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The Tax Attractiveness of EU Locations for Corporate Investments: A Stocktaking of Past Developments and Recent Reforms

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Abstract: In this paper, we illustrate the tax attractiveness of EU countries as investment locations over time in terms of effective average tax rates and evaluate potential tax reform options. Our quantitative assessment of recent tax policies suggests that corporate tax rate cuts, notional interest deductions and R&D incentives significantly reduce the effective average tax rate. When government budgets are constrained, however, tax incentives with a direct link to investment activities, such as accelerated depreciation and R&D incentives, are most suitable to stimulate private investment. Even after the introduction of the global minimum tax, these measures remain a viable tool to stimulate investments.

Keywords: effective tax rates; Devereux/Griffith methodology; global minimum tax; tax incentives; investment; location attractiveness

JEL Classification: F21; F23; H25; K34

1 Introduction

The effective tax burden at the corporate level is an important determinant of a country's attractiveness as an investment location (e.g. Overesch and Rincke 2011; Schreiber, Spengel, and Lammersen 2002; Schanz, Dinkel, and Keller 2017). Empirical evidence shows that one percentage point (pp) increase in the corporate tax rate reduces investment activity by about 2.49 percent (Feld and Heckemeyer 2011). At the same time, the tax environment heavily depends on the focus of international tax

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policy, which varies considerably over time. Until the 1990s, international, and particularly European, tax policy concentrated exclusively on avoiding double taxation to promote the international movement of goods. As economic integration progressed and capital mobility increased, the trend towards falling corporate tax rates began. In particular, when Eastern European countries gained access to the European internal market in 2004, they stood out with comparatively low corporate income tax rates. This induced a dynamic of tax rate cuts also within larger European economies (Elschner, Heckemeyer, and Spengel 2011). In the aftermath of the economic and financial crisis of 2008/2009, the trend of cutting tax rates stalled for some years.[1] In the meantime, legislators have prioritised the promotion of highly mobile and profitable economic activities by employing strategies of smart tax competition such as tax incentives for research and development (R&D) (Bührle et al. 2023a).

Within the last decade, in response to the increased public focus on presumed profit shifting activity of multinationals, policy makers in high-tax countries concentrated more on anti-tax avoidance and tax transparency measures.[2] On top of existing initiatives, in July 2021, 137 countries that belong to the OECD's Inclusive Framework agreed on the introduction of a global minimum tax of 15 percent for large firms (more than EUR 750 million turnover) as part of the OECD Two Pillar Strategy. In contrast to other countries, the EU Member States are obliged to implement the global minimum tax by the end of 2023 due to the adoption of the Global Minimum Tax Directive.[3] Taking all these developments together, it seems to be that at this point, at the latest, the main focus of international tax policy has strikingly been shifted to restrict or prevent excessive shifting of tax substrate (Heckemeyer 2022). Consequently, the importance of the effective tax burden in high-tax jurisdictions increases as it is now more costly for multinationals to reallocate profits to lower-tax jurisdictions.

Against this background, the objective of this paper is twofold. First, we illustrate the EU's tax attractiveness as an investment location over time in terms of forward-looking effective tax burdens. These estimates provide a comparative framework for analysing the impact of tax policy reforms on the taxation of a hypothetical

1 See Figure B1 in Appendix B for an illustration of the trends in combined profit tax rates in the aforementioned country groups.

2 These measures include e.g. the OECD/G20 BEPS project, the EU Anti-Tax Avoidance Directive, the EU Directive on Administrative Cooperation, and Country-by-Country Reporting.

3 For a detailed description of the regulations and functioning of the global minimum tax, see e.g. Bührle et al. (2023b).

investment by incorporating important tax base effects and non-profit taxes. As such, they are crucial for understanding ex ante how tax policy reforms are expected to shape international investment decisions. Second, we outline and assess the impact of recent tax policy measures taken or planned by selected EU Member States to improve their attractiveness as investment location within the constraints set by tight national budgets and the global minimum tax. In particular, our analysis focuses on the ability of the discussed measures to stimulate additional (private) investment. This comprehensive analysis contributes to a better understanding of current challenges faced by policy makers in creating a supportive tax environment for business investment. Understanding these challenges is essential in the context of the current economic slowdown, an observed gap in productive investment between the EU and major competitors such as the US, and increasing budgetary pressures, where governments need to make efficient use of public resources and mobilise private investment.

We find that over the past 20 years, on average, all EU Member States followed a trend of declining effective tax burdens. However, high-tax EU countries have not been able to improve their relative tax attractiveness within the EU and with respect to major non-EU competitors. Our quantitative assessment of recent tax policies suggests that corporate tax rate cuts, notional interest deductions and R&D incentives significantly reduce the effective tax burden and are therefore effective measures to increase tax competitiveness. Against the background of tight government budgets, the measures must be assessed in a differentiated manner with regard to the stimulation of investments. The first two measures might be less efficient as companies can benefit without additional investment. Yet, in the case of a notional interest deduction, investment can be encouraged by limiting the application to newly raised equity. In contrast, measures such as accelerated depreciation, input-based R&D incentives and reduced tax rates for certain types of qualifying investment ensure that only those firms that actually invest benefit. Moreover, in the context of the global minimum tax, accelerated depreciation and R&D tax incentives will be the most viable instruments to increase the tax attractiveness of a country.

The remainder of this article proceeds as follows. Section 2 provides a brief overview of the methodology that is used to measure the effective tax rates before it evaluates the development of national tax burdens over the last two decades. Section 3 measures the impact of current tax policy developments on countries' tax attractiveness quantitatively and discusses them critically. Section 4 concludes.

2 The EU's Tax Attractiveness as an Investment Location

2.1 Data and Methodology

To analyse the tax attractiveness of the EU Member States for the manufacturing sector, we primarily rely on data of the Mannheim Tax Index (Spengel et al. 2024). This index benchmarks all EU countries as well as major international competitors (such as Canada, Japan, North Macedonia, Norway, Switzerland, Türkiye, the United Kingdom, and the United States) from a corporate tax perspective by calculating forward-looking effective tax rates for highly profitable companies.[4] These forward-looking effective tax rates provide a comparative framework to analyse the effect of corporate tax policy reforms on the taxation of a hypothetical investment by incorporating important tax base effects and non-profit taxes. As such, they are instrumental in understanding ex ante how tax policy reforms are expected to shape international investment decisions.

The estimates are based on the Devereux/Griffith methodology (1999, 2003), which extends the work of Jorgenson (1963), Hall and Jorgensen (1967), and King and Fullerton (1984). This neoclassical approach assumes that firms invest in capital as long as marginal returns cover marginal costs. Thus, investment takes place until the return equals the cost of capital (CoC) – the minimum pre-tax real rate of return required by an investor given a post-tax real rate of return on an alternative (financial) investment.[5] In line with neoclassical investment theory, this approach assumes a perfect capital market under certainty.

The Devereux/Griffith methodology enables the computation of effective tax burdens not only on marginal investments but also on infra-marginal ones. In particular, the effective average tax rate (EATR) measures the change in the net present value (NPV) of a highly profitable investment caused by taxation relative to a discounted pre-tax rate of return of 20 percent:[6]

$$EATR = \frac{R^* - R}{p/(1+r)}$$

4 In the following figures, we will use the ISO 3166 ALPHA-2 abbreviation for the sample countries.
5 We assume that the financial investment yields a market interest rate of 5 percent. In the absence of taxation, the CoC equals the real market interest rate. If taxation raises the CoC above 5 percent, the marginal corporate investment is discriminated and, in theory, taxation affects the optimal level of investment activity.
6 If the pre-tax rate of return is identical to the CoC, the EATR equals the effective marginal tax rate (EMTR). For further information on the EMTR, please refer to Appendix A.

where R^* is the NPV before taxes, R is the NPV after taxes, p is the pre-tax rate of return, and r is the real interest rate. The international comparison of the tax burden on highly profitable investments is most important in terms of the choice of investment location (Devereux and Griffith 2003; Jacobs and Spengel 2000; Spengel 2003). When choosing from a set of mutually exclusive investments with an identical pre-tax real rate of return, a company will favour the alternative with the highest post-tax net present value, where the EATR is lowest.

In calculating effective tax rates, we assume a hypothetical incremental investment by a manufacturing corporation, covering investment in buildings, machinery, intangible assets, financial assets and inventories. Each asset is accorded equal weight, i.e. 20 percent of the capital employed. The investment is financed by new shares (10 percent), retained earnings (55 percent) and a loan (35 percent).[7] To calculate the effective tax burden, the approach considers country-specific information on the type of the tax system, applicable profit and non-profit taxes (e.g. corporate income tax, surcharges, real estate tax) and tax base regulations.[8]

The CoC and the EATR can be considered complementary indicators, as each is associated with a different decision margin. For instance, a firm will look at the EATR to choose the location of an investment (e.g. the location of production facilities). Conditional on the choice of its location, the CoC will determine the scale of investment (e.g. the number of employees to hire or the size of the physical investment). As we aim at analysing the effect of corporate taxes on countries' tax attractiveness as an investment location, i.e. on multinational companies' decision whether or not to choose a specific investment location, we focus our analysis on the EATR.

2.2 Trends in the Development of Effective Tax Burdens in the EU and Selected Third Countries

Figure 1 shows pronounced variations in investment location attractiveness among the countries examined, particularly within the EU. Already in 2005, Spain, Germany, and France showed the highest EATRs among the EU27 Member States with 36.5 percent, 35.8 percent, and 34.8 percent, respectively, and are still the top

7 For a graphical illustration of the hypothetical investment, the necessary adjustments in case of R&D investment, and the key assumptions and economic parameters, please refer to Appendix A.

8 We assume that the manufacturer makes its investment and profits in the same jurisdiction and entity. Thus, we do not take into account tax planning or profit shifting activities. In addition, the Devereux/Griffith methodology does not allow, without further simplifying assumptions, to account for more stringent anti-avoidance measures (e.g. interest deduction limitation rules, controlled foreign corporation rules).

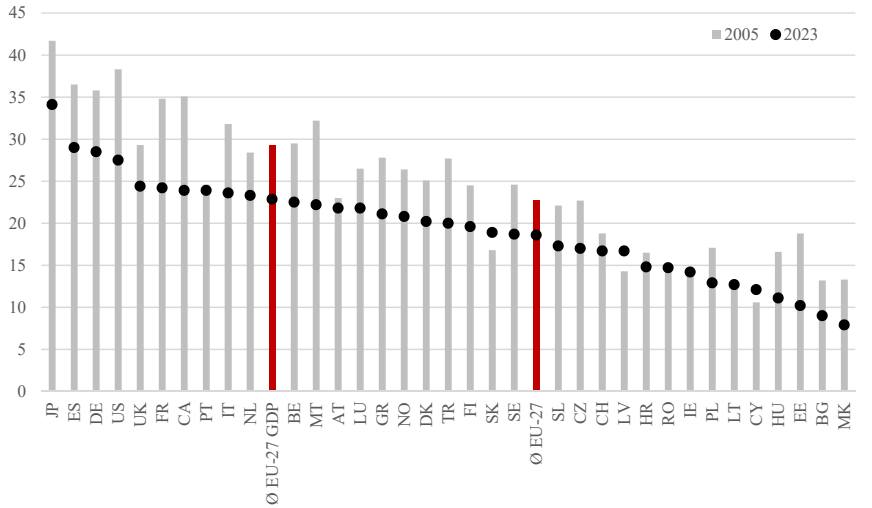

Figure 1: EATRs for corporations in 2005 and 2023 (in percent). *Notes:* The figure displays EATRs for corporations in 2005 (grey bars) and in 2023 (black dots) in percent. The red bars represent the GDP-weighted and the unweighted average EATR in the EU27. *Source:* Spengel et al. (2024)/Authors' contribution.

three high-tax countries in the EU in 2023 (29.0 percent, 28.5 percent, and 24.2 percent). In our sample, only investments in Japan face a higher effective tax burden in 2023, whereas former high-tax country competitors such as the United States and Canada significantly reduced their EATRs over the last decade. Yet, they still have above-EU average EATRs. This is in line with the theoretical prediction that large economies have on average a higher tax burden than smaller economies (Sorensen 2004).[9]

A glance at the timeline of the EATR (based on the comparison of 2005 and 2023) shows a significant downward trend for most of the countries considered. However, the degree of reduction in the effective tax burden varies considerably between these countries. Notably, countries with an above-average EATR in 2005 exhibited more significant reductions. In addition, we find that the tax competition witnessed was primarily driven by countries outside the EU27. The unweighted

9 See Figure B2 in Appendix B for an illustration of the mentioned relationship among our sample countries for the year 2023.

(GDP-weighted[10]) average tax burden in the group of third countries[11] has decreased by 6.9 percentage points (9.4 pp) from 2005 to 2023, with the greatest reductions occurring in Canada (–11.2 pp), the United States (–10.8 pp), and Türkiye (–7.7 pp). In contrast, the unweighted (GDP-weighted) average tax burden in the EU27 has decreased by merely 4.2 percentage points (6.5 pp) within the same time span. Thus, we observe a significantly lower dynamic in tax rate cuts in the EU as of 2005 in comparison to earlier observation periods (Elschner, Heckemeyer, and Spengel 2011).

To gain further insights into the dynamics of EATRs and their main drivers, Figure 2 illustrates the development of average EATRs and average statutory corporate income tax rates relative to the base year 2005. Thereby, we differentiate between EU27 Member States and countries outside the EU27. In doing so, Figure 2

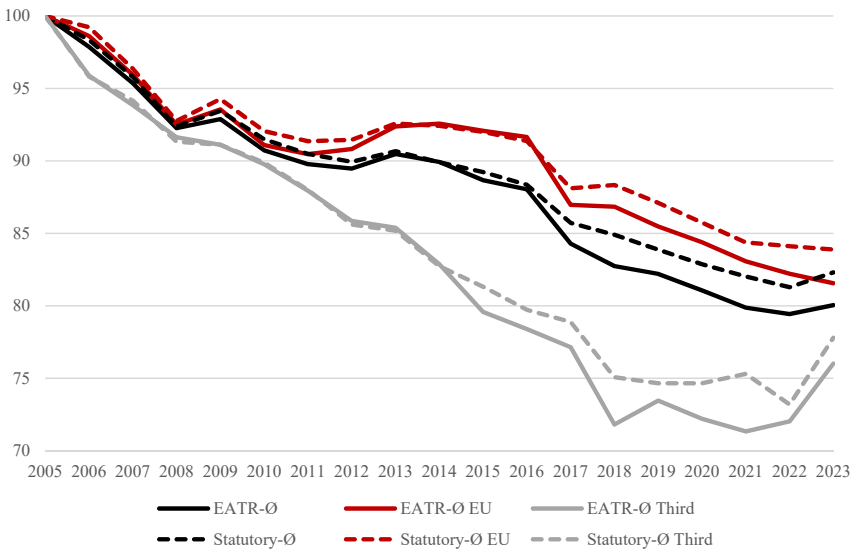

Figure 2: Development of the average tax rates in relation to the base year 2005. *Notes:* The figure displays the development of average EATRs and average statutory corporate tax rates relative to the base year 2005, i.e. 2005 has a value of 100 percent. The black lines represent all countries, while the red (grey) lines take into account the average EATR of the EU27 (third countries) separately. The group of third countries consists of CA, JP, MK, NO, CH, TR, UK, and US. In 2005, the average EATR of all countries was 24.2 percent, while the average EATR of the EU27 (third countries) was 22.8 percent (28.8 percent). *Source:* Authors' contribution.

10 To calculate the average EATR weighted by GDP, we use the GDP (total) data of OECD (2023), measured in million US dollars.

11 The group of third countries consists of CA, JP, MK, NO, CH, TR, UK, and US.

allows us to draw conclusions about the heterogeneous development of average effective tax burdens over time between the EU and non-EU countries. In addition, the comparison of the relative development of average EATRs (solid lines) and statutory corporate income tax rates (dashed lines) illustrates the influence of tax base measures in tax competition.

The development of the average effective tax burden can be broken down into three phases. In the first phase, from 2005 to 2008, both EU27 Member States and third countries were characterised by an on average declining effective tax burden. The reduction in EATRs was slightly more pronounced in third countries, but was driven by statutory corporate tax rate cuts in both groups of countries, as highlighted by the missing spread between the solid and dashed line.

In the second phase, from 2008 to 2016, a diverging EATR-trend can be observed between third countries and the EU. While the average effective tax burden in third countries continued to fall, it nearly stagnated in the EU due to opposing developments within EU Member States. The fluctuation in the European effective tax burden can be explained as follows: In the years following the financial crisis, several EU Member States increased their statutory corporate income tax rates and thus their effective tax burden. Yet, the majority of these increases in the corporate income tax rate were only temporary and (largely) reversed in the following years.[12] Simultaneously, some EU Member States reduced their corporate income tax base by introducing notional interest deduction regimes, resulting in an initially lower EATR.[13] However, due to the development to a low-interest environment in the EU, corporate tax bases started to increase again as notional interest deduction rates were often closely linked to the general interest environment. In addition, our analysis shows that alongside the reduction of statutory corporate income tax rates, for both sets of countries, tax base measures have become an important instrument for making an investment location more attractive (as indicated by the gap between the solid and dashed line).[14]

12 We observe final increases in CY, LV, PT and SK. For an overview of the historical development of statutory corporate income tax rates, see Section A, Table A-1 in Spengel et al. (2022).

13 During the sample period, notional interest deductions were introduced in BE (2006–2022), LV (2010–2013), IT (2011), CY (2015), TR (2015), PT (2017), MT (2017) and PL (2019). For the impact of notional interest deductions on effective tax burden measures and their development over time, see Section B. 7 to B.13 in Spengel et al. (2022).

14 In line with Bräutigam, Spengel, and Stutzenberger (2019), we also observe stronger tax base broadening tendencies for depreciation schedules across EU Member States from 2009 onwards. However, we do not observe the tax base broadening effect of interest deduction limitation rules or loss compensation limitations, as these regulations are not included in our quantification.

The third phase captures the development as of 2016. Since then, the average EATR for the EU has shown a clear downward trend, while the effective tax burden for third countries remained relatively constant between 2018 and 2022 and even increased in 2023. Thereby, countries still rely on generous tax rate cuts (e.g. France, Belgium). However, the increasing spread of the solid and dashed lines highlights that countries more heavily rely on complementary tax base measures to increase their investment location attractiveness. The increase in the EU spread is mostly driven by the introduction of very generous notional interest deduction regimes (e.g. in Portugal and Malta). In addition, EU Member States regularly use accelerated capital allowances to improve their location attractiveness for corporate investment from a tax perspective.[15] This instrument allows them to encourage investment in certain types of assets either on a permanent basis or temporarily as a stimulus in times of economic crisis.

3 Evaluation of Potential Tax Reform Options to Stimulate Corporate Investment

3.1 Current Tax Policy Developments and Their Impact on Effective Tax Burdens

After having evaluated past developments in effective tax burdens, this section focuses on the most recent tax reforms and reform plans of selected EU Member States to improve their tax attractiveness for corporate investments. As pointed out above, numerous anti-tax avoidance measures limit the scope for tax policy actions. In particular, the implementation of the global minimum tax as of 2024 reduces the possibility for tax rate and tax base cuts. However, high-tax countries still have significant scope for tax reductions. We therefore focus our analysis on long-standing high-tax countries to highlight their potential for becoming more attractive investment locations.

In the following, we briefly outline selected policy actions recently taken as well as tax reform proposals discussed by Member States. In addition, we estimate their potential impact on effective tax burdens for companies to evaluate to what extent countries can improve their attractiveness within the boundaries of current EU legislation.

15 For an overview on the applicable capital allowances for industrial buildings, machinery and acquired intangibles, see Section A, Table A-6, A-7, and A-8 in Spengel et al. (2022).

3.1.1 Tax Rate Cut and "Mini-IRES" Regime

A common measure to attract corporate investments is a reduction in the statutory corporate tax rate. To give an example, France has continuously decreased its corporate income tax rate from 33.3 percent in 2019 to 25 percent in 2022. In addition, the French legislator decided to gradually abolish the *Cotisation sur la Valeur Ajoutée des Entreprises (CVAE)*[16] to increase the competitiveness of French companies.[17] Figure 3 shows the effect of the French reform on the EATR. The decrease in the statutory corporate tax rate and the *CVAE* translate into a decline in the EATR of 7.8 percentage points (from 32 percent to 24.2 percent).

As opposed to a general corporate income tax rate cut, Italy decided in favour of a system with a regular tax rate (*IRES*[18]) and a reduced tax rate on certain qualifying

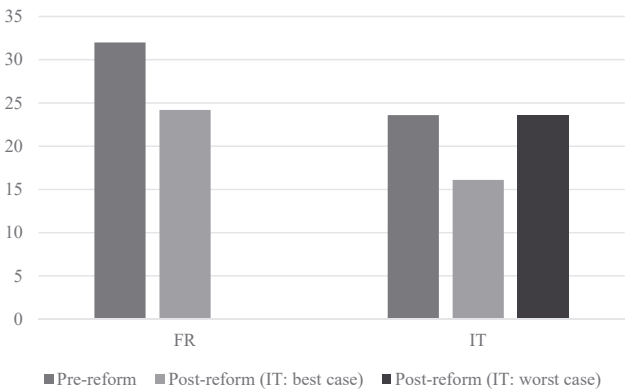

Figure 3: Impact of a tax rate cut and the "Mini-IRES" regime on the EATR (in percent). *Notes:* The figure compares EATRs of corporations before and after incorporating the reform options discussed in Section 3.1.1 in percent. While the reform is still pending in IT, FR already implemented the tax rate cut in the period from 2019 to 2022. IT: best (worst) case refers to a 100 (zero) percent qualifying investment in the Italian reform proposal. *Source:* Authors' contribution.

16 The French *Cotisation sur la Valeur Ajoutée des Entreprises (CVAE)* is a tax on the value added (i.e. the sales minus the purchases and the inventory value at the beginning of the financial year) by companies with turnover exceeding EUR 152,500 in France. It is one component of France's local business tax system, which also includes the *Cotisation Foncière des Entreprises (CFE)*. The *CVAE* will be phased out by 2027.

17 *Projet de loi de finances pour 2023*, Article 5, available at https://www.assemblee-nationale.fr/dyn/16/textes/l16b0273_projet-loi (accessed 13/10/2023).

18 The Italian *Imposta sul Reddito delle Società* (*IRES*) is the ordinary corporate income tax rate.

investments and new hires ("*Mini-IRES*").[19] The aim of the reform, which was approved in 2023, is to stimulate economic growth and ensure greater international tax competitiveness.[20] While the specific design of the regulation is not yet known, some elements might be adopted from a similar reform proposal in the 2019 budget law.[21] For example, the definition of qualifying investment is expected to align with the "Transition 4.0" initiative[22] of the Italian government, incentivising companies that invest in the digital transformation of production processes.[23] The reduced tax rate is supposed to precede the execution of the investments, i.e. companies are subject to the reduced tax rate in the first place and in case they do not perform a qualifying investment, they have to pay back the difference between the regular rate and the reduced rate in subsequent periods. Although the specific tax rates are not yet known, the reduced tax rate is expected to align with the global minimum tax rate of 15 percent.[24] When modelling the reform, we assume that the regular tax rate remains at 24 percent. Figure 3 depicts the EATRs for two extreme scenarios, i.e. 100 percent qualifying investments ("best case") and zero percent qualifying investments ("worst case"). In case of qualifying investments only, the reduced tax rate of 15 percent would result in an EATR of 16.1 percent. In contrast, the EATR would remain at 23.6 percent if the firm did not perform any qualifying investment. However, in reality, the effective tax burden might lie between these extreme values.

In sum, Figure 3 illustrates that the corporate income tax rate is the main driver of the EATR. This can be attributed to the fact that the EATR measures the tax burden on a highly profitable investment, i.e. the profit tax has a large impact compared to other non-profit taxes and tax base regulations.

3.1.2 Accelerated Depreciation

As mentioned in Section 2, countries also rely on accelerated depreciation schemes to boost economic activity. To highlight the impact of this measure on the EATR and

19 In addition, the "*Mini-IRES*" only applies if the profits are not distributed in the two subsequent tax periods. The difference between the "*Mini-IRES*" regime and the Estonian/Latvian split rate systems is that in these two countries, company profits are only taxed in the event of a distribution, irrespective of investment. This approach means that there is no per se selection among qualifying investments, but rather a general preference for retained earnings.

20 *Legge 9 agosto 2023, n. 111, Delega al Governo per la riforma fiscale*, Article 3, available at https://www.gazzettaufficiale.it/eli/id/2023/08/14/23G00122/sg (accessed 13/10/2023).

21 *Legge 30 dicembre 2018, n. 145, Bilancio di previsione dello Stato per l'anno finanziario 2019 e bilancio pluriennale per il triennio 2019–2021*, Article 1, available at https://www.gazzettaufficiale.it/eli/id/2018/12/31/18G00172/sg (accessed 01/03/2024).

22 For more information, see e.g. https://www.mimit.gov.it/it/transizione40 (accessed 01/03/2024).

23 See https://www.italiaoggi.it/news/mini-ires-il-ritorno-2610243 (accessed 01/03/2024).

24 The tax rate of 15 percent was also proposed in the 2019 budget law.

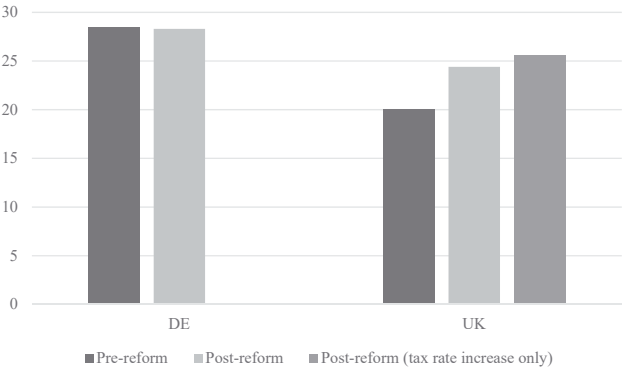

Figure 4: Impact of accelerated depreciation schemes on the EATR (in percent). *Notes:* The figure compares EATRs of corporations before and after incorporating the reform options discussed in Section 3.1.2 in percent. While the reform is still pending in DE, the UK already implemented the reform in 2023. *Source:* Authors' contribution.

thus on countries' tax attractiveness as investment location, we focus on two countries implementing different accelerated depreciation schedules.

As part of the Growth Opportunities Act,[25] the German legislator plans to temporarily introduce a declining-balance depreciation with a rate of 25 percent instead of a linear depreciation scheme for tangible assets.[26] Figure 4 shows that the impact of this reform proposal on the EATR is only marginal.[27] The small decrease of 0.2 percentage points results from the fact that in the model applied for the calculation of the effective tax burden, the more favourable depreciation scheme would apply to machinery, which represents only 20 percent of capital employed. However, even in case of a 100 percent investment in machinery, the EATR-reducing effect would increase to 1.2 percentage points (from 28.3 percent to 27.1 percent) only. This is due to the fact that the current German legislation allows companies to depreciate machinery linearly over its useful life. Assuming a useful life of seven years, the difference between the status quo and the reform proposal is relatively small.

25 After being passed by the Bundestag, the original government draft was partially amended by a Mediation Committee, removing some measures. This new version is expected to be voted on in the Bundesrat at the end of March 2024.

26 *Entwurf eines Gesetzes zur Stärkung von Wachstumschancen, Investitionen und Innovation sowie Steuervereinfachung und Steuerfairness*, Article 4, available at https://dserver.bundestag.de/btd/20/086/2008628.pdf (accessed 13/10/2023).

27 Note that the tax base only has a minor effect on the EATR and therefore is less relevant for location choices than the tax rate. However, tax base elements can have a significant impact on the CoC and thus on the volume of investments.

A larger reduction in the EATR may only be achieved with more generous depreciation rules as recently implemented in the United Kingdom.

In 2023, the United Kingdom's corporate income tax rate was increased from 19 percent to 25 percent, but at the same time full expensing, i.e. a 100 percent capital allowance on qualifying plant and machinery investment, was implemented on a temporary basis. Prior to the reform, machinery had to be depreciated on a declining-balance basis at a rate of 18 percent. Figure 4 displays the impact of both reform elements separately. The six percentage point increase in the statutory tax rate raises the EATR from 20.1 percent to 25.6 percent. However, when also taking into account the possibility of an immediate write-off of machinery, the EATR decreases to 24.4 percent. Taken together, both measures have opposing effects on the effective tax burden.

3.1.3 Notional Interest Deduction

Another policy option that is currently discussed is the introduction or even harmonisation of notional interest deduction regimes. As outlined in Section 2, some EU Member States already apply notional interest deductions. However, the notional interest rate and the specific design of the regime differs across countries. In 2022, the European Commission presented the so-called Debt-Equity Bias Reduction Allowance (DEBRA) proposal that aims at reducing tax-induced distortions between equity and debt financing.[28] One of the proposed measures is the implementation of an allowance on equity using a (currency-specific) harmonised notional interest rate. If the DEBRA proposal is adopted, countries that already have a notional interest deduction regime in place will have to apply DEBRA's provisions instead of their domestic regulations.[29]

Figure 5 illustrates the heterogeneous impact the DEBRA proposal has on Member States' effective tax burdens based on two example countries. While Spain currently does not apply a notional interest deduction and represents a high-tax country, Poland has a very generous regime in place with a notional interest rate of 7.75 percent. For the simulation of DEBRA, we use an interest rate of 4.09 percent.[30] The implementation of the aforementioned measure would decrease the EATR in

28 Proposal for a Council Directive on laying down rules on a debt-equity bias reduction allowance and on limiting the deductibility of interest for corporate income tax purposes (11 May 2022), COM (2022) 216 final.

29 However, there is a grandfathering rule that allows these countries to defer the application of DEBRA's provisions up to ten years.

30 This is the ten-year risk-free interest rate published by the European Insurance and Occupational Pensions Authority (EIOPA) as of 31 December 2022 to which the directive proposal refers, plus a risk premium of one percent.

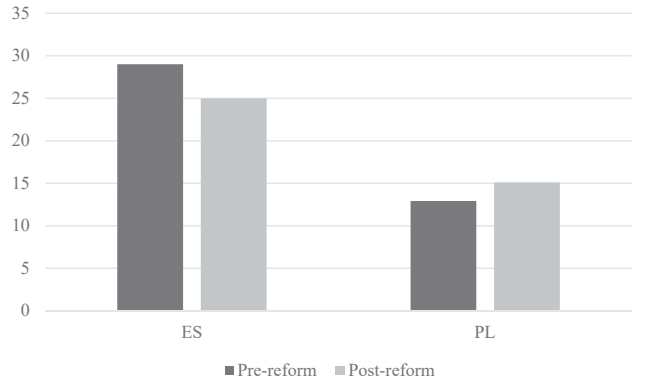

Figure 5: Impact of notional interest deduction regimes on the EATR (in percent). *Notes:* The figure compares EATRs of corporations before and after incorporating the reform options discussed in Section 3.1.3 in percent. In both countries, the reform is still pending, as the European Commission has not yet implemented DEBRA. *Source:* Authors' contribution.

Spain by four percentage points, while the EATR in Poland would increase by 2.2 percentage points. Thus, depending on the generosity of the current national regime, the DEBRA proposal can have heterogeneous effects on the effective tax burden. Compared to the accelerated depreciation schemes shown above, the introduction of an allowance on equity has a larger impact on the EATR. However, both effects are strongly dependent on the exact parameters, i.e. the depreciation rates, notional interest rates and the respective asset and financing weight.[31]

3.1.4 R&D Tax Incentives

In addition to general measures reducing the effective tax burden, countries grant tax incentives for specific activities. In the context of the so-called "smart tax competition", R&D tax incentives are a widely used measure to attract mobile activities. A distinction between input- and output-based incentives has to be made: Input-based incentives refer to more generous tax deductions for R&D expenses (in the form of tax credits, super-deductions and accelerated depreciation for assets used in the R&D process), while output-based incentives grant reduced tax rates for income resulting from the innovation process (so-called patent box regimes).

31 For example, in the extreme case of a pure equity-financed investment, the effect of DEBRA would be even higher. While the EATR would decrease by 6.2 percentage points (from 32.1 percent to 25.9 percent) in Spain, it would increase by 3.4 percentage points (from 12.7 percent to 16.1 percent) in Poland.

To examine the impact of these R&D incentives on the effective tax burden, some model assumptions have to be modified.[32] More specifically, we consider a self-developed patent instead of an acquired patent in all of the following R&D incentive simulations. This allows us to model incentives related to different R&D activities within a company, such as expenses for personnel, machinery and buildings. Before analysing the impact of R&D tax incentives on the EATR, we highlight the effect of the modified model assumptions. While an acquired patent has to be capitalised and depreciated over several years, expenses for a self-developed patent can usually be immediately expensed. To illustrate the effect of these different depreciation schedules, Figure 6 contrasts the EATRs resulting from an investment in an acquired patent versus a self-developed patent in selected countries.[33] While the EATRs of these two types of assets are relatively similar in Germany, Italy and the United States, the effective tax burden from the investment in a self-developed patent is much lower compared to the investment in an acquired patent in Spain, France and the United Kingdom. These heterogeneous effects can be explained by the different lengths of the underlying depreciation schedules for acquired patents in the aforementioned countries.

In the following, we analyse the impact of R&D incentives on the EATR. Figure 7 displays the results of several sensitivity analyses with respect to changes in the

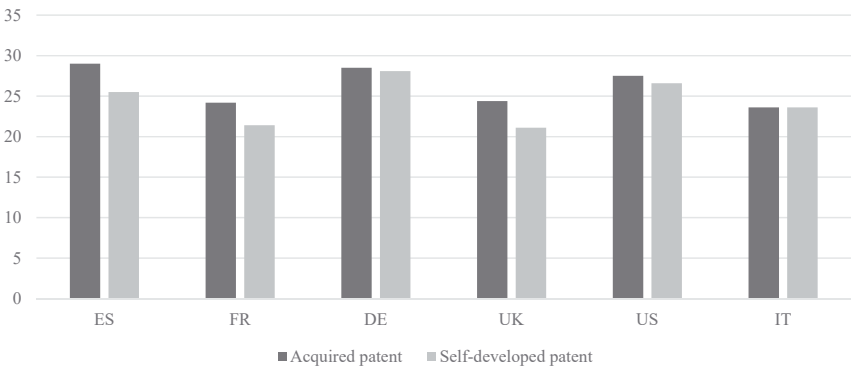

Figure 6: EATRs in the baseline scenario and in the R&D scenario without incentives (in percent). *Notes:* The figure compares EATRs of corporations in the baseline scenario and the R&D scenario without incentives (in 2023) in percent. In the baseline (R&D) scenario, we assume an acquired (self-developed) intangible asset. While the acquired intangible is capitalised and depreciated over several years, the self-developed intangible can usually be immediately expensed. *Source:* Authors' contribution.

32 For more details, see Appendix A, Table A1.

33 Note that in both cases, the patent investment has a weight of 20 percent.

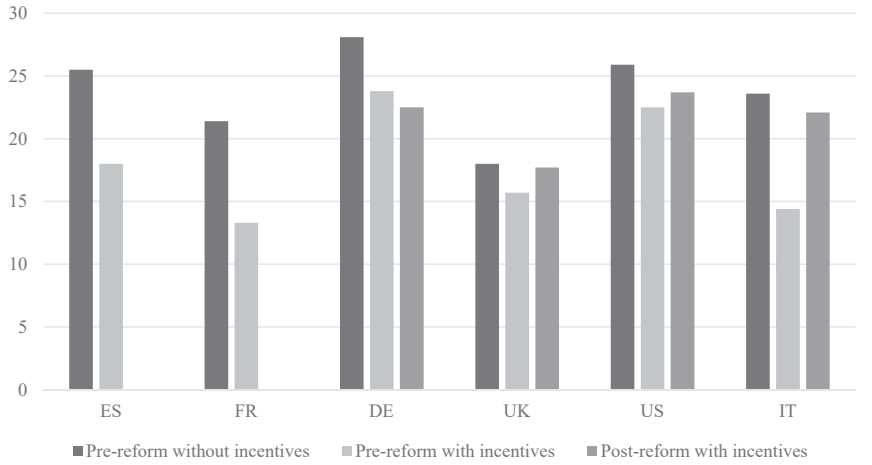

Figure 7: Impact of R&D tax incentives on the EATR (in percent). *Notes:* The figure displays EATRs of corporations with and without R&D incentives before and after incorporating the reform options discussed in Section 3.1.4 in percent. While the reforms are still pending in DE and IT, the UK (US) already implemented the reform in 2023 (2022). *Source:* Authors' contribution.

generosity of R&D incentives. On the one hand, it illustrates the impact of incentives compared to the ordinary tax burden and on the other hand, it compares the R&D scenario in the status quo with different reform options.[34]

Although Spain and France have a relatively high ordinary effective tax burden (see Section 2), they provide generous R&D tax credits with a broad tax base and a rate higher than the corporate income tax rate as well as a patent box regime. Moreover, they allow for an accelerated depreciation of tangible assets used for R&D. Figure 7 shows that due to the aforementioned R&D incentives currently in place, the EATR in both countries is reduced by around eight percentage points. Thus, countries can increase their attractiveness significantly by implementing generous R&D tax incentives.

While R&D incentives also have been in place in the remaining countries depicted in Figure 7, they either were recently amended or are planned to be modified. In 2020, Germany introduced a tax credit for eligible R&D expenses amounting to 25 percent. Currently, eligible expenses include R&D personnel expenses only. However, the German legislator plans to extend the assessment basis to

34 To ensure comparability, we consider only R&D tax incentives that ex ante apply to all taxpayers. Thus, incentives specifically targeting small and medium-sized enterprises, young companies, companies with a strong growth rate, a particular ownership structure or within a specific region, are not included in the analysis.

expenses for movable fixed assets used for R&D activities. This expansion would decrease the EATR by 1.3 percentage points and thus make R&D investments more attractive. However, the overall impact of R&D incentives on the effective tax burden is rather limited, as apart from the tax credit, there are no other incentives in place.

In contrast to Germany, the United Kingdom provides various R&D incentives such as an accelerated depreciation for qualifying assets, a patent box regime granting a reduced tax rate of ten percent for income from intellectual property and an R&D tax credit. As part of the aforementioned reform in the United Kingdom that increased the corporate income tax rate and introduced a more generous depreciation schedule, the R&D tax credit was increased from 13 percent to 20 percent. Figure 7 illustrates that although the tax credit becomes more generous, the overall effective tax burden increases. Thus, the effect of the tax rate increase from 19 percent to 25 percent outweighs the effect of the more generous tax credit. However, without the tax credit amendment the EATR would be even higher.

As mentioned before, most countries allow for an immediate expensing of R&D personnel expenditure, even if they do not grant any further incentives. While in the United States in the past, researchers' wages could be immediately expensed in the year they were incurred, since 2022, these expenses are required to be capitalised and depreciated over six years. Although the same amount of expenses can be deducted from the tax base in both cases, the immediate recognition of expenses is more favourable for companies in terms of interest and liquidity effects. Particularly in times of rising interest rates, the effect would be similar to an interest-free loan from the government, which could support investment activity. This can also be seen in Figure 7, as the EATR increases from 22.5 percent to 23.7 percent in the capitalisation scenario.

Finally, in the context of the implementation of the "*Mini-IRES*" regime and against the background of the global minimum tax, the Italian legislator plans to revise and simplify all tax incentives. It is expected that the current tax incentives are gradually replaced by the application of the reduced tax rate for certain investments. To examine the impact of a potential shift from a tax-incentive system to a tax system based on a reduced tax rate for qualifying investments, we assume that all R&D incentives are abolished. Instead, R&D activities are regarded as qualifying investment and therefore subject to the reduced tax rate. Under the assumption that – as before – R&D investment accounts for 20 percent of the overall investment and the remaining 80 percent are not regarded as qualifying investment, we compute a weighted average tax rate of 22.2 percent.[35] In addition, we do not include

35 The regular rate of 24 percent applies to the non-qualifying investment (weighted at 80 percent) and the reduced tax rate of 15 percent to the qualifying investment (weighted at 20 percent). Thus, the tax rate is calculated as follows: 80 %*24 % + 20 %*15 % = 22.2 %.

any R&D incentives in the simulation. Under the status quo, the EATR including the R&D incentives in place is relatively low (14.4 percent) compared to the case without incentives (23.6 percent), suggesting that the incentives are generous. In contrast, under the application of the "*Mini-IRES*" regime without any tax incentives, the EATR increases significantly to 22.1 percent. However, this estimate may rather represent an upper bound of the EATR, as the percentage of qualifying investments is likely to be larger than 20 percent in many cases.

3.1.5 Overall Comparison of Tax Reform Options

After having examined different reform options separately, we compare their concrete potential for improving EU Member States' tax attractiveness for corporate investments. Figure 8 provides a comprehensive overview of the effective tax burden in the status quo as well as under the aforementioned reforms.[36] Overall, the implementation of a tax rate cut (as illustrated for Italy and France) can increase the attractiveness of a country significantly. The implementation of the "*Mini-IRES*" regime in Italy limits the application of a reduced tax rate to returns on qualifying investments only. While an accelerated depreciation scheme does not have a large effect on a country's position in the EATR ranking, the introduction of a notional interest deduction – as suggested by the DEBRA proposal – reduces the EATR significantly.[37]

In sum, tax rate changes and notional interest deduction regimes have the largest impact on the tax location attractiveness. In contrast, more generous depreciation schemes only have a minor effect as they usually are only applicable to specific assets. However, the impact on the effective tax burden strongly depends on the specific design of the respective measure.

3.2 Evaluation of Tax Reform Options Against the Background of Current Developments

The previous analysis of implemented and discussed reform options reveals that they can have different implications on the EATR. In order to analyse the potential of each tax instrument to optimise the tax attractiveness of investment locations, we

36 Note that Figure 8 does not incorporate R&D incentives and assumes that the patent is acquired. For a ranking of EATRs incorporating available R&D incentives in selected countries, see Appendix B, Figure B3.

37 The effect of the DEBRA proposal is modelled using the examples of Spain and Poland. Note that in case of the implementation of DEBRA, all EU Member States would be affected.

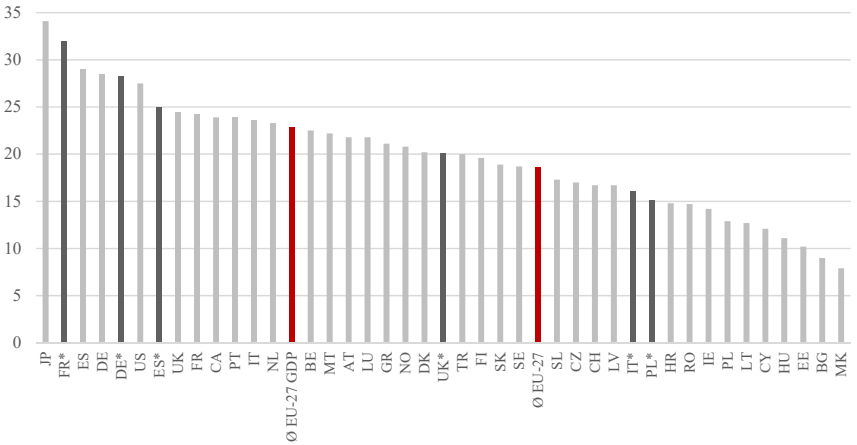

Figure 8: EATRs under status quo and with reform options (in percent). *Notes:* The figure displays EATRs for corporations in 2023 in percent. The EATRs of countries marked with an asterisk (dark coloured bars) incorporate the reform options discussed in Section 3.1. In case of FR and the UK, the dark coloured bar represents the pre-reform status and the light coloured bar the status quo. *Source:* Spengel et al. (2024)/ Authors' contribution.

complement the quantitative analysis by a critical discussion of the following aspects: empirical evidence on the ability to promote investment, the cost of the measure in the context of tight national budgets, and a reflection of its usefulness in the context of the global minimum tax.

3.2.1 Tax Rate Cut and "Mini-IRES" Regime

As has been shown in the development of EATRs over time (see Section 2), the statutory tax rate is a strong determinant of the EATR. This illustrates the important role of tax rate reductions in the international tax competition for mobile economic rents, i.e. to attract the inflow of foreign direct investment (or prevent its outflow). Moreover, in terms of tax policy, a reduction of the statutory corporate income tax rate has a major signalling effect due to the high salience of the corporate income tax rate. Against the background of numerous anti-avoidance regulations, the location choice of multinational firms will even more depend on the statutory corporate tax rate as ex-post shifting of profits to lower-tax jurisdictions becomes more costly.

This is in line with the finding of Dobbins and Jacob (2016) that prior to the comprehensive anti-avoidance initiatives, domestic firms reacted more strongly to tax rate cuts than foreign owned firms (which were able to shield considerable parts of their profits from high tax rates by relocating them to low-tax jurisdictions).

Further studies indicate that a reduction in corporate income tax rates is associated with higher levels of innovation (Atanassov and Liu 2020; Falck, Kerkhof, and Pfaffl 2021) as well as an increase in investments, total wages, private consumption and GDP (Dorn et al. 2021).

The advantage of tax rate cuts comes at a cost. Most prominently, tax rate cuts imply immediate revenue losses that are considerably larger compared to alternative tax incentives that materialise for new investments only (Dorn et al. 2021). In addition, even for large corporate tax rate cuts the effect on economic growth and investment might be less substantial than that of more specific incentives (Hanappi, Millot, and Turban 2023).

With the implementation of the global minimum tax in the EU starting from January 2024, the EU limits the scope for corporate tax rate cuts. Statutory tax rates below 15 percent become less attractive as they would likely result in effective tax burdens below this threshold and thus trigger the application of a top-up tax (Ferreira Liotti et al. 2022). However, it is important to note that this minimum tax is applicable solely to large multinationals that have revenues surpassing EUR 750 million. Therefore, significant reductions in tax rates remain a viable option for small and medium-sized businesses. In this context, it is also evident that general tax rate reductions are more appealing to countries with high tax rates as in most cases they still have room to decrease statutory tax rates towards the global minimum tax rate of 15 percent.

An alternative scheme of a tax rate cut distinguishes between favourable tax rates for certain qualifying investments and a general rate. Generally, the proposed introduction of the "*Mini-IRES*" regime (as quantified for Italy in Section 3.1) is better suited to incentivise investments, as only those firms that actually invest benefit. This idea is operationalised in two ways: In the first approach, companies pay the regular corporate income tax to the tax administration, and receive subsequent tax refunds for certain promoted investments. In the second approach, as recently proposed by Italy, a more favourable tax rate is initially applied to all companies, in a way similar to a general tax rate reduction.[38] However, if companies fail to meet the pre-specified investment requirements, they have to pay back taxes.

As only those companies that actually invest benefit from the lower rate, the "*Mini-IRES*" regime encourages investment in a more targeted way and also prevents windfall gains. It is a compromise in the sense that it limits the revenue loss for the government. Yet, the benefits primarily comprise those of a tax cut. The second approach, in which the lower tax rate is applied beforehand, effectively constitutes an interest-free loan to companies. In this scenario, companies should have more

38 For more details see e.g. https://taxnews.ey.com/news/2023-1451-italy-approves-framework-for-major-tax-reform-including-beps-pillar-two-principles (accessed 13/10/2023).

liquidity at their disposal for investment since lower tax payments occur before potential investment activities. However, the administration of such a system is more complex compared to a single corporate tax rate as companies have to substantiate their eligibility to the reduced tax rate.[39] An increased complexity of the tax system can be negatively related to FDI (Hoppe et al. 2020; Lawless 2012). Again, as for the general tax rate cut, the global minimum tax as well as revenue constraints limit the applicability of this policy.

3.2.2 Accelerated Depreciation

Beyond tax rate cuts, tax base measures, such as accelerated depreciation are regularly introduced as investment stimulus (recent examples include Germany and the United Kingdom, see Section 3.1). In these accelerated depreciation regimes, the depreciation allowances are concentrated on the early years of an asset's economic life while the deductions from the tax base are reduced accordingly in later years. Thus, it does not lead to a long-term loss of tax revenue, but rather in a postponement of tax payments into the future (Dorn et al. 2021). This makes it attractive from a government perspective. The tax benefit for the investing firm results from the so called timing effect of taxation: early tax savings yield a value if the interest rate is positive. Again, the postponement of tax payments essentially represents an interest-free loan for companies (Domar 1953).

Several empirical studies corroborate the effectiveness of accelerated depreciation empirically. For example, Eichfelder, Jacob, and Schneider (2023) and Maffini, Xing, and Devereux (2019) find that accelerated depreciation schemes lead to higher levels of investment. These findings are in line with the model calculation of Dorn et al. (2021), where accelerated depreciation has positive effects on the level of investment as well as on wages, consumption and GDP. However, the investment effect size depends on the existence of liquidity constraints. Zwick and Mahon (2017) find a higher investment response if accelerated depreciation results in an immediate cash flow due to tax savings in the same period as opposed to a postponed cash flow (e.g. when a firm is loss making and tax advantages only materialise in the future).[40] From the government's perspective, in the best case scenario, the lower tax revenues will be offset by additional revenues due to successful investments and the resulting increase in economic activity (Dorn et al. 2021; Goode 1955).

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39 The complexity of the "*Mini-IRES*" regime was one of the reasons the 2019 proposal was finally repealed in 2020 (Nastri, Piazza, and Volante 2019; Zangari 2020).

40 When high allowance deductions lead to losses, more generous loss carry-back or loss carry-forward rules allow for a more timely realisation of the tax advantage from depreciation.

Potential side effects of accelerated depreciation include opportunities for tax planning, increased complexity and compliance costs. Opportunities for tax planning, for example, arise due to the presence of multiple, overlapping incentives linked to one asset (Hanappi, Millot, and Turban 2023). In addition, despite the stimulating effect of accelerated depreciations, the quality of investment does not necessarily increase. In fact, Eichfelder, Jacob, and Schneider (2023) find a decrease in the quality of investments resulting from these types of tax incentives because they diminish the marginal cost of capital. Consequently, while in total more investments are carried out, a part of them is profitable only due to the additional incentive.

As mentioned above, accelerated depreciation schemes allow for higher deductions in the early years of an asset's economic life, which could result in an effective tax rate below 15 percent and thus trigger a top-up tax. However, when calculating the effective tax burden for global minimum tax purposes, not only actual taxes paid but also deferred taxes are taken into account. Deferred taxes arise from temporary differences between the actual tax expense and the tax expense according to financial accounting and thus also include accelerated depreciations for tax purposes. In the context of the global minimum tax, accelerated depreciation schemes or immediate expensing can therefore still be used as a measure for stimulating investment without increasing the risk of a top-up tax (Ferreira Liotti et al. 2022).

3.2.3 Notional Interest Deduction

In our analysis, the measure that results in the sharpest decline in EATRs after the tax rate reductions presented is the introduction of a generous notional interest deduction. This measure aims at creating an investment-promoting environment as it shields the marginal return of the investment from taxation. By allowing an additional allowance to be deducted from the tax base that reflects the cost of equity financing, a notional interest deduction addresses the debt-equity bias that arises from the distinct tax treatment of debt and equity (Devereux and Freeman 1991). Thus, it helps to achieve two primary objectives: enhancing the investment environment for domestic corporations and attracting foreign direct investments (Konings, Lecoq, and Merlevede 2022).

In the context of our study, one of the major benefits of notional interest deduction regimes lies in their neutrality regarding marginal investment decisions, as these regimes ultimately result in the taxation of economic rents only (De Mooij and Devereux 2011; van Campenhout and van Caneghem 2013). Furthermore, the notional interest deduction remains neutral for various asset classes, such as

tangibles or intangibles, as the deduction is applied in principle and is only linked to equity (Konings, Lecoq, and Merlevede 2022). With respect to the widespread debt-equity bias, a notional interest deduction decreases the cost of equity and contributes to a more equal treatment of debt and equity.[41] The IMF (2016) emphasises that removing the debt bias (from external borrowing) helps to ensure macroeconomic stability. Empirical studies corroborate this positive impact of a notional interest deduction on reducing debt levels of firms (Hebous and Ruf 2017; Romaniuk and Malik 2021).

The empirical evidence on investment effects of notional interest deductions is mixed. While Hebous and Ruf (2017) do not find significant effects on production investment after the implementation of the notional interest deduction in Belgium, Konings, Lecoq, and Merlevede (2022) show positive effects on employment and investment. Domestic Belgian firms experienced an increase in their after-tax return on investment due to the notional interest deduction (Konings, Lecoq, and Merlevede 2022).

However, the deduction of the cost of equity financing increases the complexity of the calculation of the tax base as well as the risk of cross-border tax planning (Hebous and Ruf 2017). Furthermore, the tax benefit might be quite sensitive to the overall interest environment. From a government perspective, a notional interest deduction regime could be quite costly, as the narrower tax base ultimately reduces tax revenues collected. Finke, Heckemeyer, and Spengel (2014) derive a revenue loss of up to 18 percent from a microsimulation model for Germany. According to their simulations this could be financed by an increase of the corporate profit tax rate by six percentage points to compensate for the narrowing of the tax base. The costs of a notional interest deduction regime could be capped, if one limits the benefit only to new equity which is brought into the company.

As illustrated in Section 3.1, a notional interest deduction reduces the effective tax burden significantly. Although the effect size depends on the notional interest rate and the amount of a firm's equity, such a regime makes the application of a top-up tax more likely. As the notional interest can be deducted from the tax base continuously and is not available under financial accounting rules, it results in a permanent difference between both sets of rules. Therefore, in contrast to an accelerated depreciation scheme, a notional interest deduction is not covered by deferred taxes and decreases the effective tax rate by all means. In sum, the effectiveness of such a regime is likely to be reduced by the application of the global minimum tax if it results in an effective tax burden below 15 percent (Gschossmann et al. 2024).

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41 However, concerning the specific DEBRA proposal, the objective of financing neutrality cannot be achieved due to the current design of the provisions (Heckemeyer and Nippel 2023).

3.2.4 R&D Tax Incentives

Our quantitative analysis shows that R&D tax incentives are an important instrument to enhance the tax attractiveness of countries in the competition for (R&D) investment. These tax instruments are used by legislators to encourage investment in specific industries or innovative markets (Hymel 2006). In particular, for investment activities where the benefits are highly uncertain and public spill overs are larger than private ones, the optimal level of investment is not undertaken by the private sector (e.g. R&D, green transition, digitalisation). However, higher R&D investment increases economic growth as measured by GDP (Akcali and Sismanoglu 2015). In addition, persistent R&D performers seem to survive crises better than their competitors (Lome, Heggeseth, and Moen 2016), suggesting that R&D investment acts as a form of insurance against future economic downturns.

R&D tax incentives thereby influence both corporate decision margins, the extensive one (as reflected by the EATR) and the intensive one. First, generous R&D incentives increase the post-tax net present value, indicated by a decrease in the EATR. This increases the attractiveness of the location for (new) R&D investments. Second, these incentives reduce the cost of capital, which leads to additional investments as more projects prove profitable from an investor's perspective. Empirical evidence confirms that if input-based R&D tax incentives are sufficiently generous, they do increase R&D investment (Appelt et al. 2016; Guceri and Liu 2019; Hall and Van Reenen 2000; OECD 2020). This increase in investment and employment leads to more output (Lerche 2022) and, consequently, higher tax revenues for governments. Yet, increases in R&D investments may also be due to the relocation of R&D activities and not an overall increase in R&D activity, i.e. R&D tax regimes have competitive effects (Knoll et al. 2021). In contrast, there is only limited evidence on the encouraging effect of output-based R&D tax incentives on innovation activity within a country (Alstadsæter et al. 2018; Gaessler, Hall, and Harhoff 2021).

The advantages for increasing investment activity by generous incentives (e.g. a broad scope of the tax base, refundability in case of losses) represent at the same time the more costly aspects of this measure. However, similar to accelerated depreciation schemes, these incentives materialise for new investments only and apply to certain categories of expenditure only (Thomson 2017). In order to further limit government expenditure, it is feasible to cap investment allowances beyond specific thresholds to ensure that incentives are only available to small or particularly sustainable firms (Clark and Sichel 1993; Hanappi, Millot, and Turban 2023).

One major limitation are the administrative and compliance costs caused by the complex and highly specific nature of these tax incentives (Hanappi, Millot, and Turban 2023). In addition, the delay in investment response, i.e. a time lag between carrying out the investment and receiving the tax benefit, could limit the effectiveness of tax incentives in promoting investment and innovation (Clark and Sichel 1993; Lome, Heggeseth, and Moen 2016). Finally, as these incentives are exclusively granted to the initially intended companies (Lerche 2022), separate incentives need to be developed and implemented for each asset or industry in which investments shall be encouraged, constituting an additional administrative burden for policy makers.

Depending on their design, R&D incentives can lower a firm's effective tax burden significantly (see Section 3.1, Figure 7), potentially even below 15 percent. However, in the context of the global minimum tax, the jurisdictional blending, i.e. the aggregation of all group entities in a country, allows companies to compensate lower-taxed income (e.g. due to R&D credits, patent box regimes) with higher-taxed income (Ferreira Liotti et al. 2022; Perez-Navarro 2023). Therefore, the impact of the global minimum tax on R&D tax incentives is limited. Due to the jurisdictional blending approach, high-tax countries with tax incentives such as patent box regimes could even become relatively more attractive investment locations as companies have incentives to generate both ordinary-taxed and preferentially-taxed income there (Spengel, Schulz, and Winter 2023).

4 Conclusions

In light of the current economic slowdown, creating an internationally attractive investment environment gains importance for the tax policy agenda of the EU and its Member States. However, against the background of currently tight government budgets in many countries, the scope for tax reforms remains limited. A sustainable tax policy requires a careful balancing between tax revenues and policy goals. This article examines past developments in the EU Member States' location attractiveness for corporate investment as well as current tax reform options for improving it in selected European high-tax locations.

We measure the relative tax attractiveness of locations using the effective tax burden on highly profitable investments, i.e. the EATR. Over the last 20 years, we find marked differences in investment attractiveness across the countries examined, especially within the EU. While EATRs have on average declined across all EU

Member States, high-tax jurisdictions have struggled to improve their relative attractiveness. Our analysis also indicates that EATRs have not fallen continuously over the last 20 years, but have alternated between periods of falling and more stagnant EATRs. In addition, tax base measures emerged as crucial instruments alongside statutory corporate tax rate reductions to enhance investment attractiveness in recent years.

Our detailed assessment of recent tax policy reforms in high-tax European countries highlights conflicting (policy) objectives: a strong investment stimulus (measured by a declining EATR and based on empirical results), affordability with limited government budgets, and compatibility with the global minimum tax. In addition, these reforms should not increase existing complexity of the tax system, as it is negatively related to inbound FDI.

While tax rate reductions and the introduction of notional interest deductions set the strongest investment stimulus measured by the EATR, accelerated depreciation schemes exhibit a comparatively minor impact. R&D tax incentives, depending on their design, can significantly alleviate the effective tax burden. Considering empirical investment evidence, tax revenue losses, and an interaction with the global minimum tax, our analysis indicates that (generous) accelerated depreciation remain the most viable option for stimulating corporate investment within the constraints of the global tax landscape. Additionally, R&D tax incentives can still incentivise investment without triggering top-up taxes, particularly under jurisdictional blending and for smaller enterprises not subject to the global minimum tax.

In summary, measures such as tax rate cuts and notional interest deductions entail significant short-term revenue losses. Yet, they apply universally and, in particular, corporate tax rate reductions do not increase tax complexity. Conversely, incentives such as accelerated depreciation and R&D incentives offer a more focused strategy for incentivising specific investments, making them more cost-effective for the government budget. Nonetheless, when designing these incentives, the bureaucratic burden of claiming the reductions should be kept as small as possible.

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Appendix

Appendix A The Devereux/Griffith Methodology of Analysing Effective Tax Burdens

The Devereux/Griffith methodology allows the computation of effective tax burdens on marginal investments that only yield a minimum required return (relevant measure: cost of capital, effective marginal tax rate) and on highly profitable investments with a pre-tax rate of return of 20 percent (relevant measure: effective average tax rate). The Devereux/Griffith methodology builds on the work of Jorgenson (1963), Hall and Jorgenson (1967) and King and Fullerton (1984) and assumes that firms invest in capital as long as marginal returns cover marginal costs.

The cost of capital (CoC) and the effective marginal tax rate (EMTR) indicate the impact of taxation on marginal investments, i.e. investments that yield a rate of return on the initially invested capital that is sufficient to compete with an alternative investment. This minimum rate of return before taxes required by a shareholder is called the cost of capital. As an alternative investment, we assume a financial asset that yields the market interest rate, assumed to be 5 percent. Thus in the absence of taxes, the cost of capital equals the real market interest rate. If taxation raises the cost of capital above the real market interest rate, the marginal corporate investment is discriminated and theoretically, taxation influences the optimal level of investment activity. The EMTR represents the relative tax-induced wedge between the minimum required pre-tax rate of return and the real market interest rate. Thus, the lower the EMTR is at the corporate level, the lower the required pre-tax rate of return necessary to yield – after taxes – at least the market interest rate, and the more investments will be undertaken, i.e. optimal investment levels will be higher.

The effective average tax rate (EATR) indicates the effective tax burden on an infra-marginal investment in an economic sense, i.e. a highly profitable investment. In our study, we assume that the investment yields a standardized pre-tax rate of

return on investment of 20 percent. In particular, the EATR measures the change in the net present value (NPV) of a highly profitable investment caused by taxation. The international comparison of the tax burden on highly profitable investments is most important in terms of the choice of investment location (Devereux and Griffith 2003; Spengel 2003). When choosing from a set of mutually exclusive investments with an identical pre-tax real rate of return, a company will favour the alternative with the highest post-tax net present value, where the EATR is lowest.[42] In the context of highly profitable investments, the corporate income tax rate is the main driver of effective tax burdens (i.e. EATR). In contrast, for marginal investments (i.e. CoC and EMTR), the relevance of tax base elements is the main source of variation.

Our calculations of the effective tax burden based on the Devereux/Griffith methodology assume a hypothetical domestic incremental investment by a corporation in the manufacturing sector. The incremental investment comprises investments in buildings, machinery, intangibles, financial investments and inventory. Each of the five assets is accorded equal weight, that is, it represents 20 percent of capital employed. Furthermore, we assume that the company finances its investment by new share issue (10 percent), retained earnings (55 percent) and a loan (35 percent). Figure A1 shows the structure of the baseline model. To calculate the effective average tax burden, the model considers country-specific information on the type of the tax system, applicable profit and non-profit taxes (e.g. corporate income tax, real estate tax, etc.), and tax base and tax rate regulations. The computation of income reflects the depreciation or amortization rules for each of the five assets in the model. Any applicable capital taxes, such as property taxes or charges on other assets held, are also factored into the calculations. By contrast, the tax charged on the parent company's shareholders is ignored due to lack of relevant information.

To quantify the impact of existing R&D tax incentive regimes, we have to adapt the baseline scenario of the manufacturing company. While we rely on an acquired intangible in the baseline scenario, we assume for the R&D scenario that the corporation develops the intangible itself. Thus, we are able to incorporate the different R&D tax incentives on personnel and capital expenditures as well as existing patent boxes for self-developed intangibles in the computation of the EATR. In doing so, we follow Spengel, Stage, and Steinbrenner (2022) and assume that company incurs not

42 The EATR is computed as the difference of the NPV before and after taxes ($R^* - R$) divided by the discounted pre-tax rate of return. Hence, the EATR equals the EMTR if the pre-tax rate of return is identical to the cost of capital. Further, the EATR approaches the statutory tax rate τ if profits increase (i.e. an increasing pre-tax rate of return).

only current expenses (e.g. wages for R&D staff and materials) but also expenditures in R&D infrastructure (e.g. buildings and machinery) for the in-house development of a patent. In line with González Cabral, Appelt, and Hanappi (2021), we assume that the R&D expenditure is composed of 90 percent current expenses and 10 percent capital expenditure, with an even split assumed for investments in buildings (five percent) and machinery (five percent). Figure A2 shows the structure of the R&D scenario.

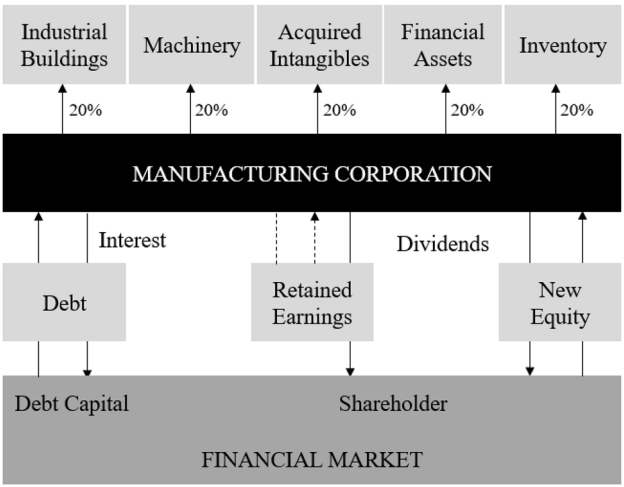

Figure A1: Devereux/Griffith model structure for manufacturing companies (baseline scenario). *Source:* Authors' contribution.

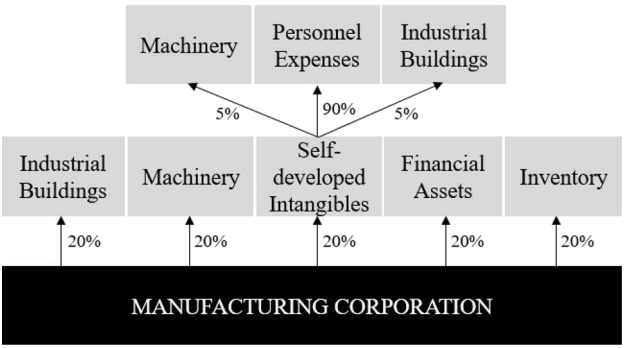

Figure A2: Adjustment of the baseline scenario to an R&D scenario. *Source:* Authors' contribution.

Table A1 shows the economic assumptions which meet international standards behind it. All economic parameters are held constant across all investments to isolate the effect of different international tax regimes irrespective of their location.

Table A1: Summary of the key assumptions and weightings.

Legal form	**Corporation**		**Corporation**	
Scenario	Manufacturing		R&D	
Assets (weights)	Industrial buildings (20 %), **intangibles – acquired patent** (20 %), machinery (20 %), financial assets (20 %), inventory (20 %)		Industrial buildings (20 - %), **intangibles – self-developed patent** (20 %), machinery (20 %), financial assets (20 %), inventory (20 %) Self-developed patent consists of current expenditure (90 %), buildings (5 %) and machinery (5 %)	
Financing (weights)	Retained earnings (55 %), new equity (10 %), debt (35 %)		Retained earnings (55 %), new equity (10 %), debt (35 %)	
True economic depreciation	Degressive		Degressive	
	Industrial building	3.10 %	Industrial building	3.10 %
	Intangibles	15.35 %	Intangibles	15.35 %
	Machinery	17.50 %	Machinery	17.50 %
Real capital market interest rate	5 %		5 %	
Pre-tax real rate of return for EATR calculation	20 %		20 %	
Inflation rate	2 %		2 %	

Source: Authors' contribution.

Appendix B: Figures

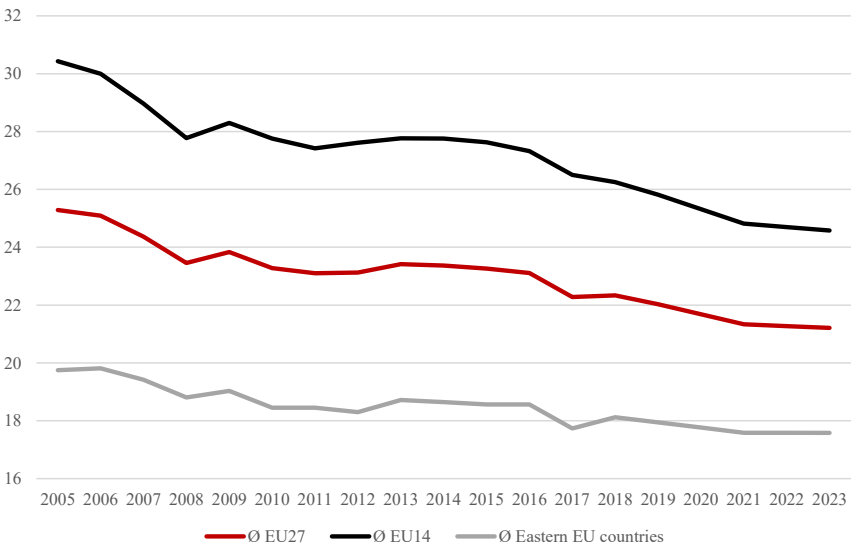

Figure B1: Combined profit tax rates in selected country groups (in percent). *Notes:* The figure displays the average combined profit tax rate of the EU27, the EU14, and Eastern European countries in percent. The group of Eastern European countries consists of BG, HR, CY, CZ, EE, HU, LV, LT, MT, PL, RO, SK, and SL. EU14 are the countries who were members of the EU prior to 2004. The combined profit tax rate includes the statutory corporate income tax rate as well as local profit taxes and surcharges. *Source:* Authors' contribution.

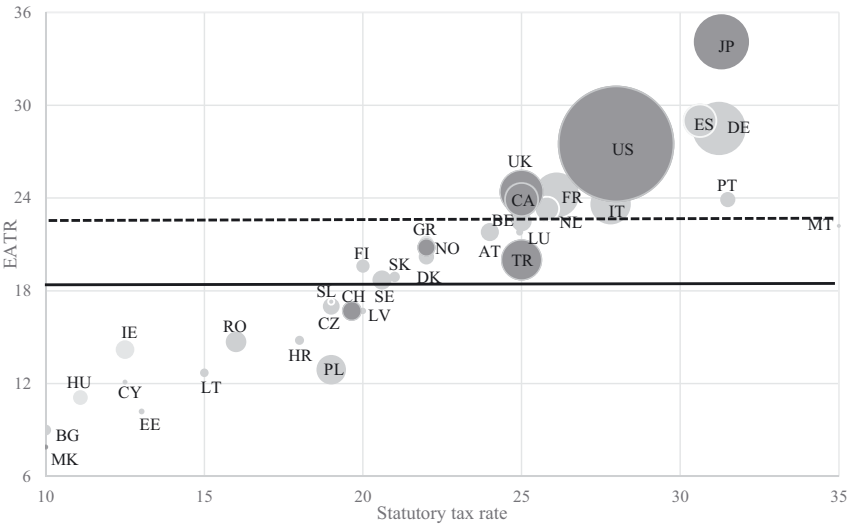

Figure B2: Relationship of EATRs and statutory tax rates to GDP as of 2023. *Notes:* The figure displays the relationship of statutory and effective average tax rates (in percent) to GDP. The size of the bubbles indicates the size of the economy measured by GDP and the colour EU27 (light grey) and third countries (dark grey). The solid (dashed) line represents the unweighted (GDP-weighted) average EATR in the EU27. *Source:* Authors' contribution.

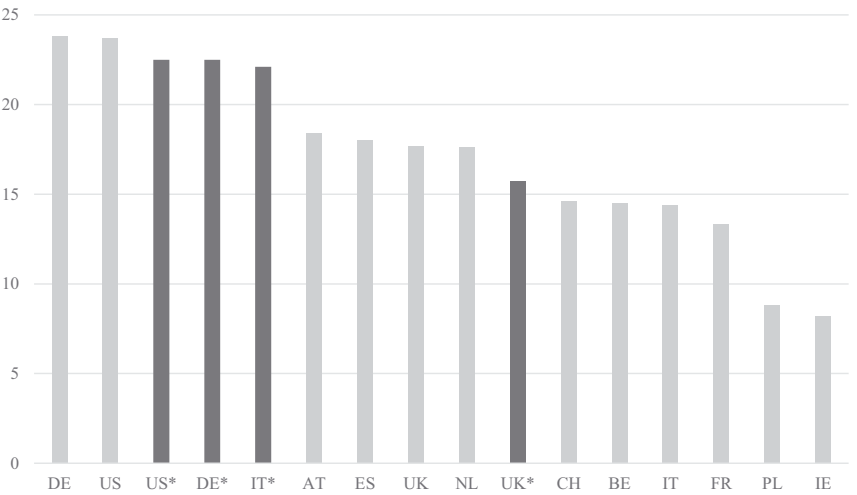

Figure B3: EATRs with R&D incentives under status quo and reform options (in percent). *Notes:* The figure displays the EATRs taking into account R&D incentives in place in 2023 (in percent). The EATRs of countries marked with an asterisk (dark coloured bars) incorporate the reform options discussed in Section 3.1. In case of the UK and the US, the dark coloured bar represents the pre-reform status and the light coloured bar the status quo. *Source:* Authors' contribution.

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