners and benefit earners in terms of their location along the income distribution, their income sources and their demographic characteristics. The differences in the allowances the pensioners are entitled to and the additional special tax on pension income (a 5.85% tax rate is applied to pension income exceeding the limit of 47,000 euro/year).

This elasticity is explained partly by the effect of tax deductions and credits loosing relative value (around 35% of the fiscal drag effect) and the rest by the progressivity of the tax brackets (65%).

These mechanisms differ markedly along the income distribution, which also displays significant variation in the elasticity. The lowest decile has an elasticity of 0.76, as part of these individuals have a zero-tax liability both before and after the increase in their income. The remaining low- and middle-income deciles display the larger elasticity, explained primarily by the loss of relative value of some tax deductions that 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 "Tax deduction or credit 1" in the paper) is the low earned income tax allowance and the basic allowance for the local income tax. Both affect the lower income taxpayers. The second tax benefit in terms of their impact on the elasticity is the low-income tax credit (denoted "Tax deduction or credit 2"), which is It is subtracted from the state tax first. If it cannot be fully subtracted, the remaining amount is proportionally applied to local and church taxes, and the sickness contribution.

Counterfactual simulations

Revenue from PIT in Finland increased 0.7% as a share of GDP to reach 13% from 2019 to 2022, while reducing back to 12.7% in 2023. The reforms carried out in 2023 are the main responsible as they reduce the tax pressure on medium income households. Compared to a contrafactual of 2019 legislation without indexation, tax collection was significantly lower. While the counterfactual PIT revenue under 2019 legislation with full indexation would have been a little lower (around 0.1 – 0.3 p.p. of GDP), as shown in Figure 7 panel (a). 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), more than 70% of potential fiscal drag was offset by measures implemented over the period, with indexation measures being the main driver (55 percentage points).

France (FR)

Description of the Personal Income Tax

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

- *Impôt sur le revenu des personnes physiques* (IRPP) which amounts to 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 exonerations 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 in 2023), followed by the IRPP, which accounts for more than a third of revenue (almost 34% in 2019, and 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

Social minimums and family benefits are automatically indexed on 1 April each year based on the CPI excluding tobacco for the year N-1. For unemployment benefits, the indexation is discretionary and is set on 1 July each year by UNEDIC, the body (including social partners and trade unions) responsible for administering unemployment insurance. For pension benefits (régime de base), indexation is statutory[1] and is based on the CPI excluding tobacco, but the government can decide (by passing a law) to apply an under-indexation (2019/2020) or even to freeze automatic indexation (2018).

Regarding the parameters of personal income tax, the indexation is not statutory but is decided each year by the government and approved by parliament (i.e. the brackets of the IRPP, the ceiling of the family ratio). In practice, it is based on the CPI excluding tobacco for the year N-1, with very few exceptions over the past 40 years (see Duchene et al. 2024).

Other reforms

In 2023, a reform affected one component of the Personal Income Taxes, the IRPP: for the 2nd bracket, both the threshold and the marginal rate were decreased. At the same time, the ceiling for the tax rebate "Décote" was also lowered. This reform amounts to 5 billion euros at the aggregate level and these changes are considered as "other reforms" in our counterfactual scenario without indexation in 2023. The increases in the other thresholds that occurred at the same time are considered as "usual indexation" in our simulation.

Note that there was also a change in the exemption of overtime pay in 2020 from the IRPP: in 2019 the first 5,000 euros of overtime pay were fully exempted from IRPP. However, from 2020, the threshold increased to 7,500 euros. In order to compute the various counterfactual scenario based on the 2019 system with the 2023 data, we therefore account for this change in the value of this threshold (i.e. we consider the 2023 value 7,500 euros)

Tax-to-base elasticities

The TTB elasticity for France is 1.54 in 2019, lower than the average of other EU countries. The elasticity is slightly larger for capital incomes (1.64) while being in line with the overall elasticity for labor incomes (1.53), incomes from benefits and pensions (1.53) and self-employment income (1.50). As expected, the elasticities are heterogeneous between the different components of the personal income tax. The elasticity associated with the IRPP is much higher (2.48), 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 is mainly explained by the progressivity of the IRPP brackets (bracket progressivity accounts for 68% of the fiscal drag effect). The rest of the elasticity is driven by tax credits and deductions such as the "décote" of the IRPP and the CSG ceilings (6% for each). The remaining tax deductions and ceilings of the IRPP, the *Quotient Familial* and the thresholds associated with the exceptional contribution on high incomes explain the remaining share of the elasticity.

Counterfactual simulations

Revenue from PIT in France remained broadly stable over the period, increasing slightly as a share of GDP from 9.22% in 2019 to 9.31% in 2023 after peaking at 9.58% in 2022.

Based on our simulations (Figure 7), fiscal drag was full offset in France between 2019 and 2023, as we obtained full-indexation counterfactuals (with only small differences depending on the counterfactual) that are closed to the observed tax revenue. It was, however, due mainly to the "other reforms" (i.e. the IRPP reform affecting the 2nd bracket), with indexation explaining only 25% of the offset.

[1] *Code de la Sécurité sociale article L.* 161-25.

Germany (DE)

Description of the Personal Income Tax

The Personal Income Tax in Germany is levied on various sources of income, mainly on income from employment, self-employment and other business activities, pensions and capital income. Income from public benefits other than pensions, such as unemployment benefits and child benefits, is tax-exempt. However, some benefits are subject to the progression clause. Capital income from interest, dividends and realized capital gains is generally taxed at a flat rate of 25 % if it exceeds the tax-free allowance for capital income.

There are numerous tax allowances and deductions, e.g. for old-age provision expenses through social insurance contributions, pensioner income or, if it is advantageous compared to the regular child benefit, a child allowance. The sum of all incomes minus allowances and deductions is considered the "taxable income" under German income tax law. Benefits that are subject to the progression clause, e.g. unemployment insurance benefits or parental leave benefits, are added to taxable income to determine the tax rate of the income tax schedule by applying the tax schedule. The resulting tax rate is then applied to taxable income excluding these benefits.

Taxable income is taxed according to a progressive tax schedule with a basic tax-free allowance of incomes that amounts to 11,784 € in 2024. Marginal tax rates for taxable income above the threshold of the basic tax-free allowance range from 14 % to 42 %. For taxable income above or equal to 277,826 €, an additional tax is levied, resulting in a marginal tax rate of 45%. If the resulting income tax liability exceeds a certain threshold (18,130 € for singles in 2024), the so-called solidarity surcharge of up to 5.5 % of the tax liability is added to the tax burden.

Another feature of the German income tax system is joint taxation. Married couples are generally taxed jointly with full income splitting. The sum of all incomes of the spouses is divided by two, then the tax schedule is applied to this quotient and the resulting tax amount is doubled. Full income splitting results in a lower tax liability than individual taxation due to the progressive income tax schedule, if one spouse has a higher income than the other.

For more detailed information on the German income tax schedule and its simulation in Euromod see Lay (2024).

Indexation Practices

The German income tax schedule is updated every year in a well-defined manner. Every two years the government publishes two reports that are usually the basis for adjusting the tax parameters: the tax progression report (BMF 2022a) and the report on the tax-free subsistence level (BMF 2022b).

The tax progression report consists of a backward-looking component, which defines the update of the tax parameters for the following year (t+1) based on the deflator of aggregate private consumption of the current year (t) and secondly a forward-looking component, which defines the tax parameters two years ahead (t+2). The forward-looking component is based on the federal government's forecast of the deflator of aggregate private consumption for the following year (t+1).

The report on the tax-free subsistence level defines the minimum amount needed to maintain a subsistence level of living is defined. This minimum amount must be tax-exempt by law. The minimum subsistence level is thus a lower limit for the basic tax-free allowance set by the federal government.

Despite the well-defined process of indexing the tax parameters, governments have a certain degree of freedom in adjusting the tax schedule. For example, in the most recent update, the tax bracket for taxpayers with very high taxable income was not 'shifted to the right'. In addition, the ex-ante component is prone to forecast errors, which may ultimately lead to under- or overcompensation of fiscal drag. For the year 2024, income taxpayers experienced an overcompensation of fiscal drag as the projected deflator of aggregated private consumption for 2023 was substantially higher than the realized number.

Other Reforms

The partial abolition of the solidarity surcharge by raising the tax liability threshold implied tax relief for most of the income taxpayers and leads to significant foregone income tax revenues as measured in this paper. In 2023 and 2024, the possibility for employers to pay a tax-free inflation compensation bonus of up to 3000 € in total drives the growth of wages and salaries in Germany. As there is little information on the temporal and sectoral distribution of these payments and their amount, they are not modelled in Euromod. They are implicitly included in the uprating factors, as wage projections used by the German government for 2023 include these payments. We take this into account by using estimates of foregone income tax revenue by the Joint Economic Forecast (2024) in the year 2023 for fiscal drag and subtracting this from the simulated income tax revenue to make these number more comparable to official statistics.

Tax-to-base Elasticities

The overall tax-to-base elasticity (TTB) for Germany is 1.71 in 2019. There is some heterogeneity in the elasticities of different income sources. While the elasticity for labor income (1.87) and for self-employment income (2.02) is above the overall rate, the elasticity for capital income corresponds to the overall elasticity (1.78). In contrast to this, the tax-to-base elasticity for benefits and pensions is 0.84, indicating that tax revenue grows less than the respective income source. The levels of the elasticities of the different income sources are in line with the expectations. Income from self-employment is on average higher than income from dependent labor which leads to a higher TTB elasticity in a progressive tax system. It should be noted that this is the theoretical fiscal drag as implemented in Euromod, where many tax allowances are modelled as lump-sum deductions due to the lack of information on, for example, deductible special and income-related expenses. In practice, the self-employed typically have higher deductible expenses than employees, which reduces their taxable income. The fiscal drag arising from capital income is lower compared to labor and self-employment income as most components of capital income (interests, dividends and realized capital gains) are usually taxed at a flat rate of 25 %. For these components, fiscal drag is only caused by increasing the tax-free allowance of the capital gains tax. However, capital income in the Euromod context also comprises income from renting and leasing, which is due to the regular progressive income tax schedule. The TTB elasticity of benefits and pensions is by far the lowest among the different income sources as the German tax system provides quite generous allowances for pension income. Benefits are not subject to personal income tax.

Regarding the effect of different components of the PIT schedule on fiscal drag, tax brackets and tax allowances and deductions contribute equally to the size of the TTB elasticity. Among the tax allowances, the allowance on earnings from mini jobs ('tax benefit 1') and the basic tax-free allowance ('tax benefit 2') are the most relevant ones, followed by the child allowance ('tax benefit 3'). While the mini jobs and the basic tax-free allowance contribute substantially to fiscal drag in the lower deciles as they are targeted at low incomes, the child allowance is more prevalent between the 6th and 9th deciles, because the child allowance tends to be more beneficial than the regular child benefit for households with higher incomes. Fiscal drag from tax brackets is more pronounced in the lower middle deciles, where marginal tax rates increase faster than in upper income deciles. The

distribution of the overall elasticity thus follows a similar pattern with the highest values in the second and first deciles and decreasing elasticities from the third to the tenth decile.

The elasticity for all incomes estimated by the OECD is higher (1.88) than the simulation results of this study. If pensions are excluded from our estimation, the elasticities are almost identical. For earnings (1.90) and capital income (1.74), the elasticities are close to Euromod estimates, while for self-employment income (1.87) the OECD estimates are lower.

Counterfactual simulations

PIT revenue as a share of GDP in Germany is relatively stable between 2019 and 2022, before falling substantially by more than 0.5 percentage points in 2023 due to the inflation compensation bonus. The estimates for the foregone PIT revenue due to these bonuses are subtracted in all counterfactual simulation results, as i.) the Euromod uprating factors for wages implicitly include these payments and ii.) we do not consider this policy measure as a direct PIT reform. Compared to a counterfactual of the tax-transfer system in 2019 without any indexation, tax revenue is 1.2 percentage points lower. The three indexation scenarios are also above the actual tax revenue share of 8.96 %, with tax base growth and lagged HCPI at 9.4 % of GDP and concurrent HCPI at 9.15 %. Fiscal drag has thus been overcompensated by 146 % based on the average effective offsetting in the three indexation scenarios. The indexation measures would not have fully offset fiscal drag (contribution to offsetting fiscal drag of 82 %), but the partial abolition of the solidarity surcharge is a decisive factor for the overcompensation between 2019 and 2023, while controlling for the inflation compensation bonus.

Greece (EL)

Description of the Personal Income Tax

Tax Base: Taxable income includes reported employment and self-employment income, other market income, income from rent, private transfers received, education allowances, civil servants' family benefit, sickness benefits, disability pensions, main old age pensions (and supplementary), minor old age pensions, orphans' and widows' pensions). Unemployment benefits are also part of the tax base for individuals with (other) taxable income over €10,000. The tax base is defined as taxable income minus the tax allowances (described below). Income from interest and dividends is taxed separately.

PIT: Personal income tax is applied at the individual level. Spouses file a joint income tax return, but their incomes are entered separately and taxed individually. However, there is a partial exception to this rule: some tax allowances and/or tax credits are jointly assessed. Income taxation is graduated, with progressively higher marginal tax rates applying to higher income brackets[1].

Exemptions: Unemployment benefits, social assistance and some family benefits are not included in taxable income. Employment or pension income of persons suffering from any kind of disability over 80% is also tax-exempted[2].

Tax allowances[3]: Tax allowances here are defined as deductions from taxable income and most of them are per tax unit. In 2019-2023 they only include social insurance contributions. All social insurance contributions are fully deducted from taxable income.

Tax credits: Tax credits are defined as deductions from tax due. They include (1) Employment & pension income tax credit[4], (2) Disability tax credit[5], (3) Charitable donations tax credit[6].

Indexation practices

Indexation of PIT brackets and income is not used in Greece. Tax parameters are adjusted on a discretionary basis.

Other reforms

PIT Tax Schedule: In 2020, the PIT tax schedule was reformed with the introduction of an additional tax band featuring a lower tax rate. Additionally, the tax rates for higher income brackets were slightly reduced. The tax schedules applicable from 2019 to 2023 are presented in the following tables. Note that the tax schedule depicted in Table 2 is applied separately to farming income.

Social Insurance Contributions: In 2020, 2021 and 2022 employees' and employers' social insurance contribution rates were reduced (cumulatively by 1.88 p.p. and by 2.22 p.p. respectively). In 2020, the self-employed and farmers'social insurance contributions changes into a schedule of insurance classes (i.e. lump sum amounts irrespective of self-employment/farming income) (as opposed to a rate-based schedule before). In 2023, the self-employed social insurance contributions were increased in line with inflation.

Minimum wage: In 2022 and 2023 the minimum wage was increased, thereby affecting the level of the unemployment insurance benefit, which is connected to it, as well as the upper and lower earnings limits for the social insurance contribution base.

Employment & pensions income tax credit: In 2020, this tax credit became less generous[7].

Table 1: Tax schedule: employment, pension, self-employment & farming income (2019)

Tax band	Income bracket (€ per year)		Tax rate (%)
	Lower limit	Upper limit	
1	0	20,000	22
2	20,001	30,000	29
3	30,001	40,000	37
4	40,001	…	45

Table 2: Tax schedule: employment, pension, self-employment & farming income (2020-23)

Tax band	Income bracket (€ per year)		Tax rate (%)
	Lower limit	Upper limit	
1	0	10,000	9
2	10,001	20,000	22
3	20,001	30,000	28
4	30,001	40,000	36
5	40,001	…	44

Table 3: Tax schedule: property income (2019-2023)

Tax band	Income bracket (€ per year)		Tax rate (%)
	Lower limit	Upper limit	
1	0	12,000	15
2	12,001	35,000	35
3	35,000	…	45

Tax-to-base Elasticities

The estimated TTB elasticity for Greece is 1.80, which is close to the average among EU countries[8]. However, the elasticity is notably higher for self-employment income (2.54) and capital income (2.15), as these income sources do not benefit from the employment and pension tax credit. In contrast, pension and benefit incomes, which are taxed under the same progressive schedule as labor income, exhibit a lower elasticity of 1.16 due to the fact that the underlying distribution of pensions is tilted to lower incomes (so pensions face a lower average tax rate), while substantial tax credits are also available.

The primary driving factor of the TTB elasticity is the impact of tax deductions and credits, accounting for approximately 80% of the fiscal drag effect, while the progressivity of tax brackets contributes the remaining 20%.

These mechanisms remain fairly consistent across the income distribution, which displays relatively low variation in elasticity. The lowest income decile has an elasticity of 1.19, as individuals in this group have zero tax liability both before and after an income increase (only around 12% of individuals in the first decile pay PIT). Lower- and middle-income deciles display higher elasticity, mainly due to the diminishing relative value of key tax deductions, which significantly influence their tax liability. At higher income levels, elasticity decreases, as bracket progressivity becomes the dominant factor in determining tax liability.

The tax benefit with the biggest impact on the elasticity (denoted "Tax benefit 1" in the paper) is the employment & pensions income tax credit. This tax credit provides tax relief which is increasing with the number of dependent children. It applies to taxpayers with incomes up to a certain threshold and is capped at their actual tax liability. For incomes exceeding his threshold, the credit gradually decreases as income rises. The second tax benefit is the disability tax credit (denoted "Tax benefit 2") and the third tax benefit is the charitable donations tax credit (denoted "Tax benefit 3")

The PIT has a relatively high redistributive capacity in Greece, as the post-tax income inequality (as measured by the GINI coefficient) is reduced after the income increase (given constant tax parameters). Inequality tends to decrease, despite the decrease in progressivity (as measured by the Kakwani index), because the tax becomes more concentrated in the lower part of the distribution, where elasticities are either zero or very low (as a result of a large share of zero-taxpayers remaining unaffected after a 1% increase in their income).

Counterfactual simulations

Between 2019 and 2023, PIT revenues as a share of GDP remained largely stable at approximately 5.9% of GDP, while the average effective tax rate declined slightly by 0.15 pp to 8.68%. This development was the combined effect of the PIT tax policy reforms and the absence of indexation practices. A counterfactual scenario under the 2019 legislation without indexation would have resulted in higher revenues – by 0.61 pp of GDP – and an increased effective tax rate. Conversely, applying full indexation under the 2019 legislation (with tax base growth and lagged HICP) would have led to only a slight increase in revenues, by 0.1 to 0.2 pp of GDP, respectively. In contrast, indexation based on concurrent HICP would have resulted in marginally lower revenue collection and a slight decrease in the average effective tax rate compared to 2019.

More specifically, as illustrated in Figure 7, panel (b), policy reforms implemented between 2019 and 2023 effectively offset more than 100% of the potential fiscal impact, maintaining the average effective tax rate approximately at its 2019 level.

[1] For more details on the tax schedule, see "Other reforms" section.

[2] Unemployment benefits, large family benefit, disability benefits are taxed for individuals with (other) taxable over €10,000.

[3] Note that tax allowances are usually shared between the main taxpayer and his/her spouse.

[4] It applies to the sum of employment, pensions and farming income (EPF incomes). For more details, see "Other reforms" section.

[5] In 2019-2023 the tax credit was €200 annually per eligible taxpayer.

[6] The charitable donations tax credit is calculated as 10% of donations greater than 100 euro per annum but less than 5% of tax base.

[7] In 2019 it was equal to €1,900/€1,950/€2,000/€2,100 for taxpayers with zero/one/two/three or more dependent children and EPF incomes up to €20,000 per year and it is capped to the amount of people's actual tax liability; it was decreased by €10 for each additional €1,000 of EPF incomes over €20,000. In 2020-2023 the tax credit was equal to €777/€810/€900/€1,120/€1,340 for taxpayers with zero/one/two/three/four dependent children and EPF incomes up to €12,000 per year and it is capped to the amount of people's actual tax liability; for each additional dependent child after the fourth it increases by €220. The tax credit decreased by €20 for each additional €1,000 of EFP incomes over €12,000.

[8] Similar to the OECD estimate (Price et al, 2015), especially after excluding pensions.

Hungary (HU)

Description of the Personal Income Tax

The Hungarian Personal Income Tax (PIT) is levied on the universal income of Hungarian tax residents (persons). The PIT generally has a flat rate of 15% on labor income, capital income and some forms of income from self-employment, while government benefits and pensions are technically tax-exempt. Income from self-employment is calculated by deducting the deductible costs from the gross revenue, while in case of labor income and capital income the tax base is in general the gross income. The Social Security Contribution (SSC) is levied on labor income and income from self-employment, but none of capital income with the flat rate of 18.5%.

There are multiple tax allowances, exemptions and benefits available for taxpayers, which can reduce the payable PIT and SSC. The Family Tax Allowance (CSAK) is available for either of the parents raising at least one child. The amount of this tax benefit increases progressively with the number of dependents and is deductible from the PIT base and payable SSC. Since 2020, women raising or having raised four or more children are exempt from paying PIT for their labor income. Similarly, labor income is partially PIT-exempt for residents under the age of 25 from 2022, and also for mothers under the age of 30 since 2023.

Indexation practices

The nominal amount of tax benefits is not automatically indexed annually, and it hasn't changed in the examined 2019-2023 period.

Other reforms

The government decided on a one-off PIT refund in 2022 (PIT paid after 2021 incomes) for families raising children, up to HUF 800,000 per parent. The size of the measure was approximately HUF 680 billion, reducing net PIT cash revenues in 2022.

There have been some major changes in the Itemized Tax of Small Taxpayers (KATA) in September 2022, which tightened the conditions for self-entrepreneurs. This might have channeled some of the taxpayers into different, higher rate tax categories, such as the Flat Rate Tax or PIT and in return could have increased PIT revenues.

Tax-to-base Elasticities

The TTB elasticity estimated for Hungary is 1.10, which is one of the lowest in the EU. The elasticity was larger for labor incomes (1.37), self-employment incomes (1.25), and capital incomes (1.40). Pension and most benefit incomes are taxed with a 0% PIT rate; thus the elasticity is near zero (0.02).

This elasticity is explained vastly by the effect of tax benefits and allowances loosing relative value (99% of the fiscal drag effect), while the effect of other factors is marginal.

The elasticity slightly differs along the income distribution. While the elasticity of the first decile is only 1.01, that of the fourth decile is 1.20, and slowly decreases in higher income deciles to 1.04 in the top income decile. The main reason for this is the nominally fixed Family Tax Benefit. While lower income families cannot deduct the full amount of the benefit, families in the 2nd-4th income decile are more bound to be able to do so and thus start paying more tax with higher income. This is underscored by the fact that individuals with zero tax liability

is the highest in the lowest income decile (63%), which gradually declines in higher income deciles to 4% in the top decile.

The difference between this TTB estimate and the one calculated by OECD is mainly attributable to the different sample period as the elasticity may have decreased in time because of dynamics of tax benefit depreciation.

Counterfactual simulations

The revenue from PIT in Hungary increased from 5.06% in 2019 to 5.32% in 2023 as a share of GDP. It also dropped to 4.21% of GDP in 2022 due to a vast tax refund to families. The slight increase is in line with the contemporary income growth and the relatively low-income elasticity of PIT revenues. Comparing the counterfactuals with the 2023 figure (5.3% of GDP), all kinds of indexation of tax parameters would have slightly decreased the revenue (by 0.1 p.p. of GDP). In case 2019 tax legislation was applicable for 2023, PIT revenue as a share of GDP would have increased to 5.9%. The main difference in 2019 and 2023 legislation is the tax exemption.

Ireland (IE)

Description of the personal income tax

In Ireland, income from most sources is liable for personal income tax (PIT). This includes income from employment (including wages, bonuses, overtime and benefits-in-kind), self-employment, property and investments, pensions and social protection payments, which covers: *universal payments* (such as child benefit, which are non-contributory and non-means tested); *social assistance payments* (such as fuel allowance or job seeker's allowance, which are non-contributory but means tested) and *social insurance payments* (such as maternity/paternity benefit and the State pension, which are dependent on contribution history). While all income is in principle taxable, some payments (largely universal and social assistance payments) are de facto not taxed or specifically tax exempt (e.g. child benefit). Some specific sources of personal income are also taxed separately, such as deposit interest. There are three types of tax encompassing the Irish PIT system:

- Pay-As-You-Earn (PAYE) income tax
- Self-assessed income tax
- The Universal Social Charge (USC)

PAYE and self-assessed income tax

PAYE tax is levied on employee income and is collected as part of payroll processes. Self-assessed income tax applies to income from sources where some or all of the tax cannot be collected under the PAYE system. This includes income from self-employment and income from pensions that is declared as part of the annual self-assessment return. Income tax is applied at the individual level, but there is the option for married couples and civil partners to choose to be taxed jointly. Income tax is calculated as a percentage of taxable income. Currently, there are two rates of tax: a "standard" rate of 20% which applies to all income up to the standard rate cut-off point and a "higher" 40% rate which applies to the remaining balance. Individuals aged 65 or over do not pay income tax if their income is below the exemption limit.

The final amount of tax owed is reduced through *tax credits,* entitlement of which depends on personal circumstances. In Ireland, the main tax credits are personal tax credit, employee tax credit and earned income (self-employment) tax credit. Tax credits are deducted after an individual's tax liability has been calculated; meaning they have the same value whether an individual is a standard or higher rate taxpayer. *Tax reliefs,* for example for making pension contributions, are also available. These reduce the amount of income that an individual pays tax on. Public sector employees pay an *Additional Superannuation Contribution* (ASC, formerly *Pension-Related Deduction*) calculated on the basis of pension remuneration, not taxable income. However, the ASC qualifies for income tax relief at the marginal rate and is therefore relevant to PIT.

USC

The USC is a tax on gross incomes exceeding €13,000 per year. It is calculated separately to the income tax calculations under PAYE or self-assessment. Therefore, it is possible in the Irish system for an individual to have income that is not liable to income tax but is liable for the USC. However, unlike income tax, all social protection payments including maternity benefit, child benefit and State pension are exempt from the USC. In addition, USC is fully individualized and cannot be jointly assessed. Aside from PIT, Ireland's tax system also includes capital and inheritance taxes. The social welfare system is also primarily financed by Pay-Related Social Insurance (PRSI) contributions made by employers and employed persons. Different contribution conditions

apply to different types of employment. Most employees earning below €352 are exempt from paying PRSI but remain insured. The PRSI calculation applies a different set of reliefs to the personal income tax system and social insurance contributions are not tax deductible.

Indexation practices

There is no formal, automatic indexation regime in Ireland. Instead, tax parameters are adjusted on a discretionary basis. However, these adjustments are intended to act in a similar fashion to indexation. Over 2019 to 2023, the main discretionary indexation changes were:

- An increase of €125 to the personal, employee and earned income tax credits and €250 for the married/civil partnership tax credit.
- A broadening of €4,700 to the standard rate tax band.
- The upper limit cut-off for the 2% rate of USC increases from €20,687 to €22,920.

Other reforms

The main reforms relevant to PIT that occurred between 2019 and 2023 are:

- Introduction of a rent tax credit – available to eligible renters for the tax years 2022 to 2025. In 2022 and 2023, the credit is worth €1,000 per year for jointly assessed married couples or civil partners or €500 in all other cases, including single persons.
- Mortgage interest relief – available in 2023 and 2024 to eligible homeowners with an outstanding mortgage balance between €80,000 and €500,000 as of 31st December 2022. Standard tax rate (20%) relief is available up to a maximum tax credit of €1,250.

Both of these measures require a taxpayer to apply for them via the annual self-assessment return process. While, we implement these measures in EUROMOD in the year they are available from (i.e. 2022 and 2023 respectively), we note that in practice, taxpayers typically apply for these (via the self-assessment process) in the following tax year and actually have up to four years to submit a self-assessment and claim the credits.

Tax-to-base Elasticities

The Irish analysis for this project was completed on EUROMOD Model J0.12. The TTB elasticity estimated for Ireland is 1.81 in 2019. This value is similar to previous estimates. For example, OECD estimates by Price, Dang & Botev (2015) find 2.04 (drawing on a data sample covering 1990-2013) and Acheson et al. (2017) obtain estimates of 2.0 for income tax and 1.2 for USC (based on the 2003–2013 tax structure). While Conroy (2020) estimates an elasticity of 1.4 for income tax – which includes USC and the income levy (prior to 2011) – using a revenue dataset covering 1987-2017 which has been adjusted for tax policy changes.

There is some heterogeneity in the TTB elasticities of different income sources. We find the largest elasticity is associated with self-employment income (2.12), followed by capital (2.03) labour (1.97) and finally benefits and pensions (0.71). A lower TTB elasticity for the latter is due to the fact that many social welfare payments are not taxable and recipients are mostly located at the bottom of the distribution and are hence faced with zero (or very low) average tax rates. Larger elasticities for self-employment and capital income are consistent with the larger share of these income sources in the incomes of individuals in the top half of the distribution. Self-employment having the highest TTB elasticity may also reflect this source being liable for an additional USC

rate. However, our estimates do vary from previous OECD estimates which found 2.11 for labour income; 1.61 for self-employment income and 1.81 for capital income.

TTB elasticities in Ireland also vary greatly across the individual tax base distribution. They show a regressive pattern, whereby the TTB elasticity falls from 8.04 in the first decile group to 1.41 in the top decile group. However, Ireland's PIT liability is highly concentrated at the top of the distribution. Our analysis finds the top 20% of individuals in the individual tax base distribution account for almost 70 per cent of total PIT collected in the State. This finding is consistent with official data from Revenue. Therefore, while TTB elasticities are higher further down the distribution, it is the lower TTB elasticities at the top that carry the most weight in the overall calculation. The high TTB elasticity at the bottom of the distribution is to a large extent methodological, driven by the high share of taxpayers (around 8 in 10) with zero PIT liability.

Regarding the effect of different components of the PIT schedule on fiscal drag, our analysis shows that bracket indexation plays an important role in Ireland. When brackets are uprated, the TTB elasticity reduces from 1.81 to 1.42. Indexing the tax credits next further diminishes the TTB elasticity to 1.11. The remainder is driven by USC bands, while thresholds associated with pension and mortgage interest relief appear to have no role once the other factors are accounted for. For higher income taxpayers, it is the progressivity of tax brackets that is most important. In contrast, tax credits are more effective for lower income individuals. This is likely due to their application post-tax liability calculation which means the relative value of the credits is higher for lower income individuals. From an inequality perspective, we observe that Ireland's redistributive tax and benefit system performs well in reducing inequality according to both the Gini coefficient and the 80/20 ratio. As a result, the fiscal drag effect associated with a hypothetical 1 per cent increase in gross income does not appear to substantially impact inequality. Similarly, the Kakwani index remains virtually unchanged, indicating no significant deterioration in the progressivity of the Irish tax system.

Counterfactual simulations

For the analysis over 2019-2023, we apply the uprating factors in EUROMOD Model J0.12 and implement the temporary cost of living measures relevant for PIT, namely the rent tax credit and mortgage interest relief (as discussed above). We make no changes to social insurance or Local Property Tax as neither are relevant to PIT.

We estimate that, over 2019-2023, PIT revenue rose €9.6bn. However, had the tax system been unchanged, revenues would be a further €2.9bn higher and the average effective tax rate almost two percentage points higher. Of the three indexation scenarios modelled, tax revenue in 2023 is lowest under concurrent HCPI and highest under lagged HCPI. These results are consistent with the values of these indexation parameters being the largest (15.83%) and smallest (11.11%) respectively of the three scenarios. The results imply that indexing to lagged HCPI would have overcompensated for inflation.

Averaging across the three index options, the simulation estimates 90 per cent of potential fiscal drag is offset. Of this offsetting, our microsimulation estimates at least 73 per cent is due to discretionary indexation changes to tax brackets and existing tax credits, as opposed to other new reforms (i.e. the new rent tax credit and mortgage interest relief). This is consistent with Part 1 of the analysis finding the importance of progressivity of tax brackets and existing tax credits. However, the true figure could be even higher than 73 per cent, as the EUROMOD microsimulation implicitly assumes all eligible taxpayers apply in-year for all available tax credits. In reality, we know the take-up of the rent tax credit and mortgage interest relief is likely lower than simulated. Therefore, the true importance of discretionary indexation changes could be somewhat higher. Nevertheless, the analysis suggests that while Ireland does not operate automatic indexation, discretionary changes made by the Government do act in a similar fashion and are important for offsetting potential fiscal drag.

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 (around 180 billion euros, more than one-fifth of revenues, almost 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). Income from business activities (self-employment) up to a given threshold - currently 85000 euros - is subject to proportional taxation. Finally, capital income is subject to proportional taxation, with limited 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, 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 deduction 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*" or "integrative treatment") directly paid to taxpayers with nonzero tax capacity below a given threshold of income. Finally, regional and municipal authorities can impose a (limited) surcharge to each rate of the schedule.

Indexation practices

The Italian PIT system does not adjust tax brackets or thresholds for deductions and tax credits based on inflation. This results in fiscal drag, where rising nominal incomes push taxpayers into higher tax burden without an increase in real purchasing power. Since PIT mainly applies to employees and retirees (while many self-employed individuals benefit from substitute tax regimes), the lack of indexation disproportionately affects these groups.

Unlike PIT, income thresholds within which social security contributions are due (SSCs) are adjusted for inflation. This means the minimum and maximum taxable bases for SSCs change annually. SSC indexation helps maintain revenue neutrality given that pension benefits (funded by SSC) are largely indexed to inflation.

Recent policy changes reduced employee SSC rates to help offset inflation effects, though these were separate from automatic indexation.

Other reforms

Between 2019 and 2023 the personal income tax faced several changes. The 2022 budget law (Dicarlo et al., 2023) 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 5,500 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 concerned 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" 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]

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.

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.

Between 2022 and 2024 Social Security contributions follow a specific schedule as well. The standard rate 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.[2]

Tax-to-base Elasticities

The tax to base elasticity estimated for Italy is 1.86, in line with the EU average. The elasticity is larger for labor incomes (1.95) 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 (1.3), mostly concentrated in the first two deciles of the income distribution. This is likely to be underestimated as these self-employed are now mostly taxed with an optional flat rate regime ("*forfettario*") for businesses with revenues lower than 85,000 euros.[3] 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 over-proportional effect of the TTB elasticity (86 basis points) is explained partly by the effect of tax credits and deductions loosing relative value (around 52 percentage points of the over proportional elasticity) and partly by the progressivity of the tax brackets (29 basis points). The remaining 5 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 TTB elasticity. The lowest decile has *de facto* an elasticity of zero, as these 98 percent of these individuals have a zero tax liability both before and after the increase in their income. The few taxpayers in the lowest decile however face the largest elasticity, around 10 percent. The remaining low- and middle-income deciles also display a larger TTB elasticity. In both cases, this is primarily due to the loss of relative value of their tax benefits, which play a significant role in the calculation of their tax liability. Top incomes display a lower and decreasing TTB elasticity, in which bracket progressivity is the dominant force.

The tax benefit with a bigger impact on the elasticity (denoted "Tax benefit 1") are the deductions based on income source (employment, pension, and self-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 TTB elasticity on the lower part of the distribution of taxable income, as for taxpayers in this part of the distribution an increase of income not only reduces the relative value of this tax credit but it causes it to reduce its size. The second tax credit in terms of their impact on the elasticity is the so called "integrative treatment" or *Irpef bonus* (denoted "Tax benefit 2"). This is a transfer applicable to all taxpayers with income lower than 15,000 euros that depends on the months of employment within the year. These two tax credits and deductions explain most of the effect on the TTB elasticity that can be attributed to tax benefits. The last big chunk of the TTB elasticity is explained by fiscal expenditures.

Counterfactual simulations

Over the period 2019-2023, PIT revenue in Italy remained relatively stable as a share of GDP, hovering around 0.9%. This stability resulted from two offsetting forces: the lack of indexation of nominal parameters and the implementation of PIT reforms. When compared to a counterfactual scenario using 2019 legislation without indexation, actual tax collection was only marginally lower (0.3 points of 2023 GDP). However, under a counterfactual scenario with 2019 legislation and full indexation, PIT revenue would have been even lower, with estimates ranging between further 0.3 and 0.9 percentage points of GDP, as illustrated in Figure 6 panel (b). Notably, indexation based on concurrent HICP would have led to the lowest revenue collection and would have decreased the average effective tax rate compared to 2019 levels, potentially leading to over-compensation during this period.

The analysis reveals that 40% of potential fiscal drag was offset by policy measures, with reforms being the only mechanism for this offset. The remaining 60% of potential fiscal drag materialized, contributing to increased tax revenues, as shown in Figure 7 panel (b).

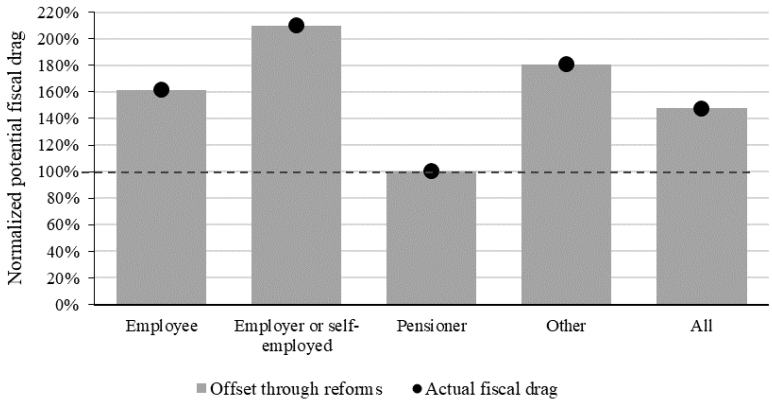
These estimates, however, do not account for changes in SSC rules, which effectively reduced the tax burden for employees. SSC cuts were introduced in 2022 and expanded in 2023 and 2024 as a mechanism to reduce the tax wedge during a period of high inflation. The 2025 budget law made these tax cuts structural by transforming them from SSC reductions into a combined system of a new bonus and tax deduction within the structure of the PIT.

When considering both SSC and PIT payments, the analysis suggests that fiscal drag in Italy was more than fully offset, primarily due to the substantial resources allocated to SSC interventions (11 billion euros annually, net). The measure benefitted dependent employees only, which anyway account for almost 60% of taxable income (figure 2, panel b). Grouping households by type of prevalent income, fiscal drag was more than offset across all household categories, with pension-dependent households experiencing a more modest relief. It's worth noticing that this is likely to understate the effect of fiscal drag for pensioners, as the analysis excludes benefit erosion in pension payments, treating pensions as a sort of deferred "salary".

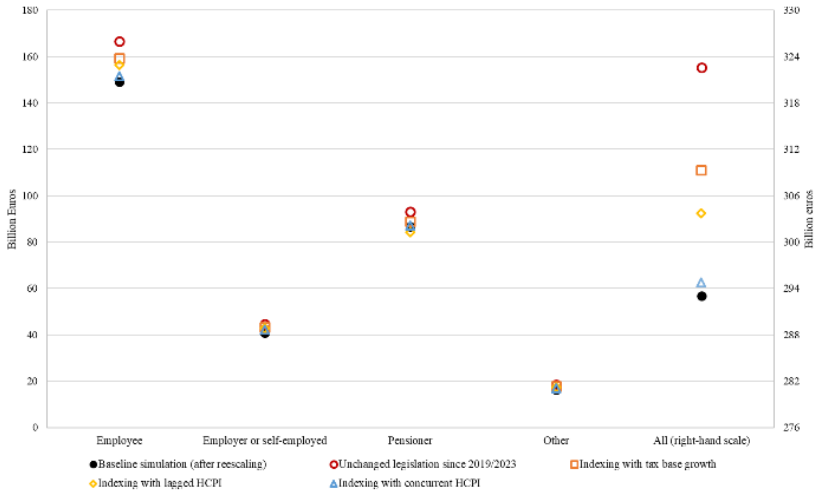
Despite the comprehensive offset of fiscal drag across categories, the lowest relief is concentrated among indeed housholds with prevalent income from pensions, as illustrated in the figure below, panels (a) and (b).

Figure IT 1: Fiscal drag in Italy including SSC cuts

(a) Fiscal drag offsetting by prevalent income within the household



(b) Tax revenue evolution, 2019-2023 by prevalent income within the household



[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 (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.

[2] The budget law for 2023 established a cut in SSC by 2 and 3 percentage points for incomes below 35 and 25 thousand euros respectively. Decree law 48/2023 increased the discount to 6 and 7 percentage points for the second half of the year. The budget law for 2024 established this cut for the whole year. The 2025 budget law made these tax cuts structural within the framework of the PIT.

[3] The EUROMOD model does not simulate the substitute tax regime on self-employment income. The fiscal drag effect in terms of erosion of resources for self-employment incomes is therefore overestimated.

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.[1] 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.

Other reforms

There have been several other reforms, beyond the PIT, that have influenced the income base taxed under PIT.

In 2018, Latvia made significant changes to its Corporate Income Tax (CIT) system, deferring taxation on corporate profits until they were distributed as dividends. This shifted the taxation of dividends from PIT at 10% to CIT at 20%. A transition period until 2020 allowed dividends to be withdrawn under PIT at the lower

rate, leading to unusually high distributions within these two years, especially in 2019. Although some dividends are still taxed under PIT, the total amount is much lower.

Additionally, as of July 1, 2021, a minimum (or mandatory) social insurance contribution (mSIC) was introduced, (based on a minimum wage, EUR 720 for 2025). If an individual earns less from all taxable income sources, the employer is responsible for making the mSIC contributions on the employee's behalf. This promoted a shift from part-time to full-time employment and potentially - towards the legal economy. Furthermore, from 2021, the rate of social contributions decreased from 35.09% to 34.09%, or by 0.5 percentage points for both employers and employees, potentially increasing the PIT base.

Moreover, in 2021, changes to the micro-enterprise tax (MET) application procedure were introduced. The general tax regime was applied to all MET payers' employees (previously a significantly lower tax regime was used), and amendments also revoked the salary ceiling applicable to MET payers' employees.

Overall, the changes in labour tax policies have also encouraged a broader shift to the general tax regime, and potentially a decrease of shadow-employment. Thus, increasing and expanding the PIT base (taxable income).

Tax-to-base Elasticities

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 TTB elasticity is primarily attributed to the diminishing relative value of tax benefits, 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 TTB 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 TTB elasticity increased to 1.55. The average effect of tax progressivity increased to 13.4% as more taxpayers 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 TTB elasticity declined to 3.5. At the same time, the pick of TTB 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.

Counterfactual simulations

Over the period 2019 – 2023, revenue from PIT in Latvia increased by 28%; however nominal GDP grew by 32% and income by around 40%. In 2019, PIT revenues were 6.7% of GDP, while dropped to 6.5% in 2023. This slower growth in PIT revenue compared to GDP and income in Latvia can be explained by a significant increase in non-taxable income and allowances for dependents (as described above), narrowing the PIT taxable base.

The counterfactual scenario, assuming that tax policies remain as in 2019 and income is indexed in line with the average income growth (represented by the red dot), shows that PIT revenues could have reached 7.7% of GDP (1 percentage point increase as compared to 2019 or 1.3 percentage point increase compared to 2023). If PIT parameters had been indexed to income growth, PIT revenues could have been 6.9% of GDP (represented by the green dot). Indexing with harmonised or lagged HICP growth could have resulted in PIT revenues of 7.0% or 7.2%, respectively. Taking the averages of the three indicators and subtracting from the 7.7%, simulations show that indexation, on average, could have lowered fiscal drag by 0.71 percentage point of GDP.

In 2023, the actual PIT revenue in Latvia was lower than in the counterfactual scenarios. This suggests that fiscal drag in Latvia in 2023 comparing to 2019 was overcompensated, similar to half of the countries in the sample. Therefore, in 2023, the actual PIT revenues were lower than they would have been if tax policies remained unchanged and PIT parameters had been indexed. The ratio of two distances - first, between the actual PIT revenues in 2023 and the contrafactual scenario with unchanged tax legislation from 2019, and second, between the indexed and non-indexed contrafactual scenarios - is 1.8.

[1] 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).

Lithuania (LT)

Description of the Personal Income Tax

Personal income tax (PIT) in Lithuania is applied at the individual level. PIT is levied on both residents and certain non-residents. Residents are taxed on their worldwide income, including earnings from employment, self-employment, investments, and capital gains. Non-residents may be taxed on specific income sourced within Lithuania, such as employment income, interest, dividends, and income from real estate or other property. Certain types of income are exempt from PIT, including various allowances[1], scholarships, grants, specific benefits[2], etc. In 2019 the Law on personal income tax stipulated 57 PIT-exempt income sources and special cases; by 2023, this number had increased to 60. The most important deduction applied is non-taxable minimum income. In 2019, the maximum amount was set at €300 and was applicable to wages up to 2 average wages (AW). By 2023, the maximum non-taxable minimum had increased to €625, applicable to wages up to 1.5 AW.

Income is taxed based on its source. A standard PIT rate of 20% applies to annual employment (labor) income up to a certain threshold, which is measured in average wages (AW) and changed over time. In 2019, the threshold for the standard PIT rate was 120 AW, reduced to 84 AW in 2020, and further to 60 AW in 2021, where it has remained constant through 2024. Income exceeding the threshold from 2019 to 2023 is taxed at a higher rate, which has also varied over time: the highest PIT rate was 27% in 2019 and increased to 32% from 2020 to 2023. Self-employment income is generally subject to a 15% PIT rate. However, the effective tax rate can range from 5% to 15% due to the application of a PIT credit (non-taxable minimum income for the self-employed), calculated using specific formulas. Additionally, individuals may carry out certain economic activities under a business certificate. Subject to specific conditions and limits—such as a defined list of eligible economic activities and an annual revenue cap of €45,000—they may pay a fixed amount of income tax. Capital income, including dividends and other similar earnings, is taxed at a 15% rate. Other types of income unrelated to employment, such as sickness, maternity, paternity, childcare, and long-term employment benefits, are also subject to a 15% PIT rate.

Indexation practices

Generally, PIT parameters in Lithuania are adjusted on a discretionary basis. The indexation of PIT brackets for the higher PIT rate is quasi-automatic, as these are defined in terms of the average wage (AW). Consequently, part of the bracket is automatically adjusted in line with AW growth, whereas the number of AW (along with other tax parameters such as tax rates, the amount of non-taxable minimum income, and thresholds for deductions) is changed based on government decisions. However, the minimum wage, which forms part of the calculation formula for the non-taxable minimum income, is indexed using a predefined formula agreed upon by the Tripartite Council of the Republic of Lithuania, ensuring adjustments reflect economic conditions.

Other reforms

There were no major reforms in PIT taxation in 2019-2023, except some parametric changes mentioned above. All these changes introduced in the system, are accounted for in the EUROMOD and our analysis.

Tax-to-base elasticities

The estimated TTB elasticity for Lithuania is 1.31, markedly lower compared to other EU countries. The highest elasticity is associated with labor income (1.42), followed by the elasticity of benefits and pensions (1.07) and capital income (1.01). The lowest elasticity is observed for self-employment income (0.73).The TTB elasticity in Lithuaniais one of the lowest among EU countries included in this analysis because PIT system is dominated

by two flat rates and tax allowance (tax-exempt minimum amount of income). Therefore, the elasticity is primarily influenced by the progressive loss of relative value of the tax allowance on the lower end of income distribution and the increasing marginal and average tax rates for high incomes (exceeding a defined threshold) on the upper end of the distribution. In quantitative terms, the indexation of tax brackets reduced the elasticity from 1.31 to 1.24, while indexation of non-tax minimum income fully offset the fiscal drag, reducing the elasticity to 1.01. The remaining 4 % is a residual component that cannot be offset by updating of the nominal tax parameters included in the micro-stimulator.

Estimated TTB elasticity for Lithuania varies significantly across the income distribution. The elasticity for the lowest decile cannot be computed, as some individuals with low income are not subject to PIT and are therefore excluded from the income dataset used in the analysis. The elasticity in the 2nd decile (1.10) remains close to proportionality effect due to very low labor and self-employments incomes. These incomes are subject to the maximum amount of non-tax minimum income, favoring the lowest effective PIT rate. The highest elasticity, at 2.19, is observed in the 3rd decile, which includes incomes near the wage threshold up to which the non-taxable minimum income is applied. As a result, the effective PIT rate for the 3rd decile is highly sensitive to income growth and discretionary changes of tax parameters. The remaining low- and middle-income deciles show lower and declining elasticity. This trend is primarily due to diminishing of relative value of tax deductions, which play a significant role in determining their tax liability. Top incomes show a further decreasing elasticity, which is primarily influenced by bracket progressivity.

Counterfactual simulations

Over the period 2019–2023, the PIT revenue-to-GDP ratio in Lithuania remained relatively unchanged, increasing slightly by approximately 0.6 percentage points. This stability can largely be attributed to the indexation of nominal PIT parameters, which were adjusted in line with the growth of overall taxable income.

Compared to a counterfactual scenario based on 2019 legislation without indexation, actual PIT collection in 2023 was 8% lower. Meanwhile, under a counterfactual scenario with full income growth indexation, PIT revenue would have been only marginally higher (1.1% or 0.08% of GDP, as shown in Figure 7, panel (a)).

Indexation based on concurrent (or lagged) HICP would still have resulted in smaller adjustments to PIT parameters, leading to higher than actual PIT revenue collection in 2023. This outcome is due to the significantly stronger income growth compared to the increase in the price level over the 2019–2023 period. Furthermore, indexation tied to HICP would have increased the average effective tax rate compared to 2019, indicating under-indexation of PIT parameters during the period.

More specifically, as shown in Figure 7 panel (b), more than 100% of potential fiscal drag was offset by measures implemented over the period, with indexation measures being the main driver. Therefore, compared to other countries, a rather small potential fiscal drag was not allowed to happen, leading to a rather stable PIT revenue-to-GDP ratio in Lithuania. As shown in Figure 7, panel (b), approximately 100% of the potential fiscal drag was offset by measures implemented during this period, with indexation being the primary driver. Consequently, compared to other countries, the relatively small potential fiscal drag in Lithuania was mitigated, resulting in a rather stable PIT revenue-to-GDP ratio.

[1] It includes allowances paid in the event of: death of an individual, child birth, very low income, natural disasters, damages or losses incurred by war actions or previous political persecution, etc.

[2] Benefits under life and non-life insurance contracts with certain conditionality, pensions and annuity payments, etc.

Luxembourg (LU)

Description of the Personal Income Tax

Luxembourg has a progressive personal income tax system. Individuals are assigned to one of three tax classes, which impacts their tax liability. Class 1 applies to single taxpayers who do not qualify for any special allowances. It generally results in a higher tax burden compared to other classes. Class 1a is assigned to single parents, widows/widowers and individuals aged 64 or older. It provides some tax advantages compared to Class 1, reducing the overall tax liability. Class 2 applies to married couples and civil partners who opt for joint taxation. It relies on income splitting, which can significantly lower the effective tax rate by spreading the income over two taxable entities. In practice, the couple's combined taxable income is divided by two, the tax is calculated on this halved amount, and then the resulting tax is doubled. This often leads to a lower effective tax rate compared to Class 1 or 1a.

Taxable income in Luxembourg is obtained by summing up all sources of income and applying relevant deductions and allowances. The main categories of income include wages and salaries, business and self-employment income, capital income, rental income and pension benefits. To determine taxable income, certain deductions and allowances are applied, such as social security contributions, work-related expenses, mortgage interest deductions or childcare and education-related expenses.

Once the taxable income is determined, the income tax is calculated using a progressive tax scale, comprising 23 tax brackets. Each bracket corresponds to a portion of taxable income to which an increasing tax rate applies, ranging from 0% for the lowest incomes to 42% for the highest. There is no automatic indexation mechanism to the tax brackets, which leads to fiscal drag if the government does not implement discretionary indexation or reforms of the tax system. Additionally, a solidarity surcharge of 7% is applied to the tax liability for most taxpayers. For the taxable income over €150,000 (for single taxpayers) or €300,000 (for jointly taxed couples), the surcharge increases to 9%.

Taxpayers can benefit from various tax credits, which reduce the amount of tax payable. These credits are designed to support individuals and families, incentivize certain behaviors, and promote economic and social policies. Some of the most common tax credits in Luxembourg include the tax credit for employees, pensioners, and self-employed individuals, which lowers the tax burden on work-related income, and the tax credit for minimum wage earners, aimed at supporting low-income workers. For low-income individuals, tax credits can lead to a negative tax burden.

Indexation practices

Tax parameters in Luxembourg are adjusted on a discretionary basis, as there are no indexation rules regulating their change over time. The tax brackets were not adjusted to inflation between 2019 and 2023[1] and most of the thresholds for deductions remained unchanged. Thresholds for some tax credits were however revised upwards (tax credits for employees/pensioners/self-employed, tax credit for social minimum wage).

Other reforms

Between 2019 and 2023, Luxembourg introduced several reforms to its personal income tax system to alleviate the financial burden on households, particularly in response to inflation and rising energy costs. Two significant tax credits were introduced during this period: the Crédit d'Impôt Conjoncture and the Crédit d'Impôt Énergie.

The Crédit d'Impôt Énergie was a tax credit introduced to mitigate the financial impact of rising energy costs. It was applied from July 2022 to March 2023 and was primarily targeted at lower- and middle-income households.

The Crédit d'Impôt Conjoncture was another tax credit, implemented in 2023 as a temporary measure to alleviate the financial impact of inflation on taxpayers. It was introduced in July 2023 but applied retroactively from January 1, 2023 and was meant to be a temporary measure, expiring on December 31, 2023.

Tax-to-base Elasticities

The TTB elasticity estimated for Luxembourg is 1.87, which is close to the mean and median values of EU countries. The elasticity for labor incomes (1.90), benefits and pensions income (1.88) and self-employment incomes (1.86) are lower than the elasticity for capital incomes (2.14). All those incomes are taxed according to the same progressive schedule. The higher elasticity for capital incomes (which, in Euromod, include gains from property as well as interest, dividends and other profit from capital investments) can be explained by the fact that an increase of capital incomes does not induce an increase of some tax deductions (in particular social security contributions).

The total TTB elasticity is explained mostly by the progressivity of the tax brackets (around 85% of the fiscal drag effect), the remaining part being explained by the effect of tax deductions and credits loosing relative value (12%) and the residual component (3%).

These mechanisms are also somewhat different across the income distribution, which also displays significant variation in the elasticity. The lowest decile has an elasticity of zero, as some of these individuals have a zero or even negative tax liability due to tax credits, both before and after the increase in their income. The remaining low- and middle-income deciles display a larger elasticity, still explained mostly by the progressivity of the tax brackets but also, on a lesser extent, by the loss of relative value of some tax deductions and tax credits. Top incomes display a lower and decreasing elasticity, explained almost entirely by the tax schedule progressivity.

The tax benefit with the biggest impact on the elasticity ("Tax deduction 1") is the tax credit for employees, pensioners, and self-employed individuals. The amount of the tax credit is flat until a certain threshold of income, after which the amount of the tax credit decreases progressively, leading to a high elasticity for the impacted individuals, in the low- and middle-income deciles. The second and third tax deductions are the tax credit for social minimum wage and the extra-professional allowance, respectively.

Counterfactual simulations

Over the period 2019 – 2023 revenue from PIT in Luxembourg increased as a share of GDP (by around 1.5p.p.). This increase materialized in a context of no indexation of tax brackets, while most of the thresholds for tax deductions remained unchanged. However, two significant tax credits were introduced in 2022/2023: the Crédit d'Impôt Conjoncture and the Crédit d'Impôt Énergie, which mitigated the lack of indexation of most tax parameters.

Compared to a counterfactual scenario of 2019 legislation without indexation, tax collection was significantly lower (due, among others, to the two aforementioned tax credits), while counterfactual PIT revenue under 2019 legislation with full indexation would have led to slightly higher tax revenues than the 2023 baseline. Indexation based on concurrent or lagged HICP would also have resulted in higher tax revenues. The fact that the baseline

PIT revenue in Luxembourg was lower than in the counterfactual scenarios suggests that the fiscal drag in 2023 compared to 2019 was (slightly) overcompensated.

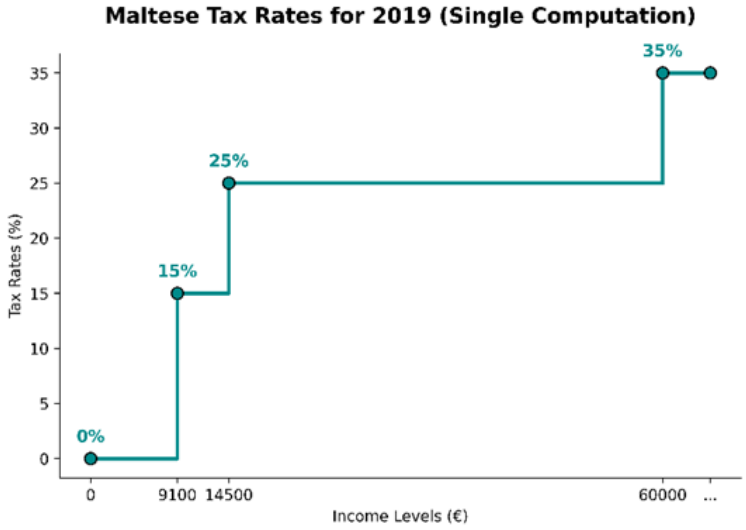
As shown in Figure 7, panel (b), slightly more than 100% of the potential fiscal drag was offset by measures implemented during this period.

[1] Brackets were however adjusted by 10.4% in 2024 and 6.4% in 2025 to account for the inflation of the past years

Malta (MT)

Description of the Personal Income Tax Framework

The Maltese Personal Income Tax (PIT) framework combines most sources of personal income and taxes them conjunctively. The primary sources of income within the scope of the PIT system are employment and self-employment income, income from pensions, capital gains, investment and dividend income, and income from rental of property. Most social assistance benefits and some other minor sources of income are exempt from taxation. Social security contributions are not deductible from taxable income. Chargeable income is taxed at rates ranging from 0% to 35%. There are three sets of income brackets to which these rates are applied, differentiating between whether the individual is single, married or a parent of a dependent child. The figure below provides an overview of the applicable tax rate on different income brackets under the 'single' tax brackets in 2019, the benchmark year in this study. Rates for parents and married individuals are identical to those of the single computation; however, the tax brackets differ slightly.



There are some exceptions to the simple rate structure described above. Individuals earning income from part-time employment can opt to have such income taxed at a flat rate of 10%, subject to a capping of €10,000 per annum for part-time employment and €12,000 per annum for part-time self-employment. Minimum wage earners who do not have any other income sources are exempt from tax. These provisions are accounted for in EUROMOD. Some provisions through which certain expenses may be deducted directly from taxable income prior to computation are also modelled, as are tax credits granted to women returning to employment after childbirth and to individuals contributing to voluntary personal retirement schemes.[1]

Additionally, pensioners benefit from two schemes aimed at reducing their tax liability, both of which are included in the model. The first scheme, introduced in 2017, ensures that pensioners whose taxable pension income exceeds the tax-free threshold receive a rebate on their tax liability (up to a capping), which is calculated on their taxable pension income (S.L. 123.174, 2017). A subsequent scheme, introduced in 2022, directly exempts a portion of taxable pension income from the income tax base, up to a ceiling. The proportion exempted has been increasing gradually from 20% in 2022 and is set to continue doing so, such that by 2026 100% of taxable pension income is excluded from the tax base, up to a capping of €16,636 (S.L. 123.204, 2022). Any residual chargeable pension income that is not deducted under the latter scheme is taken into account for the calculation of tax rebates under the former scheme (Malta Tax and Customs Administration (MTCA), 2024).

Some other provisions of the tax code are not captured by EUROMOD due to limited granularity in the data. These include reduced tax rates for athletes and individuals in the creative sectors, and on overtime pay. Lower tax rates on part-time employment are only partially simulated.[2] Moreover, in practice, income derived from investment and/or capital gains and income derived from rental of immovable property may be taxed separately using a flat rate. In EUROMOD, property income is aggregated with other sources such as employment income, while investment income is taxed at the flat rate of 15% Specific provisions regarding the taxation of fringe benefits derived from employment, as well as additional tax credits such as those on school transport and attainment of higher education degrees, are excluded.

Indexation Practices

The Maltese income tax system does not feature automatic indexation. Tax brackets were unchanged over the period 2016-2024, however adjustments to the tax brackets have been introduced as from 1 January 2025. As a result, tax brackets in the 2019 and 2023 systems used in this simulation exercise remained unchanged.

There are five main types of tax benefits simulated in the Maltese tax-benefit system in EUROMOD, being (i) tax allowances (deducted from taxable income), (ii) tax credits directed towards women returning to employment following childbirth, (iii) rebates and exemptions for pensioners, detailed above, (iv) rebates in the form of cheques, and (v) tax credit for personal retirement schemes (private pensions). In EUROMOD, the relative importance of these benefits in the tax system is limited, albeit not negligible; they are collectively simulated to reduce tax revenues by 8.1% in 2023, ceteris paribus.

The amounts granted by these benefits are updated in an ad-hoc manner, rather than in line with some statutory indexation rule. Between 2019 and 2023, the provisions of the tax credit for women returning to employment and some tax allowance amounts were unchanged. However, the maximum tax credit for individuals investing in private pensions was raised by 50% over the 2019-2023 period, from €500 to €750. Tax rebate cheques also increased over this period, from a range of €40-€68, to €60-€140. Rebates on the tax liability of pensioners were worked out using identical formulae in both years analysed (S.L. 123.163, 2014). However, the maximum rebate allowable has been adjusted annually over this period.

Tax-to-base (TTB) elasticities

The aggregate TTB elasticity for Malta in 2019 was estimated at 1.81, aligning well with the EU average (see Figure 1). Nearly all (94%) of this effect is driven by tax bracket progressivity, with around 3% driven by tax benefits or deductions, and the rest being a residual that is not accounted for by indexing tax parameters in the model. The elasticity is relatively higher for self-employment and labour income, both at 2.00, and lower for capital income (1.63), as a significant portion of the latter income – mainly from investments – is taxed at a flat rate, making it less progressive compared to labour income. The elasticity with respect to benefits and pensions stood at 0.74. This relatively low elasticity is expected considering the generous tax credit on pensions, which account for approximately 95% of the benefits and pensions tax base. Through the pension tax rebate scheme introduced in 2017, for example, single pensioners who earned taxable pensions below €13,434 and did not have other taxable sources of income, did not pay any income tax in 2019. In EUROMOD, only 11% of individuals earning pension income exceeded this ceiling in 2019, and, therefore, increasing benefits and pension related income by 1% would have a relatively limited impact on tax revenues.

Decomposing TTB elasticity by deciles of taxable income illustrates an inverse relationship between elasticity and household deciles. Lower decile households have more individuals within the lower brackets of the tax framework, where tax brackets are narrower and therefore, the marginal tax rate rises significantly with income. The limited scope of tax deductions and the smaller baseline tax liabilities of the lower deciles further contribute

to a higher elasticity of tax revenue to the tax base at the lower end of the distribution. In terms of income inequality in 2019, the PIT system reduces the Gini coefficient by 0.0384 points, from 0.3374 to 0.2990. However, a 1% increase in taxable income has a minimal effect on inequality.

In the 2023 system, aggregate TTB elasticity is measured at 1.74. Elasticities with respect to employment and self-employment income are essentially unchanged at 1.96 and 2.01, respectively, whilst the TTB elasticity of capital income falls to 1.46, largely due to the flat rate nature of investment income tax combined with a higher average proportion of capital income in the baseline relative to 2019. Meanwhile, as a result of the pension tax exemption benefit introduced in 2022, the TTB elasticity of benefit and pension incomes falls to just 0.36.

Counterfactual simulations

In nominal terms, PIT revenue in Malta increased from €984 million to €1,511 million, or by 53.5%, between 2019 and 2023. Nominal GDP increased by 40.8%, such that tax revenue as a share of GDP increased from 6.7% to 7.4% (see Figure A.3). Tax brackets, the key driver of tax revenue elasticity to taxable income, were unchanged between the two years considered. Some tax benefits were updated periodically as explained above. The only two other major changes to the tax system made during this period and which are captured by EUROMOD were the introduction of the pension tax exemptions in 2022, and the change to the flat tax rate on part-time employment income (from 15% to 10%) enacted in the same year (MTCA, 2023).

A counterfactual scenario with 2023 incomes applied to 2019 PIT legislation is estimated to result in a tax revenue of €1,558 million, or 7.6% of GDP, in 2023 – 0.2 p.p. higher than the actual figure (see Figure 7). On the other hand, we simulate three scenarios with 2023 income being applied to the 2019 system with parameters fully indexed in line with income growth, lagged HICP and concurrent HICP, respectively. On average, 2023 tax revenue under these systems would have been €1,436 million, that is 7.0% of GDP. Therefore, we infer that of all possible fiscal drag between 2019 and 2023 in our model, €47.5 million was offset, which amounts to between 32% and 46% of potential fiscal drag, depending on the lower-bound counterfactual used. The average share offset is 40%.

We further deconstruct the offset fiscal drag into the effect of 'other reforms' and the effect of the ad-hoc indexation of pre-existing tax benefits. Of the average 40% offset, 30 p.p. are accounted for by foregone tax revenue under the 'other reforms', nearly entirely accounted for by the 2022 pension income exemptions. Indeed, 'other reforms' account for €35.5 million of the €47.5 million offset. Indexation of other benefits and tax deduction parameters accounts for the rest of the effect. These results are in line with expectations, given the relatively small role played by tax benefits in the Maltese system and the nature of the indexation implemented between 2019 and 2023.

Although a relatively low proportion of fiscal drag was offset during the 2019-2023 period, significant changes to the tax brackets were introduced on 1 January 2025. The tax-free bracket threshold has been raised by €2,900 (31.9%) in the case of the single computation, €2,300 (18.1%) in the case of the married computation, and €2,500 (23.8%) for the parental computation. The second, 25% tax rate bracket will also be applicable at higher income levels. These changes are expected to counteract some of the fiscal drag induced by the lack of changes to these brackets between 2016 and 2024. Future work can quantify these effects by building on work documented in this paper.

[1] There are a number of relatively minor deductions that cannot be modelled within EUROMOD, such as, sports participation fees, childcare fees and private homes for elderly and disabled.

[2] The lower tax rate on part-time employment is included in EUROMOD, however due to the absence of granular data on part-time income, EUROMOD identifies part-time employment income based on individuals who work less than 30 hours in total. Thereby, the number of individuals benefitting from each benefit is underreported.

Netherlands (NL)

Description of the Personal Income Tax

In the Netherlands, personal income tax (inkomstenbelasting) is levied on an individual basis. However, certain exceptions apply to spouses or partners with low incomes, who may qualify for tax credits based on the earnings of the higher-income partner. The tax base is relatively broad, covering most types of income, but with key exemptions including child benefits, child support, rent allowance, healthcare allowance, and childcare allowance.

Homeowners benefit from the deductibility of mortgage interest payments for their primary residence, reducing their taxable income. However, to balance this advantage, imputed rent ("eigenwoningforfait"), which represents a notional rental value, is taxed. In 2024, income tax follows a progressive structure: taxable income below €75,624 is taxed at approximately 37%, while income above this threshold is taxed at 49.5%.

For other types of properties and assets, returns are taxed under a separate schedule known as Box 3, which assumes a fixed rate of return on investments. Income tax is generally collected at the source (loonbelasting) through payroll deductions. However, a final assessment is made via tax returns submitted after the end of the calendar year, allowing for adjustments or additional payments.

Households may also be subject to inheritance tax (successierechten). Inheritances are taxed at flat rates, with various exemptions and deductions depending on the relationship between the deceased and the beneficiary. Spouses, children, and close relatives typically benefit from lower tax rates or additional exemptions.

Companies distributing dividends to shareholders must withhold a fixed percentage as dividend tax at the company level. Individual shareholders can deduct this withheld amount from their income tax liability, preventing double taxation on the same income.

Indexation Practices

Tax thresholds and benefit amounts are adjusted annually based on inflation. Net benefits, including the state pension (AOW), are linked to the net minimum wage. The minimum wage itself is updated twice per year based on wage negotiations and parliamentary advice. As of January 1, 2024, the Minimum Hourly Wage Act introduced a statutory hourly minimum wage, ensuring consistency across sectors and leading to a one-time increase in the monthly minimum wage for companies where standard workweeks exceed 36 hours.

Other Reforms

No major tax reforms took place in 2023, but several adjustments occurred:

- The basic income tax rate was reduced from 37.07% to 36.93% for incomes up to €73,031, reflecting regular annual indexation and a policy-driven threshold reduction of €740. The top tax rate remained at 49.5%.
- For low-income taxpayers, tax credits could previously exceed tax liabilities, allowing for partial refunds. However, starting in 2023, individuals born on or after January 1, 1963, can no longer receive payouts for unused tax credits.

- The labor tax credit increased in 2023 for workers earning between €37,697 and €115,301. The phase-out rate also increased from 5.86% to 6.51%.
- The minimum wage rose by over 8% in 2023, but this increase did not affect labor tax credit thresholds, which continue to shift only through annual indexation.
- Deduction rates were reduced from 40% to 36.93%, aligning them with the basic tax rate. This change affects deductions such as mortgage interest, business expenses, and personal deductions.
- The imputed rent rate for primary residences valued between €75,000 and €1,200,000 was reduced by 0.05 percentage points to 0.35%, while properties valued above €1,200,000 remained taxed at 2.35%.

Tax-to-Base Elasticities

The estimated tax-to-base (TTB) elasticity for the Netherlands is 2.18, slightly higher than the average among EU countries.

- Labor income has the highest elasticity (2.47) due to progressive taxation.
- Self-employment income follows with an elasticity of 2.05.
- Capital income, subject to flatter tax rates and exemptions, has a lower elasticity of 1.45.
- Pension and benefit incomes, taxed at a lower progressive rate, show an elasticity of 1.69.

The elasticity is influenced by the diminishing relative value of tax credits (contributing 20% to fiscal drag) and by progressive tax brackets (accounting for 69% of fiscal drag). Wealth taxes and unexplained residual factors contribute the remaining effects.

Elasticity varies across the income distribution:

- The lowest decile has an elasticity below 1 (0.8), as most individuals in this group are largely exempt from taxation.
- High-income households show lower elasticity (1.62) due to their significant share of capital income, which is less responsive to taxation.
- Middle-income groups, especially those around the interquartile range, exhibit the highest elasticity (2.2 to 3.8).

At lower income levels, tax credits play a dominant role in elasticity, reflecting the labor tax credit's design to encourage workforce participation. At higher income levels, bracket progressivity becomes the primary driver of elasticity.

Counterfactual simulations

Between 2019 and 2023, taxable income in the Netherlands grew by approximately 15%, while tax revenues increased by 17.5%. Under a counterfactual scenario where 2019 tax legislation remained unchanged without indexation, tax revenues would have risen by 32.5%. If 2019 legislation had been indexed based on tax base growth, revenues would have increased by 15%. Indexing with respect to the Harmonized Index of Consumer Prices (HICP) would have resulted in the lowest revenue increase (9-10%), reducing the average effective tax rate and suggesting that this approach could lead to over-indexation.

A final counterfactual scenario considers 2023 tax legislation without indexation (setting thresholds back to 2019 levels). This analysis suggests that indexation measures prevented 73% of potential fiscal drag, with 69% specifically offset by indexation adjustments.

Portugal (PT)

Description of the Personal Income Tax

The Portuguese PIT is levied on labor, 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 is 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 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 and a small correction was introduced, to include taxpayers whose total gross income is equal to or less than the reference value. 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 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 2023. 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%), with all major tax deductions cut offs being fixed in nominal terms. 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 year t-1. Both tax brackets updates and the change in the parameters linked to the minimum wage or to the social support index were considered as discretionary indexation measures.

Other reforms

Main changes to PIT between 2019 and 2023 include: a new tax schedule, with lower tax rates and a higher number of brackets; and 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.

Tax-to-base Elasticities

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 labor 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 benefits 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 benefit 1"). Other tax benefits, each explaining around 7% of the elasticity each are the minimum untaxed income ("Tax benefit 2") and the deduction for general household's expenses ("tax benefit 3"). Much of the effect coming from the other tax benefits is related to the tax credits for children.

TTB elasticities vary greatly across the income distribution, reaching very high levels in the first part of the distribution. Only around 10% (20%) of the households in the first (second) decile pay PIT. This means that most households in the first quintile are not affected by these elasticities and that results are very sensitive to sampling, as the distance of a particular observation income from the relevant nominal threshold can heavily influence the results for these deciles. Tax benefits 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.

Pre-tax income inequality as measured by the GINI coefficient in Portugal is particularly high and the PIT has a relatively high redistributive capacity. This redistributive capacity is boosted with income growth, via an increase in the average tax rate, as the progressivity of the tax (measured by the Kakwani index) because the tax becomes more concentrated in the lower part of the distribution.

Counterfactual simulations

Compared to a contrafactual of 2019 legislation without indexation, tax collection in 2023 was much lower, as tax relief reforms more than compensated for the very low discretionary indexation of parameters and the fiscal drag effect was fully compensated. Indexation with tax base growth would have led to the lowest revenue collection (and a stabilization of the tax rate around 2019 levels), followed by concurrent HICP and finally lagged HIPC.

Slovakia (SK)

Description of the Personal Income Tax

Personal income tax (PIT) in Slovakia is not a mere wage tax; it includes the taxation of labor income, self-employment income and also capital income – mainly income from property renting, property sales, capital income from securities and mutual funds, etc. Income from dividends is taxed by withholding and is not part of the PIT system. Social benefits are not the subject of PIT in Slovakia and social contributions (on social and healthcare insurance) are deductible and are also not taxed.

Revenue collection of PIT is centralized, with subsequent redistribution of revenue towards local governments – smaller portion (30%) goes to higher regions (NUTS3) and larger portion (70%) goes to individual municipalities[1].

There are two tax brackets in Slovak PIT system – 19 % rate for incomes up to 176.8 x subsistence minimum (SM) and 25 % for incomes above. This threshold in 2025 represents 48 441.43 euros annually. However, the main source of PIT system progressivity is a basic tax allowance, which is set to decrease by increasing income. Basic tax allowance amounts to 21 x SM[2], which in 2025 represents 5 753.79 euros annually. This value decreases and for high income earners is 0. Apart from basic tax allowance, there are also other tax allowances, but with much lower impact on the tax system – spouse tax allowance and allowance on contributions to private pension savings funds.

Major part of the PIT system is also a payable tax credit for dependent child, which is a cornerstone of the family support policy in Slovakia. Additionally, there are also two minor tax credits for employees and mortgage interest, with much lesser impact on the system than the child bonus. For more information on the Slovak PIT system, see Slovak EUROMOD country report (Mikloš and Rigasz 2025).

Indexation practices

Statutory indexation of tax parameters is ensured via their linkage to SM. Both thresholds for the tax brackets and for tax allowances are defined as a multiple of SM. SM is adjusted annually to reflect increase of the cost of living of low-income households. Therefore, part of the potential fiscal drag is offset by this mechanism. The increase of SM, however, historically lags behind the increase in taxable income, which is the main source of fiscal drag in Slovakia.

Other reforms

In the examined period of 2019 – 2023, Slovakia underwent two major PIT reforms, both creating a fiscal expansion – lowering the revenue from PIT:

- **In 2020, discretionary change of parameters of the basic tax allowance was approved.** This did not change the indexing principles of the PIT system; therefore, we consider the reform as "Other reform" – structural change in PIT system. Basic tax allowance in 2019 amounted to 19.2 x SM, which was increased to 21 x SM and the threshold for this allowance to start decreasing was lowered from 100 x SM to 92.8 x SM. This caused a fiscal expansion for low-income earners by increasing their "non-taxable" part of income, while partially compensating with fiscal contraction in middle-income earners by earlier threshold for basic tax allowance to start decreasing.
- **In 2023, substantial increase in tax bonus on dependent child was approved, lowering the cash collection of PIT**. There were minor changes in tax credits (namely the tax bonus on dependent child)

from 2019 onwards, but a real substantial change occurred in 2023. The child bonus was increased from 40 – 70 euros monthly (dependent on the age of the child) to 50 – 140 euros monthly, which meant the overall tax bonus more than doubled. In ESA2010 methodology, this does not affect the PIT and is imputed as a social benefit in D.62, but in cash accounting, these PIT revenues were not collected.

Tax-to-base Elasticities

According to our calculations, tax-to-base elasticity of PIT reached 1.85 in 2019 and 1.92 in 2023. These results are somewhat lower, compared to OECD estimates (overall elasticity 2.43). This can be attributed to various factors, mainly to different estimation period. Between 2015 and our examination period starting in 2019, there were several tax reforms, affecting PIT elasticity, e.g. increase in some tax credits or different tax treatment of 13th and 14th wages.

The main source of the fiscal drag (above 1 elasticity) is by far a basic tax allowance. Other parameters of the tax system – spouse tax allowance and tax brackets – have only a negligible impact in our simulations. Apart from these, a minor component of the overall fiscal drag is caused by a residual. It is a fiscal drag, that is not offset with the updating of the nominal tax parameters included in the scope of our analysis. These are various tax parameters and thresholds being linked to average and minimal wage, e.g. tax credit eligibility.

The elasticity is mainly created by low- to middle-income earners, with the peak being in 3rd - 5th income decile. As the intuition suggests, here lies the main effect of the basic tax allowance, which is being decreased with higher income from certain thresholds. In the highest decile, small effect also stems from the tax brackets. Estimation of this, almost negligible effect, can be however arguable, with EUROMOD data's limited ability to correctly deal with high income earners[3].

Counterfactual simulations

Revenue collected from PIT in 2023 as a share of GDP stayed almost unchanged, compared to 2019 (between 3.7 % of GDP and 3.8 % of GDP). In our counterfactual analysis with unchanged legislation between 2019 and 2023, tax collection would reach 5 % of GDP. There are two main factors for actual development lagging behind potential – statutory indexation of tax parameters and 2 major other reforms, lowering the tax collection.

First, statutory indexation compensated about ½ of potential fiscal drag. Linkage of tax parameters to SM, which reflects the cost of living of low-income households, dampens the fiscal drag in Slovak PIT system, but is unable to fully compensate it. The remaining fiscal drag, therefore, originates in the difference between income growth and SM indexation. However, the two major expansionary tax reforms, which occurred in 2019 – 2023 period, overcompensated this difference, erasing the remaining fiscal drag and even dragging the PIT collection further below potential.

[1] The shares of PIT distributed to regions are up to end of 2024. From 2025, these changed, and part of the PIT collected revenue stays in central government. This is, however, out of range of our analysis.

[2] 19,2 x SM in 2019, 21 x SM in 2020 after reform.

[3] "Given the progressivity of the Slovak PIT system, the underrepresentation of high-income earners in particular, usually present in survey data, can contribute to the under-simulation of the PIT revenue." See more in Mikloš and Rigasz (2025).

Slovenia (SI)

Description of the Personal Income Tax

The Slovenian personal income tax is applied at the individual level. It is levied on different sources of income, including labor income, capital income, pensions, and income from business activities (self-employed). In addition to regular monthly income, employees are entitled to annual leave pay and based on the company's performance to performance bonuses. Both additional types of income are being subject to more favorable tax treatment in the form of exclusion from personal income tax up to the average gross salary in the economy and in the case of annual leave pay also from payment of social security contributions up to the average gross salary in the economy. Remuneration for home-work travel and for meals expenses during work are exempt from taxation. Most social benefits, which are not wage compensation (like child benefits, scholarships), are not subject to personal income tax.

To calculate the taxable base for most income sources total incomes are reduced by employee social security contributions, by general allowance and in the case of low incomes additional linearly determined general allowance, which decreases with income level. The resulting (intermediate) taxable income can be further reduced to take account of personal tax deductions, of which the most widely used is that for dependent children and other dependent family members. Other cases include allowance for disabled persons, students, voluntary supplementary pension insurance and from 2022 onwards for persons aged 70+. Pensioners are entitled to tax credit amounting to 13.5% of their pension.

After all those deductions have been applied, the resulting taxable income is taxed by a progressive tax schedule. There are five tax brackets with marginal tax rates ranging from 16% to 50%.

For self-employed an optional flat rate tax scheme is available if they meet certain conditions. In that case they are allowed to deduct the standardized costs from their income before applying the relevant tax rate. Capital incomes (dividends, capital gains and interests) and income from rents is levied separately via a flat tax rate of 25%. For interest tax-free allowance amounts to EUR 1.000. The tax rate on capital gains is decreased according to the length of the holding period. For rental income 10% of standardized cost is assumed.

For more details on the Slovenian Personal income tax see Kump and Kalar (2025).

Indexation practices

In Slovenia, tax parameters have not been automatically indexed during the 2019-2023 period. According to the law the governments' economic policy objectives should also be taken into account when deciding on indexation in addition to developments in relevant indexation parameter. As a consequence, indexation played a minor role in that period. Tax brackets and most other tax parameters have been adjusted to past inflation in 2022, which we consider as an indexation measure.

Other reforms

In Slovenia, major structural changes to the personal income tax were implemented in 2020 and 2022. In 2020 these changes encompassed increase of thresholds for tax brackets together with minor reductions for the 2nd and 3rd tax brackets in the marginal tax rate, increase in general allowance and in students' tax allowance (both from EUR 3.302,70 to EUR 3.500). In 2022, a reform brought the substantial increase in general allowance (from EUR 3.500 to EUR 4.500) and only a temporary reduction in the marginal tax rate in the highest bracket (from 50% to 45%) in addition to indexation of tax brackets and family allowances. General allowance was again increased in 2023 (to EUR 5.000) when allowance for dependent family members was also increased.

Tax-to-base Elasticities

The TTB elasticity estimated for Slovenia for 2019 is 1.89, which is around the average for EU countries. The elasticity is largest for capital income, which is taxed at a flat but relatively high rate, leading to a large elasticity of 2.5.[1] The elasticity is also large for labor income (2.21) and self-employment income (2.48), which are taxed by a more progressive schedule. Pension and benefit incomes are taxed by the same progressive schedule as labor income but have by far the lowest elasticity of all income sources, amounting to 0.76. This is due to the fact that pension recipients benefit from a tax credit. Note however that in Slovenia, the majority of pensioners do not pay personal income tax.

The elasticity can be explained by three factors according to our estimates: around half of the elasticity is the consequence of general and additional allowance, around third is due to the progressivity of the tax brackets and the remaining part mainly relates to allowance for dependent family members.

The tax benefit with the highest impact on the elasticity is the overall general tax allowance (denoted "Tax benefit 1"), which includes general tax allowance, applied to all individuals and additional general allowance available to low-income individuals. It is applied to individuals with positive taxable income (i.e. to all incomes reduced by employee social security contributions). The second tax benefit in terms of the impact on the elasticity is the allowance for dependent family members (denoted "Tax benefit 2"). These two tax benefits explain most of the effect on the elasticity that can be attributed to tax benefits.

These mechanisms differ markedly along the income distribution, which also displays significant variation in the elasticity. The lowest and middle-income deciles display a larger elasticity, explained primarily by the loss of relative value of their tax benefits, which play a significant role in the calculation of their tax liability. Higher incomes display a lower and decreasing elasticity, and in top decile group the bracket progressivity is the dominant factor.

Total tax elasticity is lower in comparison to OECD estimates due to low elasticity in pensions and benefits, which are not taken into account in OECD estimations. Estimate for labor income is close to OECD estimate, while estimates for other elasticities (self-employment income and capital) are higher.

These results hold when moving from 2019 to 2023. Estimated TTB elasticity for 2023 is slightly lower according to our results, amounting to 1.85 and its decrease is mostly related to its reduction for the first decile.

Counterfactual simulations

Over the period 2019 – 2023 the revenue from PIT in Slovenia decreased as a share of GDP (by around 0.2pp). This decrease was due to legislation changes implemented during this period, which include increase in general allowance, changes to tax brackets and other changes. Compared to a counterfactual of 2019 legislation without indexation, tax collection was lower by more than 1% of GDP, while counterfactual PIT revenue under 2019 legislation with full indexation would result in a slightly higher revenue than actual. This is shown in Fig A.3 panel (p). Indexation with respect to concurrent or lagged HICP would have led to higher revenue by just below/above 0.5% of GDP.

More specifically, as shown in Figure 7 panel (b), fiscal drag was more than offset by measures implemented over the period, with structural changes being the main driver, as indexation (related to adjustment of tax brackets and family benefits in 2022 by 3%) played only a minor role.

[1] In EUROMOD a 25% rate on capital income is assumed. However, for example the rate on capital gains is decreased according to the length of the holding period and is 0% after 20 years.

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.

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 traditionally been made with a frequency that has kept average effective tax rates constant over time, in the recent period these adjustments have been less frequent and partial. Over the period 2019-2023 we consider that there have been two groups of measures that could be considered as discretionary indexation measures: 1) some regions, in some years, increased the nominal parameters that determine the tax brackets of the regional rates. We note however that in some cases these changes went beyond updating nominal parameters and also changed the structure of the brackets, which we consider also as part of the indexation-measures. Some regions also created new deductions or expanded existing ones, which we do not consider indexation measures. 2) The tax deduction that is applied to all labor income earners and that is larger for low-income earners (*reducción por rendimentos del trabajo*) was increased in 2022 and 2023. The first increase was clearly directed to compensate fiscal drag effects, while the second increased was intended to ensure that individuals who only earn minimum income would remain zero-tax payers following an increase in minimum wage. We consider both as indexation measures.

Other reforms

Over this period there were small increases in the tax rate of capital income and new brackets were created. The deduction applicable for contributing to private pension plans saw a reduction in the maximum amount deductible per year. As mentioned before, some regions created or expanded relatively small tax deductions.

Tax-to-base Elasticities

The TTB elasticity estimated for Spain is 2.02, 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 some tax deductions that 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 "Tax deduction or credit 1" in the paper) 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. The second tax benefit in terms of their impact on the elasticity is the family allowance (denoted "Tax deduction or credit 2"). This is a tax credit applicable to all tax payers that depends on their personal and family characteristics.

Counterfactual simulations

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 discretionary indexation measures), while counterfactual PIT revenue under 2019 legislation with full indexation would have been significantly lower (around 0.6 – 0.9 p.p. of GDP), as shown in Figure 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), only 30% of potential fiscal drag was offset by measures implemented over the period, with indexation measures being the main driver (28 percentage points). The remaining 70% of potential fiscal drag was allowed to happen, leading to a significant rise in tax revenues.

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Online Appendix C Comparison with results based on microdata from Spanish tax records

This appendix compares the results for Spain presented in this paper based on survey data from EU-SILC and EUROMOD with the results of Balladares and García-Miralles (2025), who follow a comparable methodology using administrative tax data for Spain and a microsimulation model built on that data (Bover et al., 2017).

Overall, we conclude that the main results are qualitatively and quantitatively similar, and we identify the under-representation of top incomes in the survey data as the main driver of the quantitative differences.

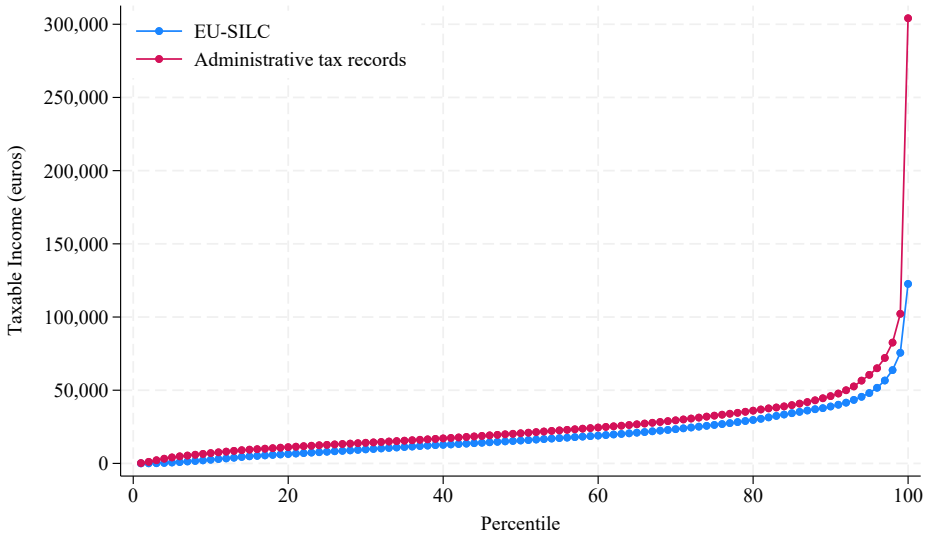
Aggregate TTB elasticity. First, we focus on the TTB elasticity of Spain estimated for 2019. The estimation based on EU-SILC and EUROMOD leads to an elasticity of 2.02. The elasticity estimated with tax records is 1.85. We show that this difference is fully driven by an underrepresentation of top-income individuals in the EU-SILC survey and that reweighting individuals at the percentile level based on the distribution of the taxable income from the tax records almost eliminates the gap.

First, in graph (a) of Figure C.1, we compare the distribution of taxable income between both data sources. While the average income is similar for most of the distribution, this difference widens for the top percentiles, where the mean income from tax records is significantly higher than in EU-SILC. This asymmetry is particularly striking at the top 1%, where taxable income according to the tax administrative data more than doubles the average from EU-SILC (around 300,000 euros and 120,000 euros, respectively).

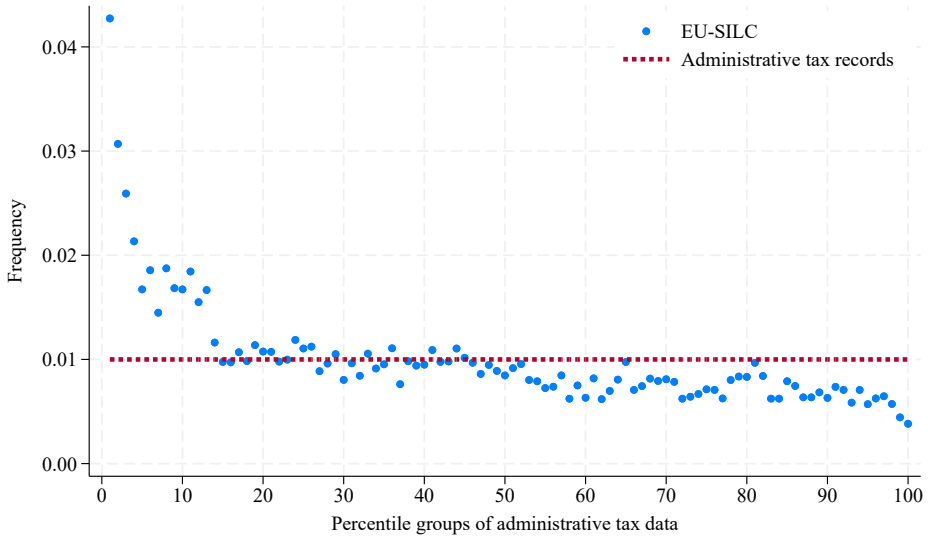
In graph (b) of Figure C.1, we directly compare the distribution of EU-SILC by computing its frequency across percentile groups of the distribution of tax records. If the distribution of both data sources were the same, we would observe that for each percentile group based on the tax records, there is a 1% of individuals from EU-SILC. However, we observe deviations. EU-SILC overrepresents groups at the bottom and underrepresents particularly high-income groups at the top. Note that in this comparison we only keep positive taxpayers, who are the ones affecting the TTB elasticity.

Figure C.1: Comparison of the distribution of taxable income in EU-SILC and in administrative tax records

(a) Distributions along their respective percentile groups



(b) Frequency distributions along percentile groups of Administrative Tax Records



Notes: This Figure compares the distribution of taxable income in Spain according to two data sources: EU-SILC and administrative tax records. Graph (a) shows each independent distribution of taxable income based on percentile groups defined for each of the corresponding data sources. Graph (b) instead uses percentile groups based on tax records to plot the frequency distribution of taxable income for both data sources. By construction, the frequency distribution according to tax records returns a frequency of 0.01 for each percentile group. The frequency distribution according to EU-SILC can vary across percentile groups of the tax records, depending on whether there is a higher or a lower frequency of individuals in those groups.

We then use the frequencies shown in graph (b) of Figure C.1, which we denote θ_i where i stands for each percentile group, to define weights that allow us to estimate the aggregate TTB elasticity based on EU-SILC but adjusted by the distribution observed in the tax records. We do this by computing TTB elasticities at the percentile level with EU-SILC and EUROMOD and then applying the "correction weights" $\frac{0.01}{\theta_i}$ for aggregating the individual elasticities. Specifically, we calculate the "reweighted TTB elasticity" (TTB^{rwt}) as:

$$TTB^{rwt} = \sum_{i=1}^{100} \left(\frac{\partial \tau_i / \tau_i}{\partial y_i / y_i} \cdot \frac{T_i}{T_{total}} \cdot \frac{0.01}{\theta_i} \right) \tag{3}$$

where $\frac{\partial \tau_i / \tau_i}{\partial y_i / y_i}$ is the elasticity for percentile group i, $\frac{T_i}{T_{total}}$ is the tax-liability-based weight factor (based on EU-SILC) and, crucially, $\frac{0.01}{\theta_i}$ introduces the "correction weights" defined above.[27]

When we apply this formula to our estimates, we obtain a reweighted TTB elasticity of 1.86, almost the same as the one obtained by Balladares and García-Miralles (2025) using tax records (1.85). This suggests that the differences in the data (particularly on the top percentile groups, which are the most influential on the aggregate TTB elasticity and who display a lower elasticity across most countries considered) are the main drivers of the different results. It is worth noting that applying this reweighting at the decile level, rather than at the percentile level, leads to an elasticity of 1.94, correcting around half of the gap we observed. This suggests that a high level of granularity is needed (both in the estimation of the TTB elasticities and the distribution of tax records, to fully close the gap in the Spanish case). While this prevents us from implementing an adjustment of this sort homogeneously across all countries considered in our study, it shows a promising way to adjust TTB elasticities based on survey data when distributional information is available from administrative statistics.

Other results. We further validate our methodological approach based on EU-SILC data and EUROMOD by comparing other results common to both papers. As in Balladares and García-Miralles (2025), we estimate that bracket progressivity explains somewhere between 35–40% of the estimated TTB elasticity above 1 and that two other major tax deductions explain most of the remaining elasticity. We also obtain that the elasticity from capital income is lower than that estimated for other income sources. Furthermore, we obtain a similarly-shaped distribution of the elasticities across the individual distribution, with fairly high elasticities for the middle incomes and a gradual reduction as income increases.

[27] Note that if both data sources were equally distributed θ_i would be equal to 0.01 for all percentile groups and the "correction weights" $\frac{0.01}{\theta_i}$ would be equal to 1. Then, the uncorrected TTB elasticity would be equal to the "reweighted TTB elasticity".

We obtain the same qualitative results in terms of impacts on progressivity and inequality. When moving to our estimation of fiscal drag in practice, we also estimate that fiscal drag caused higher revenue in 2023 of around 0.7–0.8 percentage points of GDP.

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