FISCAL DRAG: THE HETEROGENEOUS IMPACT OF INFLATION ON PERSONAL INCOME TAX REVENUE

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Abstract

In recent years, personal income tax collection has shown strong dynamism. Part of this increase is due to household income growth, while another part is due to the "fiscal drag" effect, which results in an increase in average effective rates when the parameters that determine the tax (brackets and tax benefits) are not fully updated with inflation. This paper uses a tax microsimulation tool based on tax filers' administrative data to study the magnitude of the fiscal drag effect, its heterogeneity across the income distribution, its mechanisms and its impact on tax collection and on average effective tax rates in recent years and in the future. It is estimated that, in the absence of indexation of the nominally defined parameters of the tax, a homogeneous increase in household income of 1% would lead to an increase in income tax revenue of 1.85%, in line with the average elasticity estimated for OECD countries. This effect is greater for middle and upper-middle incomes and produces an increase in effective tax rates across the entire distribution of tax filers, leading to a reduction in net income inequality. It is estimated that around half of the increase in the personal income tax-to-GDP ratio observed between 2019 and 2023 can be explained by the fiscal drag effect. Going forward, in the absence of changes in tax parameters, the ratio of personal income tax revenue to GDP could reach 9% in 2025, 29% higher than its level in 2019.

Resumen

En los últimos años, la recaudación por IRPF ha mostrado un fuerte dinamismo. Una parte de este incremento se debe al crecimiento de las rentas de los hogares, mientras que otra parte se debe al efecto progresividad en frío, que da lugar a un aumento de los tipos medios efectivos cuando los parámetros del IRPF (los tramos y los beneficios fiscales) no se actualizan plenamente con la inflación. En este trabajo se utiliza una herramienta de microsimulación fiscal basada en datos administrativos de los declarantes de este impuesto para estudiar la magnitud del efecto progresividad en frío, su heterogeneidad entre declarantes, sus mecanismos y su impacto sobre la recaudación y sobre los tipos medios efectivos en el período reciente y futuro. Se estima que, en ausencia de actualización de los parámetros fiscales, un incremento homogéneo de la renta de los hogares de un 1 % ocasionaría un incremento de la recaudación de un 1,85 %, en línea con la elasticidad media estimada para los países de la Organización para la Cooperación y el Desarrollo Económicos (OCDE). Este efecto es mayor en las rentas medias y medias-altas, y produce un aumento de los tipos efectivos a lo largo de toda la distribución de declarantes, lo que provoca una reducción de la desigualdad de la renta neta. Se estima que en torno a la mitad del incremento de la ratio de IRPF sobre PIB observado entre 2019 y 2023 estaría explicada por el efecto progresividad en frío. A futuro, en ausencia de cambios en los parámetros del impuesto, la ratio de IRPF sobre PIB podría alcanzar el 9 % en 2025, un 29 % superior a su nivel en 2019.

Palabras clave: impuesto sobre la renta, recaudación, inflación, indexación, deflactación, desigualdad.

Códigos JEL: H24, H31, E62.

Contents

1 Introduction

In recent years, personal income tax revenue has grown at historically high rates and faster than GDP. This growth accounts for around half of the increase in the government revenue-to-GDP ratio observed in Spain between 2019 and 2023, which has contributed to the convergence of this ratio towards European levels (see Chart 1). This increase in revenue owes, first, to real growth in the tax base (the number of workers and pensioners) and, second, to growth in its nominal component (wages, welfare benefits and other household income), which have been influenced upwards by the recent inflationary episode.[1]

The nominal growth of the personal income tax base, which comprises the different types of household income, may give rise to more than proportional increases in revenue when the parameters determining this tax (e.g. tax brackets or tax benefits) are set in nominal terms and are not fully updated as income increases. In technical terms, the elasticity of revenue to changes in the taxable income (ERTI) is greater than 1.[2] This phenomenon, which is a consequence of the progressive design of the tax, is known as fiscal drag and it leads to an increase in the effective rates because new income is taxed at a higher marginal rate than the average rate or because tax benefits lose relative value with respect to income.

Each country's tax systems implement different strategies for updating or indexing the nominal parameters of their taxes, including for personal income tax (see Section 2.2 for more details). Thus, while slightly over half of Organisation for Economic Co-operation and Development (OECD) countries (including Spain, Italy and Portugal), update these parameters discretionally more or less regularly, and using more or less clearly defined criteria, other countries (including the Nordic countries, the United States and Belgium) do so automatically by law. There are also differences in the benchmark index used for the update and in the reference period of the index. This means that the fiscal drag effect changes not only depending on the tax structure, but also on the updating strategy used.[3]

Fiscal drag has implications for different aspects relevant to fiscal policy, related to both the monitoring and forecasting of government revenue and to the distributional impact of personal income tax on households. More generally, the fiscal drag effect may have implications for agents' labour supply decisions and for the fiscal policy stance to the extent that it can generate an automatic stabilising effect in times of high economic growth and inflation (Immervoll, 2006). To analyse its impact on all these issues, the aggregate effect of fiscal drag, as well as the mechanisms giving rise to it, its uneven impact among taxpayers and the effect of different reform alternatives must be studied.

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1 A detailed breakdown of recent growth in revenue from personal income tax and other taxes into (i) a real component, (ii) a nominal component and (iii) the tax measures approved is presented in García-Miralles and Martínez Pagés (2023). In that paper, the estimations of Price, Dang and Botev (2015) of the non-unit elasticity of revenue to the taxable base, which is the subject of this paper, are used to calculate the nominal component of personal income tax.

2 Specifically, $ERTI = \frac{\partial t_i/t_i}{\partial y_i/y_i} = \frac{y_i}{t_i} \frac{\partial t_i}{\partial y_i} = \frac{\partial t_i/\partial y_i}{t_i/y_i} = \frac{MR_i}{AR_i}$, where t_i is the tax payable, y_i is the taxable income, MR_i is the marginal rate and AR_i is the average rate for each taxpayer i.

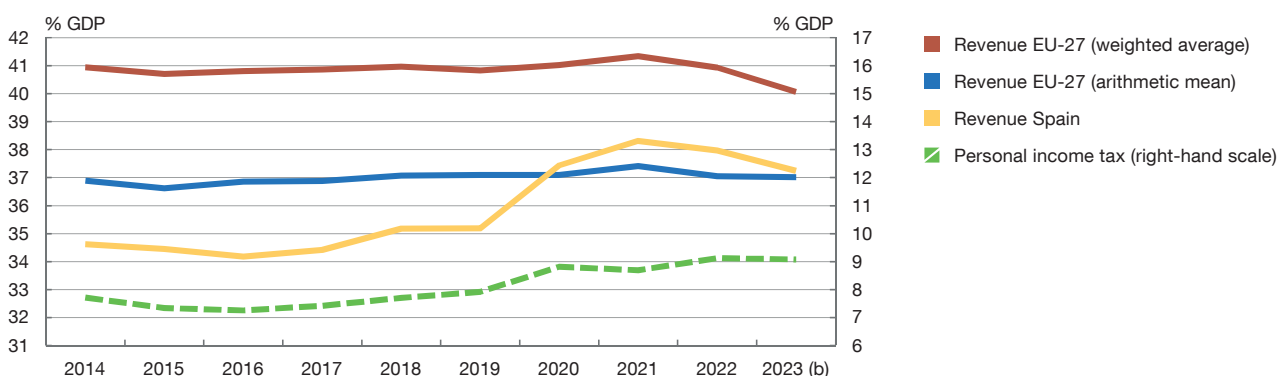3 In the long term, taxpayers' nominal income can grow for two reasons: inflation and productivity. To counter the fiscal drag effect caused by both of these factors, indexation based on actual nominal income growth is the best approach, while if the aim is to counter the effect of inflation only, the consumer price index (CPI) is a better reference. In practice both types of indices are used, although the CPI index is more common.

Chart 1
There is a strong increase in the tax revenue-to-GDP ratio in Spain, largely on account of the increase in personal income tax

1.a Tax revenue as a percentage of GDP (a)

Legend:
- Revenue EU-27 (weighted average)
- Revenue EU-27 (arithmetic mean)
- Revenue Spain
- Personal income tax (right-hand scale)

SOURCE: Banco de España (based on Instituto de Estudios Fiscales, Ministerio de Hacienda data).

a Including taxes and social security contributions.
b 2023 is extrapolated from data observed up to 2023 Q3.

This paper analyses fiscal drag using a microsimulation tool developed at the Banco de España (Bover, Casado, García-Miralles, Labeaga and Ramos, 2017) based on personal income taxpayers' administrative data. This tool can be used to estimate, for each individual, the amount of tax payable under different counterfactual exercises, in which changes in the income of each taxpayer or changes in tax legislation are simulated. Based on this, the fiscal drag effect for each individual (i.e. the individual ERTI), the aggregate effect for all the taxpayers (the total ERTI) and the ERTI for different types of income (from labour, capital or business activities) can be calculated. Furthermore, by simulating hypothetical reforms, it is possible to study the mechanisms giving rise to these effects, as well as to quantify the bearing that fiscal drag has had on past revenue and the impact it could have in the future, under different reform scenarios.

These results provide new evidence on the effects of fiscal drag in Spain, with the aim of informing the debate and improving public policy-making related to personal income tax.[4] This paper contributes to the existing Spanish and international literature in two ways.

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4 From an international perspective, Leventi, Mazzon and Orlandi (2024) estimate the ERTI of labour income for European Union (EU) countries using the EUROMOD microsimulator, as well as other relevant statistics linking wage growth to public finances. Price, Dang and Botev (2015) estimate the ERTI for OECD countries on the basis of aggregate information on income and tax revenue distribution. Mourre and Princen (2015) and Boschi and d'Addona (2019) study the fiscal drag effect over the business cycle by analysing time series for EU countries. Focusing on Spain, Sanz-Sanz and Arrazola (2024) study the fiscal drag effect using a model calibrated with administrative data for Spain and Moriana-Armendariz (2023) studies the impact of fiscal drag during the 1979-1987 period using taxpayers' administrative data, reporting that it was significant. Using a microsimulation approach, Martínez López (2011) estimates an elasticity of around 1.9 following the 2007 personal income tax reform. Creedy and Sanz-Sanz (2010) derive analytical expressions of the ERTI and estimated an elasticity of 1.3 for 2002. Onrubia and Sanz-Sanz (2009) use the fiscal drag effect in Spain as an instrument to study income elasticity to marginal tax rates. Fuenmayor, Granell, Higón-Tamarit and Sanchis (2005) use a microsimulator based on the European Community Household Panel to estimate fiscal drag in 1999 and after the 2003 reform.

First, by using a microsimulator based on administrative data in order to explore fiscal drag more accurately and in greater detail, documenting differences between taxpayers, mechanisms and heterogeneity by income type. And second, by complementing estimates of the fiscal drag effect based on the ERTI (in a static context for a given income distribution and fiscal legislation), with dynamic estimates quantifying the impact of fiscal drag over the recent period, incorporating both observed growth in different income sources, as well as changes in tax legislation. The paper concludes with a discussion of the different aspects that should be considered in the context of a hypothetical reform of this tax.

2 Personal income tax and indexation policies

2.1 Personal income tax conceptual framework

Personal income tax is a tax on the income of residents in Spain. Personal income tax is withheld at source and taxpayers are required to submit a tax return between April and June of each year on the basis of the total income earned in the previous calendar year. Calculating the tax payable is relatively complex, since it depends on various interacting factors, such as the type of income, numerous tax benefits and different tax brackets, with implications for the fiscal drag effect.[5]

Specifically, the tax is calculated on the basis of different sources of revenue, including labour income, capital income 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 for labour 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. realised 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.

General and savings taxable income are taxed under different tax regimes. These are divided into State and regional schemes, as around half of the tax revenue is transferred to the regional governments, which design their tax schemes and apply their own tax benefits. Tax rates are progressive, meaning that higher income is taxed at a higher rate. Tax rates vary by income level and also by type, with general income taxed using a higher and more progressive schedule than savings income.[6]

Lastly, various tax credits, such as the minimum personal and family allowance[7] and the maternity allowance, are deducted from the gross tax payable (the amount resulting from applying the State and regional tax rates to general and savings taxable income) to obtain the final tax payable.

2.2 Personal income tax indexation

In Spain, personal income tax has undergone several changes over the years, allowing the tax parameters to be broadly in line with cumulative inflation (García-Miralles, Guner and

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5 For a more detailed characterisation of personal income tax, see García-Miralles, Guner and Ramos (2019).

6 In 2019, the State general schedule had five brackets and a top marginal rate of 22.5%, while the State savings schedule had three brackets and an upper marginal rate of 11.5%. Since 2022, the number of general income tax brackets has increased to six and the top marginal rate is now 24.5%, while the number of savings income tax brackets rose to four in 2022 and five in 2023, and the top marginal rate increased to 14%. Regional tax brackets vary across regions.

7 This tax credit, for which there are also State and regional schemes, depends on the personal and family situation of the taxpayer.

Ramos, 2019; Almunia, 2022). However, these adjustments have been made on a discretionary basis, both when deciding which parameters to change and in the choice of the updating index. In the most recent period of high inflation, such parameter adjustments have not occurred with sufficient frequency or intensity to keep pace with price increases or household income growth.

From an international perspective, the recent surge in inflation has renewed interest in the indexation methods used by different countries to update their tax parameters. According to an International Monetary Fund (IMF) report by Balasundharam, Kayastha and Ribeiro (2023), most countries update these parameters on a discretionary basis. Focusing on Europe and North America, the OECD (2023) finds that around half of the countries (including Spain, Italy and Portugal) follow a discretionary updating method, while just under half (including the Nordic countries, the United States and Belgium) do so automatically or according to established rules. It should be noted that having a discretionary indexation system does not necessarily mean that the system is less responsive to inflation. Indeed, in a number of countries where the adjustments are made on a discretionary basis, there is a well-defined system whereby governments fairly frequently adjust taxes and benefits to reflect inflation.[8]

Another significant aspect is the benchmark indicator used for updating. The most common one is the consumer price index (CPI), but others, such as the producer price index, wage growth or ad hoc indices constructed for the purpose of indexing the tax, are also used.[9] The choice of benchmark indicator affects both the size and timing of the adjustments.

The last aspect of indexation policy decision-making to consider is the period in which the benchmark indicator and the frequency of adjustments are measured. Countries typically adjust tax parameters annually, often on the basis of lagged inflation data. More than half of the OECD countries adjust their income taxes in line with changes in a benchmark indicator recorded before the start of the fiscal year in question. Other countries, such as France, use a "nowcasting" approach to forecast the level of annual inflation in the current year during budgetary preparations in the final months of the previous year, allowing for more timely adjustments of fiscal parameters.

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8 In Germany, for example, the tax parameters are adjusted on a regular basis in response to the findings of two reports published every two years by the Federal Government to ensure that the level of subsistence income is not subject to personal income tax. In France, annual updates are usually carried out, although in some years, such as 2012 and 2013, the parameters have remained fixed as part of a consolidation plan. In Ireland, the government has committed to indexing tax credits and tax brackets each year, provided the economy is growing.

9 For instance, Denmark and Lithuania index only based on wages, while in other countries the indicator varies. Finland adjusts its personal income tax based on whichever indicator – prices or wages – has risen the most.

3 The fiscal drag effect

3.1 An analysis based on microsimulation

From a conceptual standpoint, the fiscal drag effect can be interpreted as a correlation, in aggregate terms, between changes in the personal income tax base and changes in revenue net of tax measures. However, this approach requires a correct estimation of the impact of the different fiscal measures implemented and cannot be used either to explore heterogeneity in the fiscal drag effect among taxpayers or to explore the underlying mechanisms. Although one branch of the literature documents this heterogeneity using aggregate information on the distribution of income and revenue by income group (Creedy and Gemell, 2004; Price, Dang and Botev, 2015; and Süssmuth and Wieschemeyer, 2022), these approaches often require making distributional assumptions.

This paper uses a different approach, based on microsimulation, to estimate the ERTI of each taxpayer by means of a counterfactual exercise, ceteris paribus, in which the effect of an increase in taxpayers' income on their tax liability is simulated. This methodology is being used by an increasing number of studies (e.g. Immervoll, 2005; Sutherland, Hancock, Hills and Zantomio, 2008; Paulus, Sutherland and Tasseva, 2020; Waters and Wernham, 2022; Leventi, Mazzon and Orlandi, 2024; and Moriana-Armendariz, 2023). However, most of them use simulation tools based on survey data. One contribution of this paper is the use of administrative tax data that allows the modelling of almost all the parameters making up personal income tax law, obtaining a more accurate estimation and providing greater opportunities to explore mechanisms and simulate counterfactual scenarios.

The microsimulation exercise uses as a starting point the tax microdata of personal income tax returns for 2019.[10] These data show almost all the items included in the return, including gross income, applicable tax benefits and final tax liability. The microsimulator, whose functioning is detailed in Bover, Casado, García-Miralles, Labeaga and Ramos (2017), calculates individuals' tax liability based on their gross income, with a margin of error below 0.05% for 2019.[11] Thus, the microsimulator applies the regulations in force to each taxpayer, sequentially calculating the tax liability. In other words, it adds the different types of income that make up general income and savings income, and applies tax benefits, tax brackets and tax credits until the final tax payable is obtained.

Once this simulation has been calculated and validated, two types of exercises (static or dynamic) are carried out, which are detailed in the following sections. The first type of exercise aims to estimate the ERTI induced by the personal income tax legislation in a static context, in which the data and the year of the legislation remain constant (in 2019) and taxpayers' income grows homogeneously. In other words, the potential or theoretical

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10 The microdata for 2020 are already available, but they are less representative as they are affected by the impact of the pandemic. For further details, see Pérez, Villanueva, Molinero and Vega (2022).

11 This margin of error is in line with the results reported by Bover, Casado, García-Miralles, Labeaga and Ramos (2017) for 2013 with microdata from 2013 (-0.2%).

fiscal drag effect that would arise in the absence of regulatory changes and in the event of a homogeneous increase in all sources of income is estimated. This exercise also explores heterogeneity in the ERTI due to the design of the tax, and the mechanisms giving rise to it. The second type of exercise aims at documenting the fiscal drag effect in practice, i.e. the dynamic impact it has had in the recent period and the impact it could have in the future. To this end, revenue projections are carried out between 2019 and 2025 based on observed or projected growth in different income items and on the different applicable regulations, whether these are regulations in force each year or hypothetical simulations in which the personal income tax parameters are updated.

3.2 Static simulations. Elasticity, mechanisms and heterogeneity

3.2.1 Methodology

Static simulation exercises estimate the aggregate ERTI and explore heterogeneity in the individual ERTIs, as well as the mechanisms determining such heterogeneity, based on 2019 data and the corresponding 2019 legislation. Thus, the fiscal drag effect resulting from the 2019 legislation can be characterised in a consistent manner with the 2019 data, without the need to make assumptions about taxpayer income growth after 2019 or about the fiscal measures implemented. Nonetheless, the results obtained are consistent with an equivalent exercise based on 2022 and 2023 legislation.

Specifically, this exercise simulates the effect of increasing all taxpayers' gross income by 1% in a homogeneous manner and calculates the new tax liability.[12] Thus, each taxpayers' ERTI is calculated as the relative change in their tax liability divided by the relative change in their taxable income. Once the individual ERTIs have been calculated, they can be aggregated to obtain the aggregate ERTI, defined as the average of the individual ERTIs weighted by the share of each tax liability in total revenue (a bottom-up approach). Alternatively, the aggregate ERTI can be calculated as the relative change in aggregate revenue divided by the relative change in aggregate income (a top-down approach).[13]

This exercise is also used to calculate the specific ERTI derived from certain types of income growth, such as employment income, capital income or income from business activities (mainly self-employment), which may vary because these incomes are affected by different deductions or different tax brackets, or because the composition of the individuals earning such income is different. To this end, the previous exercise is replicated by increasing only the income source under analysis by 1% and calculating the resulting tax liability and the corresponding ERTI.

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12 In this exercise, certain tax benefits which tend to grow automatically in line with income, such as the deduction for employee contributions to the social security system, are increased by 1%.

13 The two approaches are equivalent, except when the individual ERTI is not defined or leads to extreme values. For instance, a tax liability that rises from €1 to €5 represents a 400% increase, while one that changes from zero to a positive amount represents infinite growth. To correct for such cases, the bottom-up approach caps (through a winsorising procedure, so as not to lose these observations) the top 5% of the percentage increases in the tax payable amount before calculating the individual ERTIs.

Finally, to explore in more detail the origin of these elasticities, the initial exercise whereby all the different types of income are increased by 1% is repeated, but certain personal income tax parameters, such as tax brackets or certain tax benefits are also increased by 1%. This makes it possible to pinpoint which part of the ERTI is due to each type of tax parameter.

It should be noted that the data used in the microsimulator do not include "individuals not required to file a tax return", which limits the ability to characterise these individuals. This affects the lower end of the income distribution and makes it difficult to document the potential impact of the fiscal drag effect on those individuals who would be "dragged" into paying some tax. In any event, these individuals have a very small impact in terms of aggregate revenue. Furthermore, García-Miralles, Guner and Ramos (2019) show that more than 80% of taxpayers not required to file a tax return do so, as they are likely to get a refund due to tax credits.

3.2.2 Results

It is estimated that the ERTI induced by personal income tax regulations in 2019 is 1.85. In other words, a 1% increase in household income will lead to a 1.85% rise in tax revenue if the tax parameters are not changed. The result is robust to conducting the same exercise under 2022 and 2023 legislation, obtaining an ERTI of 1.82 and 1.84, respectively. Chart A1 of the Annex shows that the historical relationship observed between tax revenue net of tax measures and taxable income in per capita terms is consistent with this elasticity, particularly in the recent period. Specifically, an elasticity of 1.84 is estimated for the period 2017-2022, which suggests some stability despite changes in the distribution of income or in personal income tax regulations.

The fiscal drag effect occurs either because the increased income is taxed at a higher marginal rate than its average rate or because tax benefits (such as tax allowances) diminish their relative value or even reduce their amount. It is estimated that, in aggregate terms, 58% of the fiscal drag effect is due to the loss in relative value of tax benefits, while the remaining 42% is due to tax bracket progressivity. Chart 2 shows these results and how they affect different taxpayer groups in different ways.

In 2019 nominal terms, an ERTI of 1.85 would mean that for a taxpayer in the 77th percentile (with income of €33,700 and a tax liability of €5,472), were income to increase by 1% (€337), the tax liability would be €101 higher (a 1.85% increase). This effect is explained by the two previous mechanisms. First, a larger amount of income is taxed in the higher brackets and, second, there is a relative loss in the value of tax benefits, the amount of which remains fixed or even declines in the face of increases in income.[14] It is worth emphasizing that the ERTI that applies to each individual, even with the same level of gross income, differs depending on personal characteristics and the composition of income, as explained below.

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14 Examples are the general deduction for labour income earners, which decreases as income increases, and the minimum personal and family allowance, which only changes depending on the characteristics of taxpayers and their dependants.

There are differences in the fiscal drag effect depending on which source of income grows. The ERTI for employment income is estimated at 1.9. The estimated ERTI for capital income is 1.5 and for business activities associated with self-employment, 2.1. The lower ERTI for capital income is consistent with how personal income tax is designed, since the tax brackets for capital income are less progressive. Unlike the previous case, the differences between the ERTI for income from employment and from business activities, is not explained by the tax schedule, which is the same for both types of income, but by the fact that taxpayers who receive one type of income or another (employees and the self-employed, respectively) differ in their level of income and personal characteristics.[15]

Our empirical strategy allows us to dive deeper into the mechanisms giving rise to the fiscal drag effect. First, by calculating the ERTI applicable to each of the taxpayers, based on their income and personal characteristics. Second, by differentiating between the different tax parameters that cause fiscal drag (progressive tax brackets or loss in relative value of the different tax benefits).

Chart 2 shows that there are big differences in taxpayers' ERTI depending on their total income, with near-zero elasticities for those at the lower end of the income distribution, whose tax liability remains close to zero, and high elasticities for medium and medium-high incomes, which decrease as income increases. Specifically, the chart shows the average ERTI per income decile and the contribution of each decile to total revenue.[16]

The first deciles in the distribution have near-zero elasticities, since their tax liability remains at zero despite an increase in their gross income, due to tax allowances and deductions. Elasticity increases in the middle deciles, with an ERTI greater than 10 in the fourth decile. Although taxpayers in these deciles have low income and low tax liabilities, a rise in income triggers very high relative increases in the tax liability, mainly due to the loss of relative value in tax benefits. For illustrative purposes, an individual in the fourth decile with an average ERTI of 10 earns income amounting to €16,796 and pays €680 for personal income tax. An increase in income of €168 (1%) would lead to a €70 rise in the tax payable (slightly over 10%). One of the main factors explaining this variation is that the deduction for earning labour income[17] declines from €2,373 to €2,144.[18]

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15 The ERTI is a key parameter for modelling personal income taxes in the context of Eurosystem projection exercises. Having a disaggregated estimate updated by source of income means these models can be refined. This is because different elasticities can be applied to the various macroeconomic aggregates used to proxy taxable income.

16 The average elasticities of each decile are calculated using tax weights (i.e. the weight of each individual's tax liability in the total) so that the weighted average of each decile coincides with the aggregate's 1.85. The distribution is similar without applying these fiscal weights, but the average elasticity of the lower deciles increases.

17 All taxpayers who receive income from employment are entitled to an overall deduction of €2,000, which can be higher if certain criteria are applicable. In 2019 taxpayers with income below €13,115 had this deduction increased by €5,565 per year, and those with income ranging between €13,115 and €16,825 (where most individuals in the fourth decile fall according to our data) applied a deduction equal to €5,565 less the result of multiplying the difference between employment income and €13,115 per year by 1.5. In other words, for the majority of taxpayers in the fourth decile, this deduction decreases as their income increases.

18 Tax benefits are commonly designed to decrease as income grows. But if income does not increase in real terms (i.e. it does not grow more than the prices in the economy), taxpayers' purchasing power will not improve and the fiscal drag effect (by increasing their effective rates) will trigger a decline in their real income net of taxes.

Taxpayers in the medium-high and high end of the distribution have lower elasticities which decrease as income increases. This is mainly because the loss in relative value of tax benefits accounts for a much smaller proportion of these taxpayers' taxable income. Thus, these taxpayers' ERTI is mainly influenced by tax bracket progressivity, which is the predominant mechanism in the eighth, ninth and tenth deciles. Notably, these three deciles contribute 11.8%, 17.2% and 55.4%, respectively, to total revenue. Accordingly, their weight in aggregate ERTI is very significant. For example, for an individual in the tenth decile with an elasticity equal to the average for the decile (1.38), income of €65,621 and tax liability amounting to €11,833, a €656 increase in income (1%) entails a €164 increase in their tax payable (1.38%).[19]

3.2.3 Progressivity and inequality

This sub-section analyses how fiscal drag affects income inequality and personal income tax progressivity. Different indicators of inequality and progressivity are estimated based on the taxpayers' taxable income in 2019 and the 2019 regulations, in a ceteris paribus context in which the different sources of income grow homogeneously. Specifically, taxpayers in 2019 are considered on the basis of their observed income, as well as under the assumption of a homogeneous 1% growth in income. The results of both simulations are reported in the respective columns of Table 1.

The inequality indicators considered are the Gini index and the 90:10 ratio (the income ratio between the top and bottom 10% of the distribution), as well as a parametric function linking average rates to gross income, whose parameters capture the progressivity of the tax and its average effective rate. Specifically, the following function is estimated:

$$f(\tilde{I}) = 1 - \lambda * \tilde{I}^{-\tau}$$

Where $\tilde{I}$ represents multiples of average income, the τ parameter reflects the progressivity of the tax and $1 - \lambda$ reflects the average effective rate. Function $f(\tilde{I})$ takes a value of zero for observations below a $\bar{I}$ limit that is determined by minimising the mean squared error.[20]

First, we document that the effect of fiscal drag reduces income inequality. Table 1 shows that the Gini index for income net of taxes decreases when taxpayers' income increases homogeneously. Also, the change in the Gini index between gross income and income net of taxes is greater in the simulation in which net income has grown, i.e. the redistributive effect of personal income tax is enhanced. These results are also observed in the case of the 90:10 ratio. This inequality-reducing effect mainly owes to average effective tax rates increasing for most taxpayers, except for those with low income who continue to have a rate close to zero.

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19 Although at the top of the distribution the effect of the brackets gains relative weight with respect to the effect of tax benefits, its contribution to fiscal drag also diminishes. This is largely because a larger share of the income of these taxpayers is subject to the tax on savings income, which is less progressive. Thus, the ERTI for the top 5% and 1% is 1.32 and 1.14, respectively.

20 This functional form is based on Benabou (2002) and Heathcote, Storesletten and Violante (2017), and has previously been used to characterise personal income tax in Spain (García-Miralles, Guner and Ramos, 2017).

Chart 2
ERTI varies by taxpayer income, reflecting different factors

2.a Distribution of ERTI
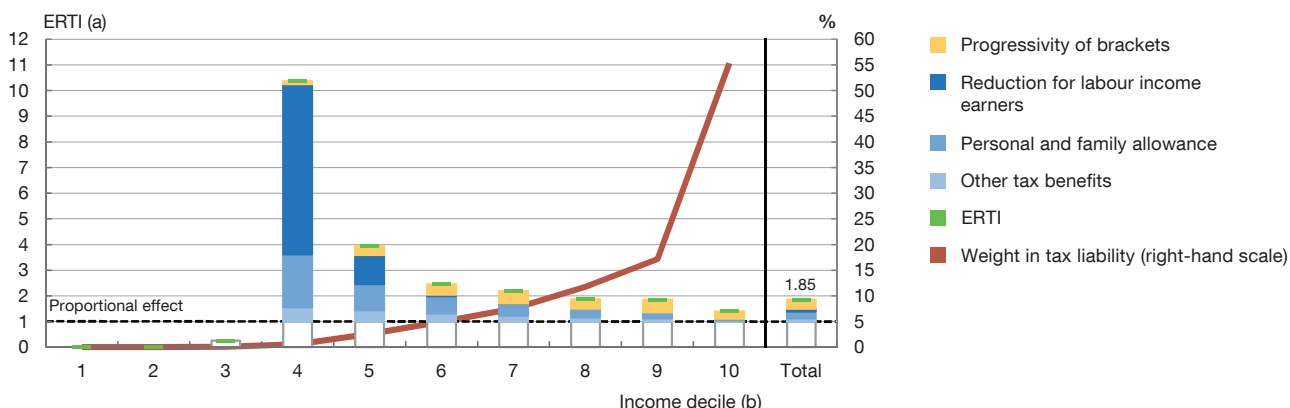
SOURCE: Banco de España (based on Instituto de Estudios Fiscales, Ministerio de Hacienda data).

a ERTI is defined as the percentage change in the tax liability triggered by a 1% increase in taxable income.
b Average ERTI in each decile is calculated as the average weighted by each individual's share in total tax revenue, such that the average of all deciles weighted by their contribution to total tax revenue coincides with aggregate ERTI.

This happens despite individual ERTIs being greater in the middle than in the high end of the distribution (see Chart 2), as is the increase in average effective rates (see Chart A2 of the Annex). Consistent with this, the Table shows that the average effective rate $(1 - \lambda)$ for taxpayers as a whole, estimated through the parametric function, increases under the simulation in which taxpayer's income increases (i.e. λ declines).

Second, although fiscal drag reduces income inequality, it also reduces tax progressivity, given that in the progressivity metrics the larger increase in effective tax rates for middle incomes over high incomes dominates.[21] Specifically, Table 1 shows that the τ parameter, which captures tax progressivity, decreases in the simulation under which taxpayer income increases, shifting from 0.1411 in the baseline scenario to 0.1398 when taxpayer income is 1% higher.[22] Chart A2 illustrates this result showing the two parametric functions estimated, as well as the difference between average effective rates along the income distribution.

3.3 Dynamic simulations. Fiscal drag, projections and reforms

3.3.1 Methodology

The second type of exercise aims to evaluate how fiscal drag is affecting tax revenue and average effective personal income tax rates in the current period. First, the impact in recent

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21 This result, a priori counterintuitive, is consistent with earlier literature, which also found that fiscal drag reduces inequality despite weakening the progressivity of the tax. See Immervoll (2005).

22 As a reference, parameter τ is estimated at 0.18 for Italy, 0.2 for the United Kingdom, 0.22 for Germany and Sweden and 0.26 for Denmark (Holter, Krueger and Stepanchuk, 2018). For Spain, on 2015 data, the figure was estimated at 0.15 (García-Miralles, Guner and Ramos, 2017).

years is estimated, given the observed income growth and the regulatory changes that have been implemented. Second, the impact on future revenue is estimated based on different hypothetical scenarios related to the updating or indexation of tax parameters.

For these exercises, the first step is to update the microdata observed in 2019 to uniformly increase the different types of income for all taxpayers. This update is based on (i) the growth observed up to the most recent date for which disaggregated data by income source is available (2022) and (ii) Banco de España projections for the following years.[23] Specifically, the income in 2020, 2021 and 2022 is updated using detailed information provided by the Spanish tax authorities on the observed growth in the number of taxpayers by region, along with the growth in the different tax items comprising the personal income tax base. Income for 2023, 2024 and 2025 is updated using the projected growth rates for various macroeconomic aggregates that proxy the personal income tax base (for more details see García-Miralles and Martínez Pagés, 2023). Accordingly, taxpayers' total income grows at different rates only to the extent that such income breaks down into different sources (such as wages, capital income or business earnings) that have grown at different rates in recent years.

This kind of exercise does not account for any heterogeneity in the growth of each source of income among taxpayers. However, this has no significant effect on the aggregate results since most of the tax revenue is concentrated in the top deciles (see Chart 2), which in turn determine the growth rates of each of the income sources used to update the microdata in the microsimulator.[24]

Once the microdata have been updated, the next step is to incorporate the personal income tax rules in force in 2020, 2021, 2022 and 2023. In 2022 and 2023 legislative changes were enacted in several regions specifically designed to update some of the fiscal parameters in response to inflation. There have also been regulatory changes at the central government level in 2023 and 2024, increasing the labour income deduction to accommodate the growth in lower incomes, particularly those affected by the rise in the national minimum wage. All of this legislation has been incorporated into the analysis.

Once the simulations for these years have been calculated, hypothetical reforms can be simulated to quantify the impact of fiscal drag to date, along with its potential future impact based on different assumptions regarding the applicable legislation. To determine how much fiscal drag contributed to the tax revenue growth observed up to 2023, a simulation

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23 The Banco de España's December 2023 projections are used: Macroeconomic projections for the Spanish economy (2023-2026). *Economic Bulletin - Banco de España,* 2023/Q4.

24 In any event, as a robustness check, a simplified simulation has also been carried out to account for heterogeneity across deciles in the total income growth of individual taxpayers, drawing on information from the National Statistics Institute's (INE) Living Conditions Survey (which includes observed income data up to 2022 and the same distribution is assumed for growth in 2023). The exercise uses this heterogeneous growth, combined with the estimated ERTI for each decile (see Chart 2), to obtain the aggregate tax revenue. This robustness exercise finds growth in personal income tax revenue of 43.7% between 2019 and 2023, very similar to that obtained using homogeneous income growth across all deciles (43.3%) and that yielded by the microsimulator (43%).

Table 1

The effect of fiscal drag on inequality and on personal income tax progressivity

		2019 income	2019 income increased by 1%
Inequality indices	Gini index - income net of taxes	0.3789	0.3788
	Change in Gini between gross and net income	11.88%	11.90%
	90:10 ratio - income net of taxes	5.5760	5.5662
	Change in 90:10 ratio between gross and net income	18.25%	18.39%
Parametric estimation (a)	Complement of average tax rate (λ)	0.8423	0.8408
		(0.0000)	(0.0000)
	Progressivity parameter (τ)	0.1411	0.1398
		(0.0001)	(0.0001)
	Zero tax liability threshold (Ĭ)	30%	29%
	Mean squared error	0.00140492	0.00138525

SOURCE: Banco de España (based on Instituto de Estudios Fiscales, Ministerio de Hacienda data).

a The functional form estimated is $f(Ĭ) = 1 – λ * Ĭ^{-τ}$, where $f(Ĭ)$ are average effective tax rates and $Ĭ$ are multiples of average gross income. $f(Ĭ) = 0$ si $Ĭ < Ī$.

is conducted to find the revenue that would have been obtained in 2023 had the fiscal parameters in 2023 rules been fully updated based on a specific index since 2019. In other words, a scenario is simulated in which the tax was fully indexed between 2019 and 2023. Three indexation options are considered based on standard international practices: CPI for the year prior to that in which the income is obtained, CPI for the year in which the income is obtained and the growth observed in the incomes included in the tax base. Specifically, for the CPI, the price growth observed between December of a given year and November of the previous year is used, as this is the standard index used to update social benefits or fiscal parameters for the following year. The income growth index is calculated based on the nominal income growth observed in the simulator's own microdata, after applying the nominal adjustment coefficients, but excluding the growth corresponding to the increase in the number of taxpayers.

To estimate the future tax revenue based on different indexation choices, tax revenue for 2025 is projected under four different scenarios. In the first scenario, 2023 legislation remains unindexed (although the recent reform extending the labour income deduction is included). In the other three scenarios the parameters are indexed using one of the three aforementioned indices: the previous year's CPI, the current year's CPI and the observed growth in the tax base. In this way, fiscal drag's potential future effect is quantified as the difference between the tax revenue without any indexation and the tax revenue if the tax system were indexed to one of the three indices.

3.3.2 Results

Chart 3 sets out the results of these hypothetical exercises in terms of their impact on total tax revenue, on the tax revenue-to-GDP ratio and on average effective rates. For each

of these variables, the brown line denotes the historical series observed between 2014 and 2023, while the blue markers show the result of the simulation for the period 2019-2023 based on present legislation and using the 2019 microdata updated according to the observed growth by income source. The simulation closely proxies the observed aggregate figures, thus offering a good baseline scenario for calculating counterfactual scenarios.[25]

To study the effect of fiscal drag on tax revenue in recent years, marked by sharp growth both in inflation and in taxpayer income, tax revenue for 2023 is simulated assuming that the personal income tax legislation for that year had been fully indexed since 2019 to one of the three indices considered: CPI for the previous year (yellow marker), CPI for the current year (green marker) or observed growth in income (grey marker). We find that indexation based on any of the three indices would have resulted in a marked reduction in tax revenue, as well as in the tax revenue-to-GDP ratio and in average effective rates.

The best counterfactual scenario for isolating the fiscal drag effect is indexation based on the observed income growth in each year (grey marker), since it reflects actual income growth over the period. Under this scenario, half of the growth in the tax revenue-to-GDP ratio between 2019 and 2023 – i.e. 0.79 percentage points (pp) of the total increase of 1.55 pp of GDP – is attributable to the fiscal drag effect. The remaining increase is mainly attributable to the personal income tax base (i.e. the number of taxpayers and their income) growing faster than GDP. Likewise, the average effective rate declines from 14.7% to 13.3%, close to, but still slightly higher than, the average effective rate for 2019 and the historical series. The remaining increase in average effective rates stems from a tax base composition effect. Lastly, tax revenue in 2023 would have been approximately €11 billion lower had the fiscal parameters been fully updated, which is slightly less than one-third of the increase observed in the period 2019-2023. The remaining increase would be explained by the growth in the real and nominal tax base, in a similar proportion.

Alternatively, indexation based on the previous year's CPI growth (yellow marker) yields a very similar tax revenue to that obtained under the previous scenario (indexation based on income growth), and therefore the fiscal drag effect in this counterfactual exercise is also very similar (0.76 pp of GDP). However, taking CPI for the current year instead (green marker) results in lower tax revenue than under the previous exercises. This is because, during the specific period in question, the index calculated in this way yields a higher value since it incorporates the CPI observed up to November 2023 and excludes that observed up to November 2019, which was far lower. In consequence, the parameters are updated to a greater extent. Under this indexation approach, fiscal drag would have accounted for 0.95 pp of the 1.55 pp increase in the tax revenue-to-GDP ratio between 2019 and 2023.

Another simulation assumes that the 2019 legislation remained unchanged through to 2023 (i.e. stripping out the various reforms made between 2019 and 2023, such as the

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25 For 2019, the difference between the simulated tax revenue and the equivalent observed aggregate is -0.03%. This difference rises to 2.4% relative to the total observed tax revenue, since this includes other revenue such as withholdings made on non-filers, which are not included in the microsimulation tool. To correct this difference, the simulated tax revenue in 2019 is rescaled, maintaining the same rescaling coefficient in the subsequent years.

regional government rebates and the State reform on labour income deductions). According to this simulation (pink marker in 2023), tax revenue would have increased even further in the absence of those reforms.[26]

To study potential future developments in personal income taxation, we simulate the tax revenue based on the household income growth envisaged in Banco de España projections, as detailed in the methodological section. Assuming that 2023 legislation remains unchanged to 2025 (except for the reform extending the labour income deduction, which affects 2024 and is already included in the simulation), the tax revenue-to-GDP ratio would continue to grow, reaching 9% of GDP (pink marker in 2025), 29% higher than its 2019 level. The average effective rate would also continue to rise, reaching 15.3%, the highest level in the historical series.

These increases in the revenue ratio and in effective rates would be less pronounced if the personal income tax parameters for 2024 and 2025 were indexed. For instance, indexing those parameters to the previous year's CPI (yellow marker), which is standard practice in other countries (see Section 2.2), would reverse 80% of the projected increase in the revenue ratio for the period 2023-2025 (to 8.6% rather than the 9% estimated under the no-legislative-change scenario). This indexation would also stop the average effective rate from rising further, which would instead hold at levels similar to those observed in 2023.
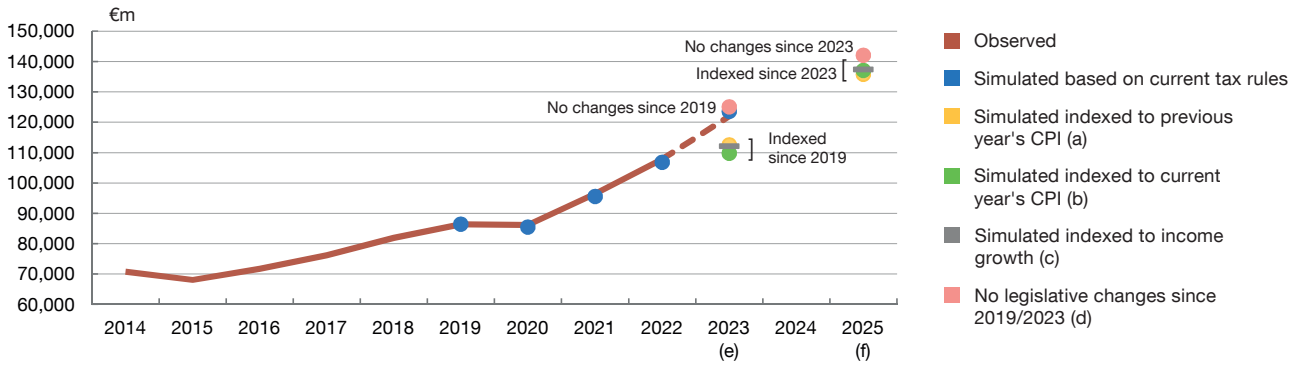
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26 The microsimulator is able to duly model the various deductions implemented by the regional governments, whose impact is estimated at just over €1.5 billion. However, it is unable to estimate the full effect of the State reform extending the labour income deduction, also estimated at just over €1.5 billion, given that this reform affects individuals not required to file tax returns, who, as noted above, are not included in the microsimulation tool.
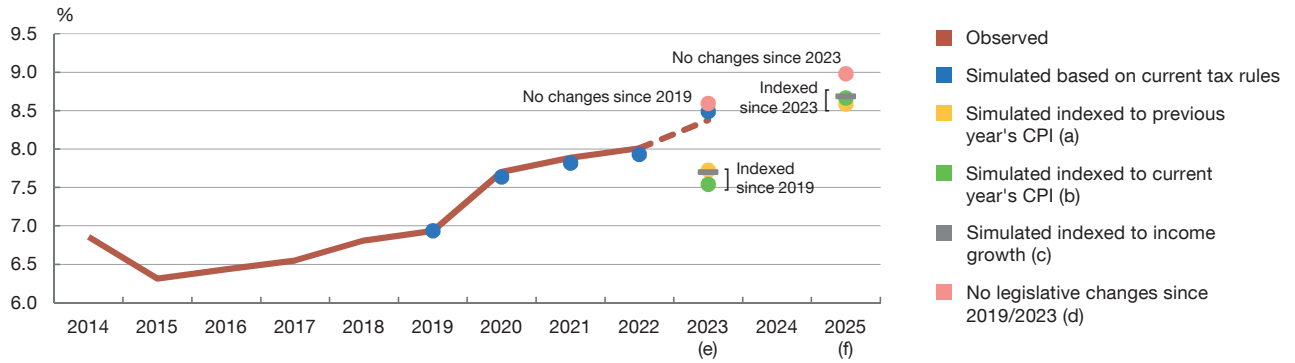
Chart 3

Personal income tax revenue and average effective rates, observed and simulated under different hypothetical scenarios
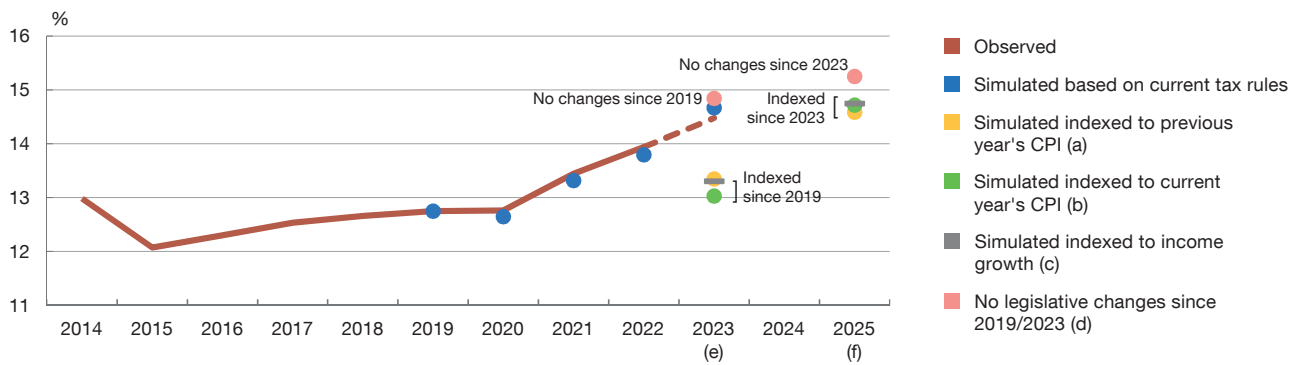
3.a Tax revenue

€m

No changes since 2023
Indexed since 2023
No changes since 2019
Indexed since 2019

- Observed
- Simulated based on current tax rules
- Simulated indexed to previous year's CPI (a)
- Simulated indexed to current year's CPI (b)
- Simulated indexed to income growth (c)
- No legislative changes since 2019/2023 (d)

3.b Tax revenue/GDP

%

No changes since 2023
Indexed since 2023
No changes since 2019
Indexed since 2019

- Observed
- Simulated based on current tax rules
- Simulated indexed to previous year's CPI (a)
- Simulated indexed to current year's CPI (b)
- Simulated indexed to income growth (c)
- No legislative changes since 2019/2023 (d)

3.c Average effective rate

%

No changes since 2023
Indexed since 2023
No changes since 2019
Indexed since 2019

- Observed
- Simulated based on current tax rules
- Simulated indexed to previous year's CPI (a)
- Simulated indexed to current year's CPI (b)
- Simulated indexed to income growth (c)
- No legislative changes since 2019/2023 (d)

SOURCE: Banco de España (based on Instituto de Estudios Fiscales, Ministerio de Hacienda data).

a Personal income tax parameters are indexed every year, using the CPI observed between December and November of the previous year.
b Personal income tax parameters are indexed every year, using the CPI observed between December and November of the current year.
c Personal income tax parameters are indexed every year, using the observed nominal growth in gross income during the current year.
d The tax legislation of 2019 or 2023 remains unindexed and unchanged.
e For 2023, growth observed up to 2023 Q3 is extrapolated to the year as a whole.
f For 2025, the Banco de España's macroeconomic projections are used for the different macroeconomic aggregates underlying the tax base.

4 The debate and options for reforms

This paper has shown that when the parameters that determine personal income tax are not fully updated, effective rates and tax revenue rise in response to increases in income, which gives rise to the so-called "fiscal drag" effect. This effect is currently having a quantitatively significant impact, accounting for half of the increase observed in the personal income tax-to-GDP ratio between 2019 and 2023. The paper also describes the mechanisms that give rise to these effects; about half is attributable to the progressivity of tax brackets and the other half to the loss of relative value in the various personal income tax benefits. These dynamics result in marked differences in the intensity of the fiscal drag effect depending on taxpayers' level of income.

The decision of whether to update personal income tax parameters, which specific parameters and based on which indices is a complex one entrusted to political actors who must weigh up trade-offs. The findings of this paper offer evidence to guide future decision-making. It is worth highlighting that in the long run these reforms are inevitable, whether through occasional ad hoc updates, recurring adjustments or automatic mechanisms, since in the absence of such reforms effective personal income tax rates would continue to rise insofar as nominal household income grows.

With regard to a future personal income tax reform, there are four key aspects to consider. First, although the fiscal drag effect has helped to increase tax revenue, thus benefiting the sustainability of Spain's public finances, this increase has been driven by higher tax rates rather than by an expansion of tax bases, as advocated by many tax experts.[27] Both in Spain, historically, and internationally, legislative amendments have been implemented to keep average effective rates stable.[28]

Second, the fiscal drag effect primarily affects the middle and the middle-high end of the income distribution, due to the diminishing relative value of several tax benefits, particularly the labour income reduction and the personal and family allowance. This suggests that updating these parameters is particularly important, not only for tax revenue considerations but also to preserve the degree of tax progressivity.[29] The distribution of the fiscal drag effect by taxpayer income depends on the specific characteristic of each country's tax system and the cross-country comparative evidence remains limited, particularly that based on non-parametric approaches capable of identifying the most affected deciles or individuals.

Third, regarding the update frequency, while automatic indexation offers predictability and is not an uncommon policy among Spain's developed peers, many other countries adjust

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27 Comité de Personas Expertas (2022) and Autoridad Independiente de Responsabilidad Fiscal (2019).

28 That said, there have been instances of deliberate decisions not to index parameters for some years as a fiscal strategy to increase tax revenue, a recent case in point being the United Kingdom (Waters and Wernham, 2022).

29 A reform where such tax benefits are automatically indexed while maintaining discretionality in adjusting the tax brackets could strike a balance between the necessary fiscal consolidation, the use of fiscal drag as an automatic stabiliser and protecting the real income of taxpayers, particularly those in the middle of the distribution.

tax parameters on a discretionary basis. If applied appropriately (i.e. with transparency and regularity), a discretionary approach could lead to an automatic stabilisation effect if the parameters are updated less during upswings and more during downswings.

Fourth, the selection of indexation benchmark also affects fiscal drag. Most OECD countries use a price index as a benchmark, primarily the CPI, with the aim of preserving the real value of the parameters and thereby protecting taxpayers' purchasing power by offsetting the effect of inflation. Alternatively, an index that proxies income growth can be used. Thus, the fiscal drag caused both by inflation and by productivity gains would be offset in the long run. This strategy could also offset the fiscal drag effect when wages grow faster than prices, although it may prove inadequate to preserve the real value of the fiscal parameters during periods of high inflation and sluggish income growth, as experienced recently (for more details see OECD, 2023). The reference period for these indices may also be relevant. Most countries use an indicator recorded before the start of the fiscal year, while other countries create an index based on projections for the following year.[30]

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30 The reference period of the index used is often a matter of secondary importance, especially in the medium term. However, during episodes of substantial price growth, like the one observed around 2022, this decision can have a considerable impact in a particular year. This makes the case for retaining a degree of discretionality in updating the fiscal parameters.

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Annex

Chart A.1

The historical relationship between tax revenue and tax base shows an elasticity greater than one. When this elasiticity is estimated for the most recent period it aligns with the microsimulation-based estimates

A1.a Relationship between tax revenue and tax base in per capita terms (a)
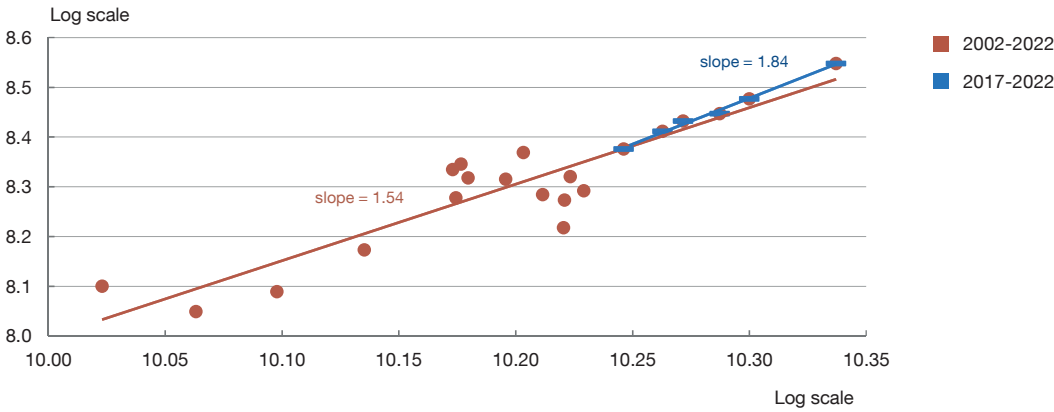
SOURCE: Banco de España based on Agencia Tributaria data.

a Tax revenue net of the fiscal measures. Tax revenue and the tax base are both calculated in per capita terms based on the number of tax filings each year. This approach aims to isolate the nominal effect (which induces fiscal drag and gives rise to an elasticity greater than one) from the real effect (which, in the absence of composition effects and unaccounted fiscal measures, would give rise to unitary elasticity).

Chart A.2

Uniform increases in income with no changes in tax legislation lead to higher average effective rates and less tax progressivity

A2.a Function of average effective rates relative to pre-tax income (a)
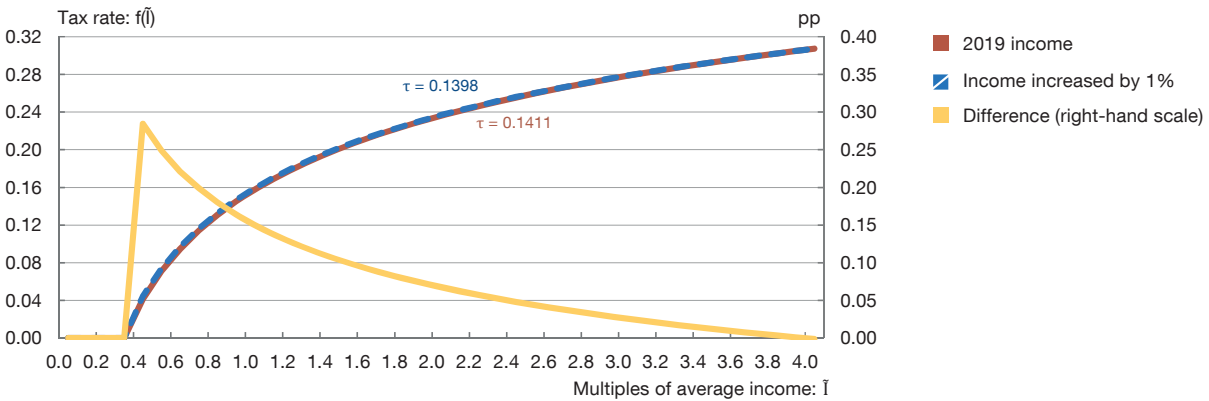
SOURCE: Banco de España based on Agencia Tributaria data.

a The function $f(Ĭ) = 1 – \lambda * Ĭ^{-\tau}$, is estimated, where $Ĭ$ is a multiple of average income and the parameter τ diminishes as the tax becomes less progressive.

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