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DISCUSSION PAPER

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Tax Policies in a Transition to a Knowledge-Based Economy – The Effective Tax Burden of Companies and Highly Skilled Labour

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Tax Policies in a Transition to a Knowledge-based Economy – The Effective Tax Burden of Companies and Highly Skilled Labour

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Abstract: Globalisation and the fast-approaching digitalisation increase capital as well as labour mobility fostering tax competition among countries worldwide. Based on a unique dataset, we analyse the development of effective tax burdens on corporations and highly skilled labour for 26 OECD countries over the last decade. The synthesis of both indicators allows us to identify tax strategies of the countries considered and to further elaborate on the scope of future tax competition against the background of current developments. Overall, we find a declining trend in effective tax burdens on corporate investments, whereas we observe increases in the top statutory tax rates for high-income earners and a rather constant average effective tax burden on labour for a disposable income of EUR 100’000. Current developments like the agreement on a global minimum tax or the transition to a knowledge-based economy can set a new lower bound to tax competition on corporate investments and might shift its focus.

JEL classification: H21, H25

Keywords: effective tax rates, tax competition, location attractiveness, corporate location decision, Devereux/Griffith Methodology, Human Resource Tax Analyzer

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1. Introduction

Globalisation has reduced trade barriers and increased capital mobility. Hence, corporations decide in a globally integrated market where to locate their capital investments. Besides several non-tax factors like production costs or market potential, it is well established that taxation can play a pivotal role in the location decision of multinational enterprises (MNE). Since governments can most visibly influence the impact of taxation on this decision, countries worldwide participated in the "race to the bottom", continuously lowering statutory corporate income tax rates over the last decades. However, the agreement on a global minimum taxation can set a new lower bound to this race.

At the same time, due to the ongoing transition to a knowledge-based economy and the fast-approaching digitalisation, the transmission of ideas and meanings through labour mobility are increasing. This transition not only leads to an enhanced shift of economic activity from the manufacturing to the service sector, but also changes the characteristics of the labour force. In particular, the shift towards globally operating service sectors and an increasing demand for internationally mobile, highly educated employees are intensifying the competition for these actors.[1] The rising digital transformation of corporations and working conditions, such as remote working, further exacerbates this process.[2] Thus, increasing mobility and intensifying international competition for highly skilled employees may enable them to shift higher parts of non-wage labour costs – at least to some extend – to the employing MNEs. Consequently, the latter are not only confronted with the direct costs of corporate taxation but also with the economic consequences of the shifted incidence of labour taxation. Hence, the synthesis of corporate and labour taxation will be increasingly important for location decisions of corporations in the near future and thus, for the location attractiveness of countries.

So far, studies analysing the developments in tax competition set the focus only on one of both indicators – either corporate or labour taxation.[3] Our paper contributes to this literature and sheds further light to ongoing discussions by evaluating both levels of taxation. First, we provide a comprehensive, cross-country analysis of the evolution of tax location attractiveness in terms of corporate and labour taxation over the past decade (2009-2019). Second, the synthesis of both indicators contributes to a deeper understanding of the current challenges policymakers face in creating an optimal tax environment for business investments and the strategies chosen to address the transition to a knowledge-based economy.[4] Looking at effective tax rates over time provides us with an intuition about tax competition, especially within the European Union (EU), as well as common trends and possible interdependences between countries' national tax systems. More precisely, we present estimates on the effective tax burden on

[1] See Hope/Limberg (2021), pp. 4f.

[2] See de la Feria/Maffini (2021), p. 156.

[3] For an exception, see Elschner et al. (2006). They provide a combined analysis of both aspects of taxation and find a strong correlation between both indicators for the majority of the countries considered for the early 2000s, i.e., 2003.

[4] For the synthesis of the two indicators, we mainly rely on the estimates of effective tax rates that we produce annually at the firm level for the European Commission (see Spengel et al. (2021)), as well as on estimates of the effective employee tax burden in the context of the BAK Taxation Index (see BAK Economics/ZEW (2020)).

corporate investments and highly skilled labour for 26 OECD member countries. Specifically, we cover 18 EU-Member States, Japan, Norway, Switzerland, and the United States (US), along with four key transition economies, namely Brazil, China, India and Russia.

To analyse the development of the tax burden on corporations and labour, we rely on well-established effective tax measures, as they go beyond the statutory tax rate and are directly comparable due to their aggregated level in relation to different locations. Our estimates on the effective tax burden on corporations are based on Devereux and Griffith's (1999; 2003) methodology, whereas for the effective tax burden on highly skilled labour, we use the intertemporal simulation model developed by Elschner and Schwager (2005).

We still find wide dispersion in effective tax levels both on corporate and labour investments across countries. These large differences over time and region have the potential to significantly affect the geographical allocation of (innovative) businesses and highly skilled labour, especially in an integrated region like the European Union. Hence, it is increasingly important that governments pay attention to mobility responses when designing tax policy. Against the background on current developments, such as corporate minimum taxes and the transition to a knowledge-based economy, labour taxes might be an even more powerful instrument to increase a countries' location attractiveness from a tax perspective.

The remainder of this paper proceeds as follows: In Section 2, we present the empirical evidence on the impact of taxation on corporate location decisions and the mobility of highly skilled employees. In Section 3, we give a brief overview of the methodology used to measure the effective tax burden before discussing the main results of the evolution of national tax burdens over the last decade. Estimates on company taxation and the taxation of highly skilled employees are first presented separately before considering them together in a synthesis. In Section 4, we discuss our findings in the context of current tax policy developments and challenges. Section 5 concludes.

2. Influence of taxation on location decisions and the role of tax competition

2.1. Literature on the impact of corporate taxation

Over the last decades, increasing globalisation reduced trade barriers and fostered economic integration worldwide. Thus, several corporations are no longer operating in country-specific local markets but rather in a global marketplace. Against this background, numerous companies have significantly enhanced their international activities.[5] In this context, they also have to decide how to serve the foreign market – either by establishing a foreign affiliate or exporting goods from their home country.[6] Several factors can determine the decision to set up an affiliated company abroad: On the one hand, non-tax reasons such as lower factor prices, market potential and access, or the size of the host market may be

[5] See Schanz et al. (2017), p. 252.
[6] See Barrios et al. (2012), p. 946; Lawless et al. (2018), p. 2920.

taken into account in the location decision of multinational firms.[7] On the other hand, corporate taxation can impact this decision. Due to non-harmonized tax regulations, firms can benefit from differences in the corporate tax systems across countries and governments can directly influence this factor to improve their location attractiveness for foreign direct investments (FDI). For governments, this is particularly relevant since several empirical studies confirm that FDI is linked to organisational expertise and new technologies that can increase productivity at an aggregated level in the host country.[8] Furthermore, FDI and, in particular, greenfield investments are associated with net job creation. Hence, to enhance its' productivity and competitiveness, governments around the world try to attract FDI using corporate taxation to improve their location attractiveness from a tax perspective.[9]

Economists have long explored how tax policy impacts investment.[10] A vast theoretical public finance literature shows the sensitivity of capital location in general and in particular of multinational firms to profit tax policy.[11] An extensive empirical literature has confirmed this result. Using data on different levels of aggregation (aggregated bilateral activity, industry, firm), these studies show that national tax policy on corporate profit taxation impacts the location decision of MNEs' investments across countries. One strand of literature relies on data of bilateral FDI flows.[12] For example, Devereux and Freeman (1995) analysed the effect of the effective marginal tax rate on bilateral FDI flows between seven countries and can confirm the impact of their measure in explaining the size of FDI flows relative to GDP. Several more recent papers rely their studies also on bilateral FDI flow data but exploring alternative specifications of the tax rate, e.g., effective average and marginal tax rate and forward-looking versus backward-looking measures.[13] Considering the effective average tax rate as a linear combination of the (forward-looking) effective marginal and the statutory tax rate, Buettner (2002) finds that both measures significantly impact FDI flows. However, due to the aggregation level, the relevance of FDI flows with regard to the investment location decision of MNEs is limited.

Therefore, the second strand of literature uses aggregated data on affiliates of MNEs, including their activities in foreign countries. Several studies focus on the US, like Grubert and Mutti (1991, 2000) and Hines and Rice (1994). Concerning the results, for example, Grubert and Mutti (1991) and Hines and Rice (1994) show that the average tax rate negatively influences the aggregated capital stock of affiliated companies. However, to explore the differences in location decisions of MNEs more precisely and to study differences between corporations' data on firm-level is necessary. This strength of literature has

[7] For the theoretical perspective see Helpman (1984, 1985) (vertical model) or Markusen (1984, 2002) (horizontal model) and for reviews on the determinants of the location choice of foreign affiliates e.g Fontagné/Mayer (2005), Lawless et al. (2014) or Davies et al. (2018).

[8] For a discussion of the literature see, Schiffbauer et al. (2017).

[9] See Davies et al. (2018), p. 2.

[10] See for example Hall/Jorgenson (1967); Cummins et al. (1995); Goolsbee (1998); House/Shapiro (2008).

[11] See, for instance, Wilson (1987); Janeba (1995) or Devereux/Hubbard (2003).

[12] For an overview of earlier work, see Slemrod (1990).

[13] See for example Buettner (2002); Gorter/Parikh (2003); Bénassy-Quéré et al. (2005).

been rapidly growing over the last two decades.[14] For example, Stöwhase (2002) uses a dataset on German MNEs analysing the number of affiliates of German MNEs in eight host countries. The results show that the average tax rate has a significant impact on companies in production industries, while the statutory tax rate plays a relevant role for companies in the service, finance and R&D industries. More recently, Schanz et al. (2017) confirm – using not only corporate tax rates but several other tax variables – that German MNEs locate their affiliates in countries that offer favourable statutory tax rates, withholding taxes, double tax treaty networks and holding incentives. Overall, the studies indicate that taxation impacts the location decision of multinational corporations – whereby the magnitude differs. For example, in the overall allocation of capital, effective average tax rates tend to play a pivotal role, while effective marginal tax rates are less relevant.[15]

Due to the extensive empirical literature studying the impact of taxation on the location decision of corporations, meta-studies shed further light on this question.[16] For example, Feld and Heckemeyer (2011) estimate a semi-elasticity with respect to the corporate tax rate of 2.49, indicating that a one percentage point increase in the corporate tax rate of one country decreases its' FDI by 2.49%. Hence, besides several non-tax factors which are not included in our analysis, it is widely established that corporate taxation influences the location decision of corporate investments.

2.2. Literature on the impact of taxation on highly skilled labour

In contrast to the previous chapter, there is very little empirical work on the effect of taxation on the spatial mobility of individuals.[17] However, it is essential to consider income taxation not only as a potential distortion for corporate investments but also for the market of highly skilled human resources. Besides anecdotal evidence of the negative impact of taxation on top earners[18], there is growing evidence that taxes can affect the migration of employees both within and across countries, especially among high-skilled employees. These prior studies have shown that labour taxes can be used to attract highly skilled individuals and can also exert an effect on the wage-setting process of top earners.

With respect to attracting highly skilled labour, the small but growing literature on within and cross-border country migration shows that especially highly skilled employees and top earners significantly react to tax differentials through mobility across regions. Liebig et al. (2007) and Schmidheiny and Slotwinski (2018) find evidence for this subgroup of employees on within-country migration by

[14] See for example Devereux/Griffith (1998); Stöwhase (2002); Altshuler/Grubert (2002); Desai et al. (2004); Schanz et al. 2017); Lawless et al. (2018).

[15] See Devereux/Maffini (2006), p. 41.

[16] See, for instance, de Mooij/Ederveen (2003); Feld/Heckemeyer (2011).

[17] In the context of our analysis, we do not focus on the impact of taxation on other kinds of personal income, i.e. capital or business income, which comprises a majority of the income of superrich people. For more details on the impact of taxation on this type of top income earner, see Scheuer/Slemrod (2020).

[18] Some anecdotal evidence on the French wealth tax (a marginal tax rate of 75% for incomes above EUR 1 million) indicates that this tax was abandoned in 2015 not only due to its low incidence but also due to difficulties of French companies to attract top international staff, see Hopkins (2014, December 23; https://www.dailymail.co.uk/news/article-2885197/France-waves-discreet-goodbye-75-percent-super-tax.html).

exploiting discontinuities in Swiss cantons' income tax rates. Recent analyses confirm this pattern of within-country variations for other countries.[19] Furthermore, these studies commonly stress that specific segments of the population (e.g., highly skilled employees, young and/or unmarried individuals (without family) and CEOs) are more sensitive to taxes, either because they are less tied to specific firms or their skills are less likely to be location-specific. Besides population characteristics, Agrawal and Foremny (2019) highlight the relevance of particular industries, i.e., scientific, health, finance, real estate and information industries, in driving the largest effects of migration. Concentrating on an even more specific subgroup of top earners, i.e., highly paid star scientists, Moretti and Wilson (2017) confirm the findings of interstate mobility within the US. In contrast, Young and Varner (2011) and Young et al. (2016) find only very limited effects of tax differentials at the US federal income tax level on millionaires' migration.

In the context of cross-border migration, the existing literature is even more focused on the impact of taxation on specific occupations, i.e., football players[20], highly paid foreigners[21] and inventors[22]. These studies show that tax-induced migration of (foreign) top income earners can be important for local governments, especially in a large mobility area like the European Union.[23] Participation in beggar-thy-neighbour strategies allows countries to take advantage of top earner's tax-driven mobility. Kleven et al. (2013) provided the first evidence on the positive (upper bound) effect of foreigner-specific tax breaks on immigration by analysing the European football market.[24] Based on panel data from the US and European Patent Offices, Akcigit et al. (2016) can track inventors over time and across countries and exploit the differential impact of top rates on inventors at different productivity and, therefore, income levels. The authors confirm the results of Moretti and Wilson (2017) in an international setting. Further evidence in this regard is provided by Akcigit et al. (2018) by showing a strong impact of corporate and personal taxes on the mobility of foreign inventors across US states over the twentieth century. Exploiting a preferential flat tax rate granted in Denmark for a maximum of 36 months after the immigration of highly skilled foreign employees, Kleven et al. (2014) do not only find a significant increase of highly paid foreigners eligible to this preferential tax scheme (i.e., the scheme almost doubled the number of highly paid foreigners in Denmark relative to slightly less paid ineligible foreigners), but they also provide evidence of wage bargaining power of these top earners. Even if they find evidence on a larger group of top earners, the migration effects are quite heterogeneous between sectors, i.e., sports and entertainment and all other industries.[25] Muñoz (2019) shows that countries included in a

[19] See Agrawal/Foremny (2019) for Spain and Rubolino (2020) for Italy.
[20] See Kleven et al. (2013).
[21] See Kleven et al. (2014).
[22] See Akcigit et al. (2016).
[23] See Muñoz (2019), pp. 48-50.
[24] Usually, football players can make their clubs pay the full cost of the tax thanks to their unique contracts, see Guillot (2021).
[25] See Kleven et al. (2020), p. 129.

large mobility area like the European Union have increasing interests to participate in beggar-thy-neighbour strategies to take advantage of top earner's tax-driven mobility.

Besides the suggestive evidence on tax-induced migration effects within and across certain regions, our analysis rests on the assumption that highly skilled employees exert enough bargaining power to shift at least part of their labour tax burden to the employer. Recent literature on the incidence of labour taxes finds very different results, ranging from full incidence among employers[26] to full incidence among employees.[27] However, in line with Ruf and Schmider (2018), Kleven et al. (2014) point out in the context of highly skilled employees and CEOs that they seem to be able to shift part of their payroll tax burden to employers. Guillot (2021) confirms these findings by analysing the impact of the French 75% tax on millionaires. However, she stresses that the bargaining power, and thus, the incidence is highly driven by the employees' occupation, both upon the introduction and the removal of the tax. Especially, CEOs and, to a lesser extent, admin and business managers exert a higher share of bargaining power. Engineers and technical managers bear half of the incidence and do not benefit as much as the others from the removal of the wealth tax.

Based on the empirical evidence presented, any increase in the taxation of highly skilled employees could result in a (partly) offsetting increase in the remuneration and thus increase companies'' labour costs. As multinationals are especially quite sensitive to costs, higher employer-borne taxes and social security contributions could exert negative investment distortions. Feld and Kirchgässner (2002), who exploit the regional distribution of companies and on cantonal employment using a panel data set of the 26 Swiss cantons from 1985 to 1997, show that corporate and personal income taxes deter companies from locating in a canton and subsequently reducing cantonal employment. Additional evidence of the sensitivity of firms to variation in top labour income tax rates is provided by Egger and Radulescu (2011) and Egger et al. (2013) in their studies, where they show that firms tend to locate their headquarters where top tax rates and tax progression are lower. In detail, Egger et al. (2013) find that a one percentage point increase in the payroll taxes (i.e., personal income taxes and social security contributions) reduces the probability of a country attracting headquarters by 6.1%. Further indirect empirical evidence on the negative impact of labour costs is provided by Buettner and Ruf (2007), Buettner and Wamser (2009) as well as Montout and Sami (2016). Implicitly controlling for labour taxes by including labour costs in their analyses, these studies find a significant negative effect of labour taxes on cross-border location and investment decisions.

Overall, there is evidence that first, highly skilled employees react to tax incentives through within and cross-border country migration. Second, the literature has shown that these employees use their bargaining power to shift – at least some parts – of their labour tax burden to the employer.

[26] See Saez et al. (2012), p. 526.
[27] See Gruber (1997), p. S99.

3. Trends in effective tax burdens of corporations and highly skilled labour

To identify trends in a countries' location attractiveness from a tax perspective for corporations and highly skilled employees over the last decade, we rely on well-established measures of the effective tax burden at the corporate level as well as on labour, namely the models developed by Devereux and Griffith (1999; 2003) and Elschner and Schwager (2005).[28] These effective tax rates should be preferred over statutory tax rates as they incorporate the most significant features of the underlying corporate and personal income tax system, e.g., tax allowances, local profit tax rates, surcharges, non-income tax charges as well as social security contributions, and could therefore point out distortions of taxes on investment decisions.

To analyse the attractiveness of different locations from a tax perspective, we compare effective tax burdens on corporations and labour internationally. In particular, we compare 18 EU Member States and four major industrialised non-EU countries (i.e., CH, JP, NO, and the US) and four transition economies (i.e., BR, CN, IN, and RU). In the majority of countries, corporate and personal income tax rates are only set at the federal level. However, we also cover certain countries which levy income taxes on the national and sub-national levels (e.g., BE, CH, DK, ES, FI, IT, JP, NO, SE, and the US). Further, regional differences in social security contributions drive variations in the Chinese tax burden. In the context of our analysis, we, therefore, focus on the regulation applicable in the capital cities if there are local differences within a country.[29]

3.1. Development of effective tax burden on corporations

3.1.1. The Devereux/Griffith methodology

The Devereux/Griffith methodology (1999, 2003) builds on the work of Jorgenson (1963), Hall and Jorgensen (1967) and King and Fullerton (1984) and is based on the neoclassical investment theory. It assumes a perfect capital market under certainty and considers a hypothetical domestic incremental investment by a corporation in the manufacturing sector.[30] This investment takes place in one period and generates a return in the subsequent period. Further, it assumes that firms undertake the hypothetical domestic investment as long as its' marginal return covers its' marginal costs. Said differently, investment takes place until the return is equal to the cost of capital – 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.

The methodology of Devereux and Griffith allows us to compute effective tax burdens on marginal investments that just yield a minimum required return (relevant measure: cost of capital, effective marginal tax rate (EMTR)) and on highly profitable investments with a pre-tax rate of return of 20%

[28] Our focus on the taxation of corporations and highly skilled employees is not meant to imply that we deny the importance of other location factors such as infrastructure or environmental amenities. Rather, we concentrate on taxation so as to clearly isolate the impact of one specific location factor.

[29] In CH we refer to the canton and city of Zurich and in the US to the state of California.

[30] See Evers et al. (2015), p. 510; Pfeiffer/Spengel (2017), p.21.

(relevant measure: effective average tax rate (EATR)). For this study, we only consider the EATR at the corporate level with the aim to analyse the impact of taxes on the location attractiveness of countries for corporate investments over time.[31]

The EATR measures the change in the net present value (NPV) of a highly profitable investment caused by taxation. This is especially relevant when companies have to decide on the geographical allocation of economic returns in the course of investment location decisions.[32] From a set of discrete, mutually exclusive investments with an identical pre-tax real rate of return, the investor will choose the location for which the NPV is least reduced by taxation, that is, the EATR is lowest.[33]

The EATR is computed as the difference of NPV before and after taxes ($R^* - R$), divided by the discounted pre-tax rate of return p.

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

Alternatively, the EATR can be written as:[34]

$$EATR = \frac{\tilde{p}}{p} * EMTR + \frac{p - \tilde{p}}{p} * \tau \tag{2}$$

Hence, the EATR equals the EMTR if the pre-tax rate of return (p) is identical to the cost of capital ($\tilde{p}$). Further, the EATR approaches the statutory tax rate τ if profits increase (i.e., an increasing pre-tax rate of return). Therefore, the corporate income tax rate can be considered the main driver of the EATR for highly profitable investments, whereas tax base elements considerably decrease for such investments.[35]

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.), as well as tax base and tax rate regulations.[36] Besides these country-specific tax information, the model rests on several important economic assumptions displayed in Table 1. All economic parameters are held constant across all investments to isolate the effect of different international tax regimes, irrespective of their location.

[31] It is adequate to disregard taxes at the shareholder level in case managers do not know the tax position of their marginal shareholder. For a discussion of these issues, see Devereux et al. (2002).
[32] See, for instance, Devereux/Griffith (2003) and Auerbach (2006).
[33] For an illustrative example and interpretation, see Spengel et al. (2018), p. 62.
[34] Personal taxes are neglected. For the derivation see Devereux/Griffith (1999), pp. 21f.
[35] See Devereux/Griffith (2003), pp. 112f.; Spengel (2003), pp. 75f.
[36] For further details the annual update on effective tax level in the EU; see Spengel et al. (2021).

Table 1: Parameters of Devereux Griffith Methodology

Economic parameters	
True economic depreciation rate (%)	
intangibles	15.35
industrial building	3.1
machinery	17.5
real interest rate (%)	5
inflation rate (%)	2
pre-tax rate of return for EATR (%)	20
Composition of investment	
Weighting of investment (%)	
Intangibles, buildings, machinery, inventory, financial assets	each 20
Weighting of financing (%)	
Retained earnings	55
New equity	10
Debt	35

Note: Assumptions based on Spengel et al. (2021).

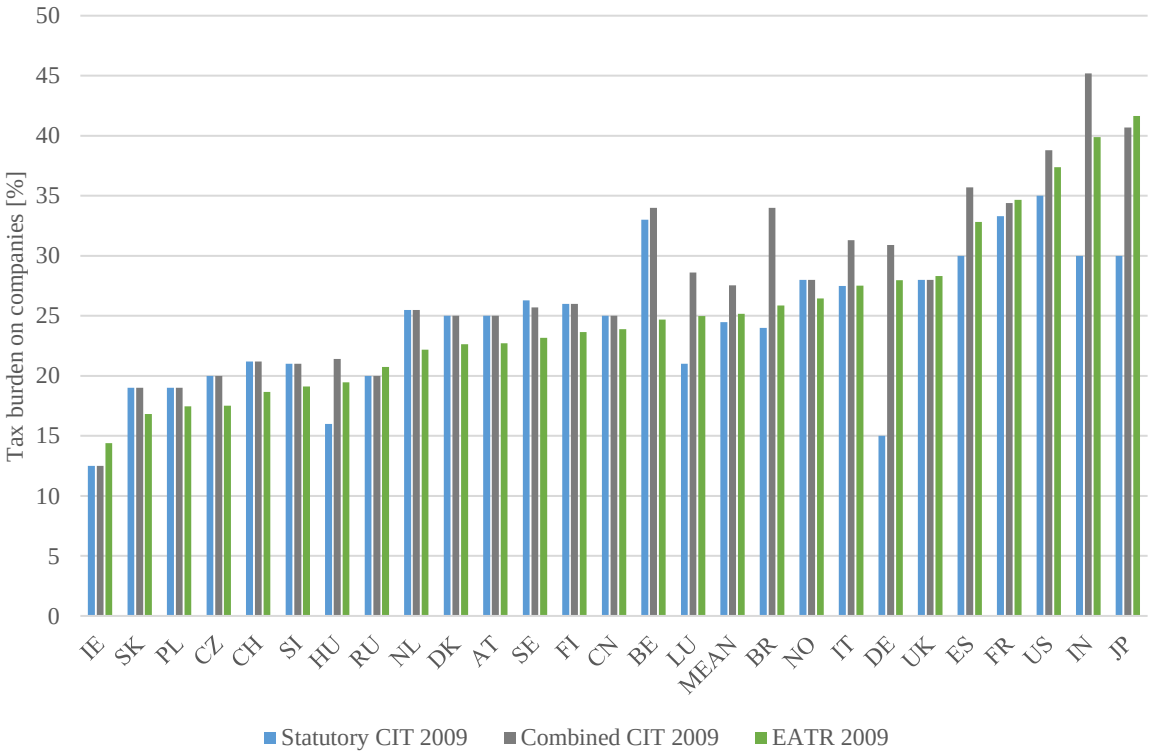
3.1.2. Tax burden on profitable investment projects – country comparison 2009-2019

Statutory corporate income tax rates

All countries considered in our sample apply a flat statutory rate to tax corporate profits. In addition, some countries like Germany, Italy, or India levy additional surcharges or business taxes that increase the statutory corporate income tax rate. Therefore, the combined corporate income tax rate (statutory tax rate incl. surcharges/business taxes) can deviate from the statutory rate. Before evaluating the trends of effective average tax rates over the last decade, we focus on the development and distribution of statutory as well as combined profit tax rates, as these are often used as a first indicator of the effective tax burden on corporate investments.

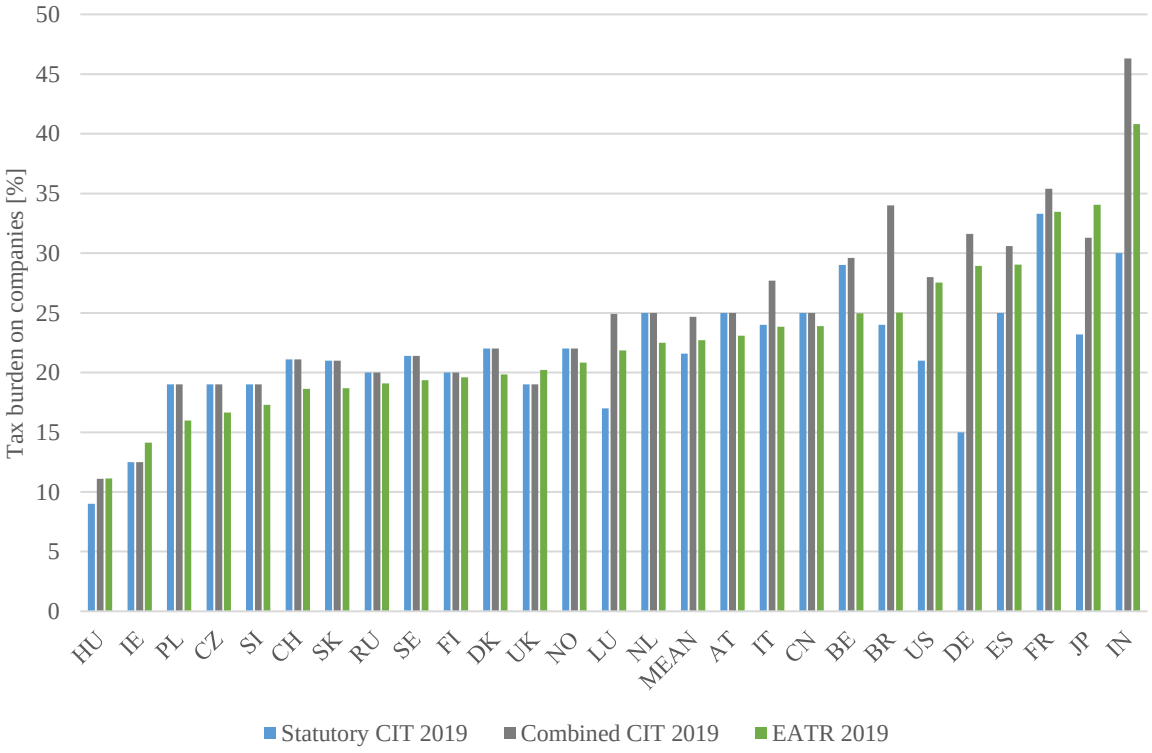
Figure 1 and Figure 2 graphically illustrate the statutory, combined and effective average tax rates for all considered countries for the years 2009 and 2019 (see also Table 3 in the appendix). A glance at the timeline of the different averages shows a significant trend downwards across all tax rate measures. Overall, average statutory corporate income tax rates (combined tax rates) decreased from 24.5% (27.5%) in 2009 to 21.6% (24.7%) ten years later. The modest reduction in the standard deviation of statutory tax rates (combined tax rates) indicates that the difference in national tax levels persists over the observation period (5.7 (7.5) in 2009 to 5.0 (7.3) in 2019).

Figure 1: Statutory, combined and effective average tax rates for corporations in 2009



Source: Spengel et al. (2021), own calculation for transition economies.

Figure 2: Statutory, combined and effective average tax rates for corporations in 2019



Source: Spengel et al. (2021), own calculation for transition economies.

Within our sample, the average combined profit tax rate on distributed profits is 24.7%, and the remarkable spread between the highest and the lowest profit tax rate amounts to 35.2 percentage points (pp) in 2019. In this regard, Hungary and Ireland levy the lowest combined corporate income tax rate at 11.1% and 12.5%, respectively, and India the highest at 46.3%. In India, companies face an above-average statutory corporate income tax rate of 30%, further increased by an additional dividend distribution tax (15%), surcharge and educational tax levy.[37] In comparison, the average combined corporate income tax rate in the EU is 23%.

The dispersion of statutory and combined profit tax rates indicates significant regional variation, partly reflecting the underlying tax systems. Most large economies complement corporate income taxes by surcharges and local business taxes (e.g., DE, FR, ES, IT) or state taxes (e.g., CH, US). In contrast, the majority of Eastern European countries considered, as well as Russia, not only apply slightly below average corporate income tax rates but also use relatively simple tax regimes without any additional surcharges on profit, revenue or other business assets.

Effective average tax rates

Concerning effective average tax rates, the figures mentioned above show that in the majority of countries, the EATR is lower than the combined statutory tax rate due to the tax-reducing impact of tax base regulations and the deduction of interest payments on debt financing.

Table 4 in the appendix presents the respective EATRs for 26 countries every two years, starting from 2009 to 2019. In line with the developments of statutory and combined corporate income tax rates, the results show, on average, a decline in EATRs (25.2% in 2009 vs. 22.7% in 2019) as well as a remarkable dispersion across countries that persist over the observation period. In 2009, the EATRs ranged from 14.4% in Ireland to 41.7% in Japan, while in 2019, Hungary shows the lowest EATR with 11.1% and India the highest with 40.8%. However, these trends might differ between regions, especially between EU- and non-EU countries.

Although the average level of effective tax burdens is slightly lower compared to the overall sample, the above-mentioned trends – on average – can also be observed for the EU Member States considered with a decreasing unweighted average EATR of 23.3% in 2009 and 21.1% in 2019. Furthermore, the nearly constant standard deviation suggests that a comparatively high cross-country spread in EATRs persists over time (5.3 in 2009 vs. 5.4 in 2019). The slightly lower level of EATRs compared to the overall sample is mainly driven by the tax burdens of the five Eastern European countries, namely the Czech Republic, Hungary, Poland, Slovakia and Slovenia. Compared to the other Member States considered, the unweighted average EATR of the Eastern European countries is around seven percentage points

[37] The effective tax burden of an Indian company is determined by the product of the sum of the corporate income tax rate and the distribution tax and the surcharge as well as educational tax levy ((30%+15%)*1.12*1.04).

lower, at 18.1% in 2009 and 16.0% in 2019. With a standard deviation of 1.0, the levels of effective tax burdens for corporate taxpayers in these five countries were very much aligned in 2009. However, due to contrary developments in Hungary and Slovakia, the spread in EATRs across these Eastern European countries increased significantly and resulted in a standard deviation of 2.6 in 2019.

As these findings already imply, the location attractiveness from a tax perspective differs significantly within the European Union. Already in 2009, France, Spain and Germany showed the highest EATRs among the EU Member States considered with 34.7%, 32.8% and 28.0%, respectively, and are still the top three high-tax countries in 2019. Whereas the German effective tax burden increased slightly due to, on average, increasing local scaling factors of the business tax and the lack of major tax reform, the EATRs in France and Spain decreased to 33.5% and 29.0% in 2019. Especially, a rather strong EATR decline of 3.8 percentage points can be observed in Spain, which is due to several cuts in the statutory corporate income tax rate (2009: 30%, 2015: 28%, 2016: 25%). From a tax perspective, the most attractive investment condition was offered by Ireland in 2009 with an EATR of 14.4%. While Ireland's effective corporate tax burden has been relatively constant over the observation period (2019: 14.1%), Hungary significantly reduced the statutory corporate income tax rate by seven percentage points from 16% to 9% with major tax reform in 2017. As a result, Hungarian corporations faced the lowest average effective tax burden in 2019 among the European countries under consideration.

Besides the most noticeable EATR reduction in Hungary (-8.4 pp), the effective average tax burden for corporations in the UK has fallen by 8.1 percentage points from 28.3% in 2009 to 20.2% in 2019. This substantial decline is also due to continuous reductions in the statutory corporate tax rate (from 28% in 2009 to 19% from 2017 onwards).[38] Another seven out of the 18 EU Member States considered showing a decline in EATRs of slightly above or around three percentage points. Most of these countries reduced their statutory corporate income tax rate (e.g., FI, SE, LU, ES), while Italy introduced a notional interest deduction in 2011, leading to a lower corporate income tax base. In contrast to the strong decreases in EATRs among the Member States considered, only Austria, Belgium, Germany and the Netherlands faced slight increases in the effective tax burdens of their corporate taxpayers, ranging from 0.3 percentage points (BE) to 0.9 percentage points (DE). These increases are mainly caused by local profit as well as real estate taxes. By contrast, the increases in the effective tax burden of Belgian corporations until 2017 are due to significant reductions in the eligible rate for the notional interest deduction (around 4.5% in 2009 to 0.2% in 2017). Hence, it broadened the corporate tax base and therefore increased the EATR. This increase was not fully offset by the Belgian tax reform in 2018, which reduced the statutory corporate income tax rate from 33% to 29%. The most substantial increase of 1.9 percentage points between 2009 and 2019 in effective average tax burdens among the European Member States considered can be observed in Slovakia. This country significantly increased its corporate income tax rate by four percentage points in 2013. Taken together, the Northern and Eastern

[38] The planned decrease of the corporate income tax rate to 16% in 2020 was abolished due to the Covid-19 pandemic.

European countries considered show a stronger trend towards declining effective average tax burdens on corporate investment in comparison to Central and Western European Member States.

The four industrialised non- EU countries – Japan, Norway, Switzerland and the US – show on average a significantly higher level of EATRs compared to the 18 EU Member States during the last decade. Nevertheless, a declining trend of EATRs can also be observed in these countries: The average EATR of 31.0% in 2009 decreased to 25.3% in 2019. While in Switzerland, EATRs stayed almost constant over the observation period, EATR reductions in Japan, Norway and the US drive the aforementioned EATR decline.

Due to the "Tax Cuts and Jobs Act" of 2017, the US – besides introducing several other tax law changes – reduced the federal statutory corporate income tax rate from 35% to 21% as of 2018. Compared to all other countries considered, this reform is the main driver for the most substantial decrease in EATRs – namely 9.9 percentage points – over the entire observation period.

Between 2009 and 2019, Japan also steadily reduced the statutory corporate income tax rate, with a major decrease of 4.5 percentage points from 30% to 25.5% in 2012. From 2014 onwards, the statutory tax rate was even further decreased; however, the respective steps were rather small (2015: 23.9%, 2016: 23.4%, 2018: 23.2%). The observed declines in EATRs over the last decade have led to a 7.6 percentage points reduction of the EATR in Japan and thus to the most vital improvement of location attractiveness from a tax perspective after the US (-9.9 pp.), Hungary (-8.4 pp.), and the UK (-8.1 pp.). In line with the observations in Japan and the US, the declining trend in EATRs can also be observed in Norway. Similarly, it is mainly driven by reductions in the statutory corporate income tax rate. However, in contrast to the other two countries, there has not been one major reduction but rather several continuous steps with similar magnitudes. While the statutory corporate tax rate amounted to 28% for the years 2009 to 2013, Norway started to reduce it by one percentage point in (nearly) each subsequent year, resulting in a statutory corporate tax rate of 22% in 2019.[39] Besides the aforementioned cuts in the statutory tax rates, other temporary tax law changes could counteract (e.g., special reconstruction tax in JP from 2012-2015) or even amplify the effect (e.g., accelerated depreciation for machinery and equipment in NO from 2014-2016).

Overall, the significant decrease of the effective corporate tax rate in Japan led to an alignment with the European high-tax countries. Whereas corporate taxpayers in Japan faced a nearly seven percentage points higher tax burden than their counterparts in France in 2009 (41.7% vs. 34.7%), this difference in effective tax levels narrowed down to 0.6 percentage points ten years later. Hence, Japan is – from a tax perspective – equally attractive for corporate investments as France in 2019. Similar improvements in location attractiveness can be observed for the US. While in 2009, the tax burden for corporations in the

[39] The statutory corporate tax rates for the years 2014 to 2019 are the following: 2014-2015: 27%, 2016: 25%, 2017: 24%, 2018: 23% and 22% in 2019.

US was higher than in every other EU Member State under consideration, this has changed significantly due to their major tax reform in 2017 and no or rather moderate reforms in the EU high-tax countries France, Spain and Germany. Hence, in 2019 the situation is reversed – with EATRs of 33.5%, 29.0% and 28.9%, taxpayers in France, Spain and Germany faced higher tax burdens than US corporations with an effective average tax rate of 27.5%. Finally, with an almost constant EATR of around 18.6% over the last decade, Switzerland provides rather attractive investment conditions compared to the considered EU Member States. Lower EATRs can only be observed in the European low-tax countries, namely the five Eastern Member States and Ireland.

In contrast to the aforementioned observations, the overall trend of declining EATRs over the last decade cannot be perceived for the four key transition economies Brazil, China, India and Russia. While the effective corporate tax burdens in Brazil, China and India stayed (almost) constant over the last decade, only a minor EATR decrease from 20.7% to 19.1% can be observed in Russia. Since the statutory corporate income tax rate is unchanged over the observation period, the EATR reduction is due to an exemption of fixed assets from the corporate property tax as of 2013. Compared to the overall sample, India offered the least attractive investment conditions in 2019 due to the absence of tax reforms during the last decade. The EATR of 40.8% in 2019 is far above the tax burden of every other high-tax country in the sample. The effective corporate tax burdens in Brazil and China are slightly above average compared to the Central and Western European Member States considered, while Russia's EATR is comparable with the one of the Northern EU Member States Sweden, Finland and Denmark.

Overall, we show that, on average, there is a declining trend in EATRs over the last decade as well as a remarkable dispersion of EATRs across countries that persist over the observation period. As shown above, these developments depend on the national tax reforms of the countries under consideration. In general, the level of the effective corporate tax burden depends on the statutory corporate tax rate, tax base regulations, and the imposition of additional income and non-income taxes on corporations by the respective country. Hence, a comparison of the statutory corporate income tax rate with the corresponding EATR allows a conclusion on changes in the tax base as well as on other corporate taxes considered in the model.[40] It is evident that the EATR correlates strongly with the statutory corporate tax rate of the respective country. Hence, a high statutory tax rate is associated with a high EATR. This traces back to the assumption of a highly profitable investment. As profits increase, i.e., an increasing pre-tax rate of return, the EATR approaches the statutory tax rate, which becomes the decisive factor with regard to the corporate tax burden. Consequently, higher profits are associated with a declining impact of tax base elements, e.g., depreciation allowances, relative to the absolute value of the profits.[41] Therefore, in the vast majority of the considered countries, the EATR is not significantly lower than the statutory and combined tax rate. This holds for the years 2009 and 2019.

[40] See Endres et al. (2013), p. 502.
[41] See Bärsch et al. (2014), p. 430; Spengel et al. (2016), p. 16.

In ten out of the 26 OECD countries, the combined corporate income tax rate exceeds the statutory tax rate in 2009 and 2019.[42] This traces back to additional (local) business taxes levied in these countries, which can account for up to 50% of the combined corporate income tax rate, such as in Germany. Further, some local business taxes take the form of taxes on gross profits without a deduction allowance for financing and/or labour costs. Such taxes are levied, for example, in Hungary (iparu zési adó), Italy (IRAP) and France (CVAE)[43]. In contrast to the vast majority of the countries considered, the effective average tax rate is higher than the statutory and combined tax rate in France, Ireland, Japan, Russia and the UK in 2009. The reasons behind it are in general twofold: First, in Japan, Russia and the UK, the depreciation regulations according to the countries' tax law are less favourable than the economic depreciation assumed in the model for some assets considered. For example, in the UK in 2009, industrial buildings could be depreciated over 50 years under the straight-line method resulting in an annual depreciation rate of 2%. However, the underlying economic depreciation rate assumed in the model is significantly higher at 3.1%. Thus, these national tax regulations of the respective countries increase the net present value after taxes and lead to a higher EATR. Second, France, Japan and Russia levied a wealth tax in general or only with regard to specific assets considered in the model in 2009. This tax increased the effective tax burden of the corporation but is neither considered in the statutory nor in the combined corporate income tax rate. However, Russia and France abolished this tax or excluded the considered assets from the tax base during the observation period. Therefore, the EATR was lower or equal to the statutory and combined tax rate in 2019.

Regarding Ireland, the explanation differs: Trading income is taxed at a statutory tax rate of 12.5%, whereas non-trading income, such as interest income, is taxed at a much higher rate of 25%. Since the model also considers an investment in financial assets, we adjust for this issue resulting in a higher effective average tax burden for corporations compared to the statutory and combined income tax rate on trading income.

Overall, in line with previous studies, we find a declining trend in statutory as well as effective corporate tax burdens in the EU. However, comparing our results to previous work[44], we observe that the downward trend of effective average tax burden slowed down in the last decade.

[42] The combined corporate income tax rate exceeds the statutory tax rate in BE, BR, DE, HU, IN, IT, JP, LU, ES and the US in 2009 and 2019.

[43] The tax on the added value of business was introduced in 2010 under the name of cotisation sur la valeur ajoutée des entreprises.

[44] See for example Bräutigam et al. (2019).

3.2. Development of effective tax burden on highly skilled labour

3.2.1. The Human Resource Tax Analyzer model

To analyse the effective tax burden on highly skilled labour, we rely on the effective tax measure developed by Elschner and Schwager (2005), the so-called Human Resource Tax Analyzer.[45] This approach rests on the assumption that highly skilled employees are perfectly mobile across countries, which allows them to demand a specific disposable income after taxes when choosing among job offers. Based on the empirical evidence summarized in chapter 2.2, we assume that especially highly skilled employees in a competitive labour market can shift their respective burden of labour taxes and tax-like social security contributions to the employer. Thus, differences in these country-specific non-wage labour costs lead to distortions in the cost of labour of a highly skilled employee. In particular, employers are required to compensate their employees for these higher charges on labour income to stay competitive in an international comparison. Said differently, the higher the perceived labour costs of companies due to taxes and social security contributions payable by the employer, the less attractive is a country for companies employing highly skilled employees there.

To measure and analyse the differences in national regulations concerning labour costs, the methodology by Elschner und Schwager (2005) allows us to calculate the effective average tax burden for a fixed disposable income after taxes and social security contributions. The EATR represents the tax wedge, reflecting the share of the remuneration which does not benefit the highly skilled employee. Thus, the EATR expresses how much the employer has to expend in addition to the predetermined disposable income due to taxation. This is especially relevant when companies have to decide on the geographical location of highly skilled employees. High effective average tax rates indicate that the employer has to spend significantly more to compensate an internationally mobile employee. Or, to express it in the context of our study, the higher the EATR, the less attractive is a country for companies employing highly skilled employees.

The EATR is computed as the difference between the total remuneration of the employee (pre-tax value (E^*)) and the required fixed income after taxes and social security contributions (after-tax value (E)) divided by the total remuneration (pre-tax value (E^*)).

$$EATR = \frac{E^* - E}{E^*} \tag{3}$$

In line with the Devereux and Griffith methodology, which we use to calculate effective corporate tax burdens, the Human Resource Tax Analyzer incorporates information about current and future tax payments and charges that occur in the context of the total remuneration in one period. In detail, we

[45] For a detailed explanation of the methodology, see Elschner/Schwager (2005), Elschner/Schwager (2007). The Human Resource Tax Analyzer is closest to the OECD publication series on „taxing wages“. However, there are two significant deviations: First, this approach suggests that social security contributions should not treated as a whole as tax-like contributions. Second, it takes into account the tax impacts on old-age contribution (Elschner/Schwager (2005)).

consider all personal income taxes, including surcharges, state and municipality taxes. On the company's side, we take into account payroll taxes applicable to the aggregate wage costs. Furthermore, we consider social security contributions as part of the tax burden as long as it can be assumed that employees do not earn a specific individual benefit by participating in these schemes. Hence, we explicitly treat the contributions to unemployment insurance and accident insurance as tax-like contributions. On the other hand, due to the unavailability of the precise tax component in healthcare premiums, we do not treat these contributions as taxes.[46] Concerning mandatory public pension schemes, we carefully account for the benefits provided by such schemes according to the regulations currently in force in each country. Following Elschner and Schwager (2007), we take account of the fact that payments into a public pension scheme can at least partially be considered as insurance premiums even if the benefits provided are typically not actuarially fair.

Different types of compensation determine the total remuneration of employees. We restrict our analysis to cash compensations (75%) and contributions to old-age provisions (25%). Cash compensations are taxable in the year of payment, whereas the treatment of old-age provisions is not straightforward. If the contributions are paid out of taxed income, the resulting benefits are non-taxable, whereas the initial exclusion of the old-age contributions from taxable income results in taxable old-age benefits. The intertemporal approach of Elschner and Schwager (2005) explicitly deals with the different timing of income payments and their consequences on taxes and social security contributions by considering personal characteristics of the highly qualified employee like contribution years and life expectancy (see Table 2).

Table 2: Parameters of Human Resource Tax Analyzer

Personal characteristics of highly qualified employee	
Current age	40 years
Age at start of work	25 years
Age at retirement	65 years
Life expectancy	85 years
Status	Single, without children
Economic parameter	
Real interest rate (%)	5
Disposable income (baseline)	EUR 100'000
Composition of remuneration	
Cash components (%)	75
Old age contributions (%)	25

Note: Assumptions based on Elschner and Schwager (2005).

We express our disposable income for all locations in Euro to obtain internationally comparable effective tax rates. Thus, we have to convert the disposable income into the national currency of a

[46] See Elschner et al. (2006), p. 523.

country unless the local currency is Euro. To isolate fiscal changes and abstain from fluctuations in currency exchange rates, we use fixed nominal exchange rates, displayed in Table 7 in the appendix.[47]

3.2.2. Tax burden on highly qualified employees – country comparison 2009-2019

Statutory personal income tax rates

Although average effective tax rates should be the decisive factor for location choices, statutory top personal income tax rates are often of high relevance for individuals and thus, can have an important signalling effect for many employees. Consequently, it is very likely that these tax rates could have an impact on international labour tax competition.[48] Therefore, we first provide a brief overview of the evolution of statutory top personal income tax rates over the last decade.

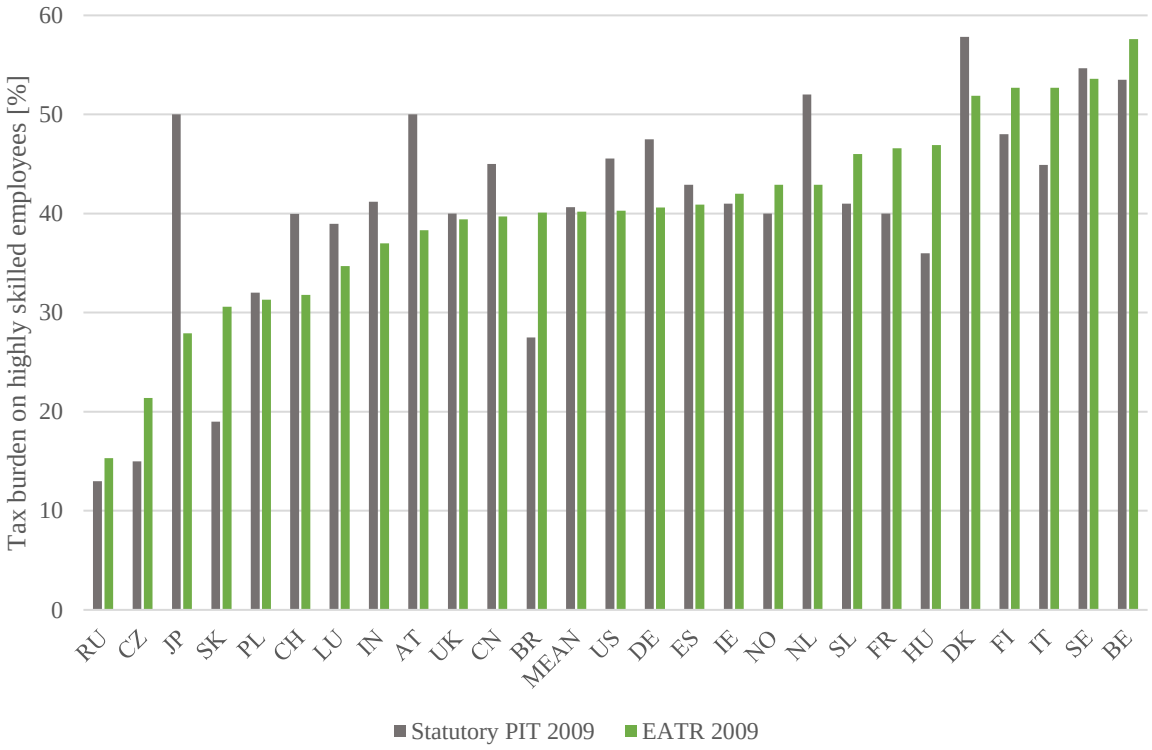
In contrast to corporate taxation, most of the countries considered rely on a progressive tax schedule for labour income. Within our observation period, only a few countries, i.e., the Czech Republic, Hungary, Slovakia and Russia, use a flat statutory tax rate – at least temporarily. In this case, the tax burden is mainly driven by the statutory tax rate of the respective country. In contrast, if a country applies a progressive tax schedule, the tax burden depends not only on the statutory tax rate but also on the size and distribution of the income brackets. Within the group of countries levying progressive tax rates on labour income, a stepped progression tariff is used, except for Germany applying a linear progression schedule. Both progression types have an income-dependent increase in the average tax rate. However, while the linear progression increases steadily, the increase in the stepped progression has a ripple effect depending on the size of income brackets. The number of income brackets with a flat marginal tax rate is at least two (e.g., CZ, DK, IE, PL, SK) and can be subdivided indefinitely (e.g., LU with up to 23 brackets). With an increasing number of income brackets, it approaches the linear progression. Figures 3 and 4 display the evolution of the top personal statutory income tax rates, including local surcharges over the last decade (see Table 5 in the appendix).[49]

[47] Further, we do not adjust our assumed disposable income to inflation. If we converted with purchasing-power parities, to remain consistent, we would also have to convert the disposable income within the euro region. In any case, the effect of inflation adjustments on the country rankings are moderate.

[48] See de la Feria/Maffini (2021), p. 165.

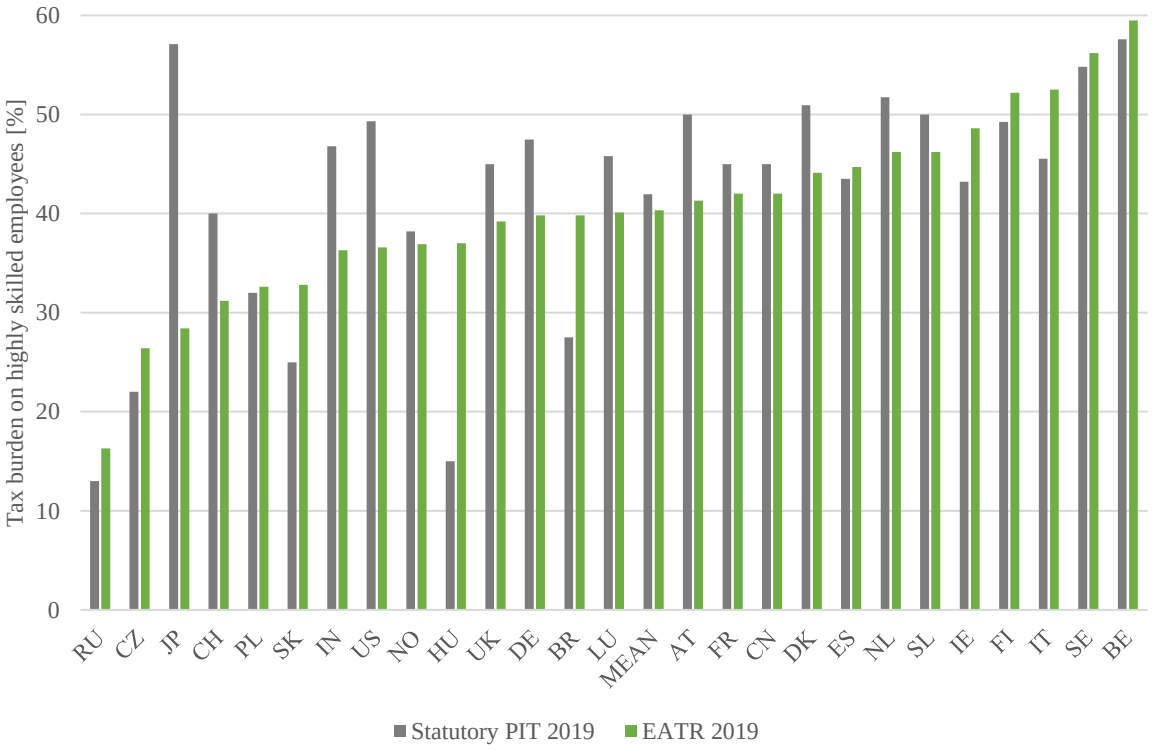
[49] Several countries levy taxes also at the regional level (i.e., BE, CH DK, FI, IT, JP, NO, SE, and the US), whereas a general surcharge is levied in seven countries (i.e., BE, CZ, DE, IE, LU, IN and JP). For more details on the respective income brackets, see Table 5 in appendix.

Figure 3: Statutory tax rates and effective tax burdens on highly skilled labour, 2009



Source: BAK Economics and ZEW (2020), own calculation for BR, IN, JP, RU for the year 2009.

Figure 4: Statutory tax rates and effective tax burdens on highly skilled labour, 2019



Source: BAK Economics and ZEW (2020).

In contrast to the declining trend in statutory corporate income tax rates, we observe a slight increase in the unweighted average top personal income tax rate from 40.6% (2009) to 42.1% (2019). In addition, the simultaneous increase in the standard deviation (11.5% in 2009 to 12.4% in 2019) shows a further divergence in statutory tax rates within our group of countries. In contrast, the overall spread of personal statutory income tax rates stagnated over the last decade resulting in a constant, substantial dispersion. In this regard, Russia levies the lowest personal income tax rate at 13% and Belgium and Denmark the highest at 58% in 2009 and 2019. Still, significant differences in the level and development of top personal income tax rates can be observed between individual countries and regions.

Employees in the EU face an average statutory tax rate of 43.3%, which is slightly higher than the overall average in our country comparison. This results in above-average wage costs for hiring a highly qualified employee in this region. In addition, this region follows the general trend of slightly increasing income tax rates (41.9% in 2009 vs. 43.3% in 2019), except for Denmark, Hungary and the Netherlands. Among these three countries, Hungarian employees experienced the most drastic personal income tax reform. In 2011, Hungary did not only reduce its top personal income tax rate by 20 percentage points but also abolished the progressive tax schedule. In doing so, Hungary followed the trend of other Eastern countries (i.e., CZ in 2008, SK in 2009).

In general, there are significant differences at the regional level within the EU. The Western Member States as well as the UK and Ireland, have comparatively high statutory top tax rates with an average of 48%. The Eastern Member States stand out in the comparison group with low to moderate top tax rates, ranging from below 25% in Hungary and the Czech Republic to 50% in Slovenia. In comparison, the four industrialised non-EU and the four transition economies show a stronger increase in personal income taxes. Although, this increase is strongly driven by increasing tax rates of individual countries, i.e., Japan (+7.1 pp), India (+5.2 pp) and the US (+3.7 pp). Whereas most of these countries face comparatively high tax rates of over 40%, Russia and Brazil have comparatively low statutory personal income tax rates.

In addition to the absolute level of the top statutory tax rates, however, the absence or length of the progression is also decisive for the effective tax burden. Within the countries considered, Austria, Germany, Switzerland and the US stand out in particular, as the top personal income tax rate takes effect relatively late (e.g., DE: EUR 250’000, JP: EUR 271’089, CH: EUR 512’211, the US: EUR 608’259 and AT: EUR 1’000’000). In Austria, Switzerland and the US in particular, the top marginal tax rate is more comparable to a wealth surcharge, as it only takes effect at a very late stage.

Effective average tax rates

In the second set of estimations, we present the EATRs for an employee, who is unmarried without children and demands a disposable income of EUR 100'000 after taxes and charges (see Table 6 in the appendix). In contrast to the evolution of the average statutory top personal income tax rate, we do not observe an overall increase in the average effective tax burden over the last decade (40.2% in 2009 vs. 40.3% in 2019). Still, our results show a wide dispersion of effective tax levels on highly skilled employees across countries, with a total spread of more than 40 percentage points in both periods. In 2009, the EATRs range from 15.3% in Russia to 57.6% in Belgium, while in 2019, the lowest EATR in Russia slightly increased to 16.3%, whereas the highest EATR decreased to 59.5% for Belgium. To better illustrate these differences, we translate the EATRs back into total remuneration costs an employer faces in each location.[50] Thus in 2019, employers incurred expenses of EUR 119'474 in Russia to compensate their highly skilled employees for a disposable income of EUR 100'000 after taxes. In contrast, Belgium employers had to pay with EUR 246'914, more than twice the amount, to grant the same disposable income.

Among the countries considered, the EU Member States show, on average, an above-average level of the effective tax burden as well as an increase in the unweighted average EATR of 42.8% in 2009 to 43.4% in 2019. This higher level of effective tax burdens is driven by the Continental EU Member States, including Ireland and the UK, as their average tax burden is with 45.7% in 2009 and 46.6% in 2019 significantly higher than the overall average. Except for Germany and the UK, all Northern and Continental European countries, including Ireland, show effective tax rates above the unweighted average of 40.3% in 2019. With a tax burden of less than 40%, the two largest EU economies in terms of GDP, i.e., Germany and the UK, are in good company with other major industrialised non-EU countries, such as the US, and can also compete with emerging economies like India and Brazil. Whereas other large EU countries like Italy and France, even catching up since its major pension system reform in 2019[51] (-4.6 pp), lag behind. Luxembourg had a rather moderate effective tax burden of labour at 34.7% in 2009 but approached the overall average EATR with 40.1% in 2019. With Ireland, another rather small EU economy showed one of the most significant increases in the effective tax burden (+6.6 pp) over the last ten years, which is due to several cuts in personal tax credits, allowances as well as the abolition of the employee's income ceiling to global social insurance.

Not surprisingly, we find that the Scandinavian countries levied relatively high tax levels – topped, however, by Belgium. Already in 2009, Belgium, Denmark, Finland, Italy and Sweden raised the highest

[50] To obtain the total amount of remuneration, transformation of equation (3) gives us the following formula: $E^* = E/(1 - EATR)$, with the disposable income $E = 100'000$.

[51] The reform of the occupational pension system (integration of the two previously existing constructs into one system, which is shown to be advantageous in the modelling, especially for high incomes) results in a significant reduction of the effective burden which is accompanied by a slight reduction of the effective tax burden due to adjustments of the progression schedule of the personal income tax. For more information on the French pension tax reform in 2019, see https://www.cleiss.fr/docs/regimes/regime_france/an_3.html.

EATRs among the EU Member States considered with more than 50%, and are still the top high-tax countries in 2019, except for Denmark. Among these high-tax countries, a relatively strong EATR decrease of 7.8 percentage points to 44.1% can be observed in Denmark in 2019 due to several reductions in the top statutory tax rate as well as adjustments in the progression schedule and personal allowances.

In comparison, Eastern European countries face significantly lower effective tax burdens than their Western counterparts, averaging 11 percentage points. Slovenia is the only Eastern European country with a tax burden of over 40% and is, therefore, surrounded by high-tax countries. Further, this region showed an opposite trend with even a slight reduction over the last decade, at 35.2% in 2009 and 35% in 2019. However, this decrease is driven by the big tax reform in Hungary in 2011, which led to a decline of the Hungarian EATR by 9.9 percentage points. The Hungarian reduction in EATR overcompensated the observed increases in EATRs in the other Eastern Member States, e.g., the introduction of a solidarity surcharge in the Czech Republic in 2013 (+5 pp). Especially, the countervailing reforms in the Czech Republic and Hungary, which had the lowest and highest tax burdens in the Eastern countries considered in 2009, have led to a significant convergence of the effective tax burden in this region.

In 2019, the four industrialised non-EU countries, i.e., Japan, Norway, Switzerland and the US, levied low to moderate effective tax burdens on labour, ranging from 28.4% in Japan to 36.9% in NO. Thus, these countries showed, on average, a significantly lower level and slightly decreasing EATRs compared to the EU counterparts during the last decade: The average EATR decreased from 35.7% in 2009 to 33.3% in 2019. While we observe a slight EATR reduction in Switzerland, Japan faced a minor increase. The most interesting developments in this group of countries can be observed in Norway and the US, with rather large declines of 6 and 3.7 percentage points over the last decade. In both countries, the reduction is attributable to extensive reforms in 2018 and 2019, which not only adjusted income tax rates and brackets but also significantly increased various personal allowances and deductions for income-related expenses. In line with the other non-EU countries, the four key transition economies raised a moderate effective labour tax burden between 2009 and 2019, with a relatively constant average tax burden of around 33%. However, the range among these countries is much broader, from 16.3% in Russia to 42% in China in 2019.

The main tax drivers of the effective tax burden are, on the one hand, the statutory personal income tax rate, including its progressive evolution, and, on the other hand, social security rates (if classified as charges)[52] in combination with income ceilings. Still, the composition of the effective tax rate, i.e., the split between taxes and contributions of the total effective average tax rate, varies across countries. In some countries, e.g., in Hungary, contributions to social security outweigh the personal income tax. In other countries, e.g., in Belgium, the personal income tax accounts for by far the largest share of the

[52] We explicitly treat the contributions to unemployment insurance and accident insurance as charges.

total effective average tax rate. The personal income tax base, i.e., personal allowances, earned income allowances, deductibility of social security contributions, and taxation of old-age benefits, are typical of secondary importance at these high-income levels.

The absolute minimum and maximum of the effective average tax burden, i.e., Russia and Belgium, reflect the extremes of the distribution based on the statutory top tax rate and show, therefore, the significant influence of the statutory tax rate on the effective average tax burden. Russia applies a flat income tax of only 13% with ceilings on old-age as well as unemployment social security contributions, whereas Belgian employees already face a top rate of 57.6% on income above EUR 40'480 without ceilings in social security. The EATR's sensitivity to the development of the income tax rates is also reflected in Spain. Initially, we observe a continuous increase in the Spanish effective tax burden up to 47.5% in 2013, after which the EATR levelled off at a constant level of around 44%. The basis for this decline (-3.5 pp) was a comprehensive reform of personal income taxation in 2011.[53] Since then, regions can independently choose on additional tax brackets and rates. As we focus in our analysis on the capital Madrid, which is referred to as a Spanish tax haven for personal income taxation, we capture the significant reduction of Madrid's regional top marginal tax rate.

Besides the top personal income tax, the progressive schedule is decisive for the effective average tax burden. Among other countries in our sample, Japan applies a long progression, which results in a lower effective tax burden. An applicable stepped progression further enhances this effect. For this reason, we observe the most substantial divergence between the statutory tax rate and the EATR in Japan. In our baseline scenario with a disposable income of EUR 100'000, the Japanese employee earns a taxable income of EUR 66'136, subject to a maximum tax rate of 35.1% on the excess of EUR 47'102.[54] Similarly, the long, stepped progression drives the divergence in Luxembourg, Germany, Switzerland, the UK and the US.

The second main driver of the effective average tax burden is the social security system. In particular, the existence of income ceilings above which no further contributions are payable or their absence. If there are comparably low ceilings, only smaller fractions of the income are subject to social security contributions, reducing the implicit tax burden. Although most countries have a rule to limit social security contributions, the approaches are quite heterogeneous. Not only do the contribution limits differ in their absolute amount, but they can also be restricted to the employee or employer as well as to different types of social insurance. We only observe income ceilings for all branches of social security for both the employee and the employer in Austria, China, the Czech Republic, Germany, India,

[53] Since 2011 personal income tax rates are not only set at the federal level but also on a regional level. In detail, regions are allowed to introduce new tax brackets on top of those implemented by the federal level. For more institutional details on this reform, see Agrawal/Foremny (2019).

[54] The Japanese employee faces a gross income of around EUR 111'113 which is for tax purposes further decreased by existing personal allowances as well as allowances on earned income. For a taxable income above EUR 47'102 (JPY 6'950'000) and below Japanese employees face a tax rate of 35.1% (=23%+2.1%+10%), which combines the personal income tax, reconstruction income tax and the residence tax.

Luxembourg, the Netherlands, Slovakia, Spain, the UK and the USA. A particular low ceiling of less than EUR 3'500 exists in India, which drives the divergence of the EATR from the statutory tax rate. Further, we observe comparably low absolute amounts of social security contributions in Denmark, which positively impact the tax burden.

Another example that shows the importance of income thresholds on the effective average tax burden is the abolition of the proportional tax and the simultaneous increase of the top tax rates in the Czech Republic and Slovakia in 2013. The Czech Republic introduced a solidarity surcharge of 7% on top income earners (income above EUR 59'068), whereas Slovakia introduced a progressive tax system for individuals, increasing the top rate from 19% to 25% for taxable income above EUR 37'163. In both countries, the impact of the decreasing importance of social security contributions due to their ceilings outweighs the increase in personal income taxes. These developments show the importance of ceilings on social security contributions, especially for high-income earners. By contrast, the absence of a social security contribution ceiling in Hungary drives the stronger increase in the EATR compared to Russia. This effect is enhanced by higher combined contribution rates (e.g., more than 40% in HU vs. around 30% in RU[55]). Besides Belgium, Finland, Hungary, Ireland, Norway and Slovenia do not apply any social security contribution ceiling. Thus the overall contribution rate is payable on all income.

In contrast to our results on corporate investment, we observe an increase in the top statutory tax rates for high-income earners, which in some countries resembles the intention of a wealth surcharges on the superrich, whereas the average effective tax burden on labour for a disposable income of EUR 100'000 remained relatively constant over the last decade.

3.3. Synthesis of effective average tax burdens of both indicators

To analyse the overall attractiveness of countries for investments from a tax perspective, we combine our indicators for the effective average tax burden of companies and highly qualified employees. Figures 5 and 6 graphically illustrate the EATR at the corporate level together with the EATR of a single highly skilled employee with a disposable income of EUR 100'000 for the years 2009 and 2019. The x-axis reflects the effective average tax burden of a corporation, whereas the y-axis displays the effective average tax burden of highly qualified employees. In both cases, the (unweighted) average is represented by the grey line. Since the underlying methodologies to calculate the respective EATR slightly differ, we focus on the ranking and relative differences of both indicators for the respective countries in the following analysis.

[55] RU applies an income ceiling to the old age insurance (EUR 16'313) and the unemployment insurance (EUR 12'270). Contributions to the health insurance as well as occupational accident insurance are not capped. In our model, especially contribution to the unemployment insurance represent charges in contrast to the health insurance, thus resulting in a higher increase in the effective tax burden. Further, in RU only the employer faces contributions to the social security system.

Figure 5: Correlation of tax burdens on corporations and highly skilled employees, 2009

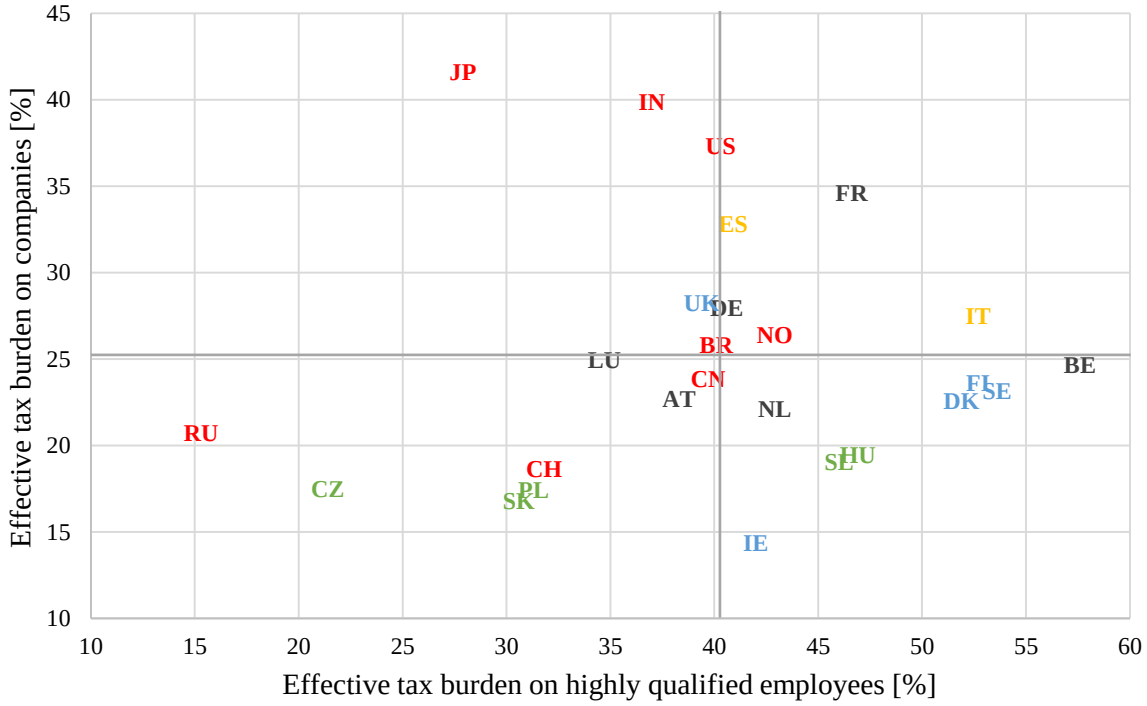
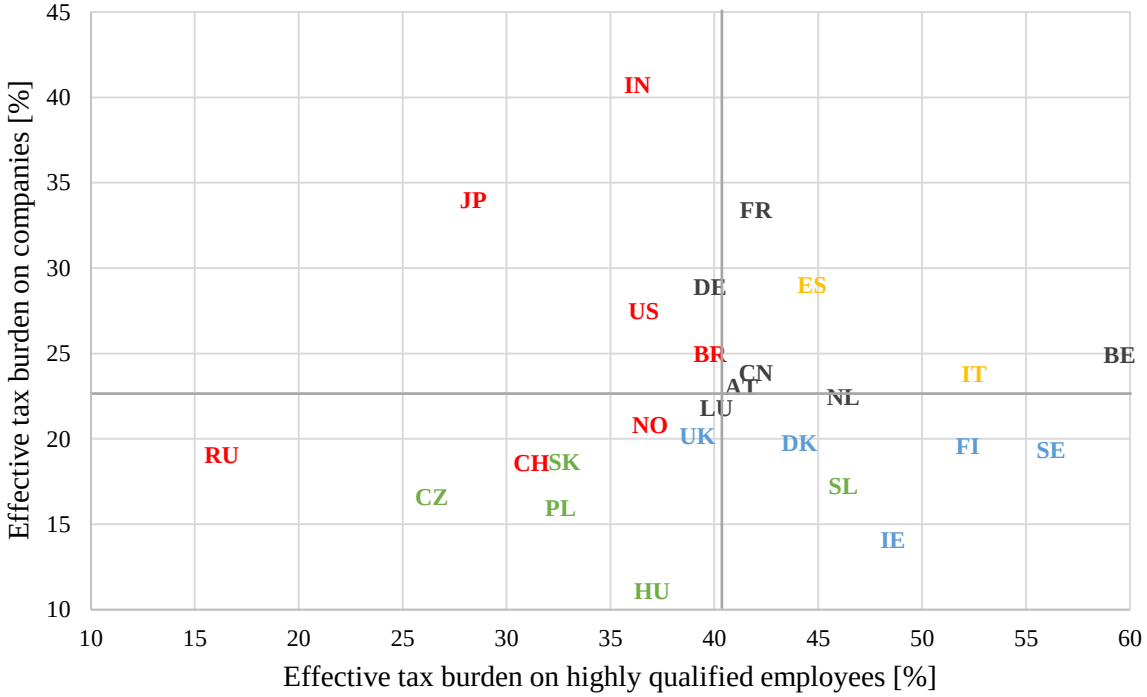


Figure 6: Correlation of tax burdens on corporations and highly skilled employees, 2019



At first glance, the significant reduction in the average EATR of corporations already discussed above is striking (2009: 25.2%; 2019: 22.7%), whereas the average EATR on employees stays almost constant over the observation period (2009: 40.2%; 2019: 40.3%). Furthermore, the synthesis brings forward that the effective tax burden levied on highly skilled labour may differ substantially from the effective tax burden imposed on companies. Comparing the two Figures in this regard shows that the overall picture for 2009 and 2019 is similar. However, some countries significantly moved their position – horizontally and/or vertically – resulting in a change in their location attractiveness for corporate investments and/or employing highly skilled employees. Hence, the synthesis leads us to the following conclusions for the countries under consideration:

Central and Western EU Member States are characterised by moderate to high tax burdens on labour, with a trend towards above-average effective tax burdens in 2019. This development is accentuated as the average EATR on labour was nearly constant over the last decade for the countries analysed. Thus, in an international comparison, Central and Western EU countries lose ground in the tax competition on highly skilled labour. Among these countries, only Germany and France reduced their effective tax burden on highly skilled employees, while all other countries in this cluster increased. Throughout the observation period, Belgium offers the least attractive conditions for investments in highly qualified employees. With an effective average tax burden of close to 60%, Belgium lies nearly 20 percentage points above the overall average. For companies, on the other hand, the picture is more differentiated, but one that is typical of corporate tax competition. Large economies such as France and Germany impose high EATRs on corporations, while taxpayers in the smaller countries like Austria, Luxembourg or the Netherlands face rather average corporate tax burdens. As of 2019, only Luxembourg provides a below-average effective corporate tax burden compared to the countries analysed. Since the corporate EATRs remained nearly constant in the majority of these countries over the last decade, Central and Western EU countries also became less attractive for corporate investments from a tax perspective. In addition, the location attractiveness of these Member States and, especially for Germany and France, depends on the point of view: Germany and France, which are high-tax countries concerning company taxation, indicated moderate tax levels with regard to the taxation of highly skilled labour. Taken together, countries of this cluster levy moderate to high effective average tax rates on companies as well as on highly qualified employees.[56]

Within the Northern EU countries, including Ireland and the UK, Scandinavian companies already faced a below-average effective corporate tax burden and Ireland offered the most attractive investment conditions at the beginning of the observation period. In contrast, the UK imposed one of the highest effective tax burdens within the EU in 2009. Due to significant tax reductions for companies in the Scandinavian countries, i.e., Denmark, Finland and Sweden, as well as the UK, all countries of this

[56] With regard to corporate EATRs, moderate tax burdens are imposed by AT, LU and NL, whereas BE, DE and FR levy high corporate tax burdens. Concerning highly skilled employees, AT, LU, FR and DE tax them at a moderate level, while the tax burden in BE and NL is high compared to the overall sample.

cluster levy below-average EATRs on corporate investments in 2019. Concerning highly qualified employees, the evolution is more dispersed. Whereas Sweden and Ireland increased the effective tax burden on labour significantly, the UK further improved its competitiveness for highly skilled employees by offering minor reductions in the EATR. Denmark occupies a special position in this country cluster, as it drastically reduced its effective tax burden on highly qualified employees. Overall, this country cluster is characterised by below-average taxation of capital (companies) and a rather above-average taxation of labour (highly qualified employees). The most pronounced representative of this tax strategy is Ireland, which was the most attractive location from a corporate tax perspective while imposing moderate taxes on labour in 2009. Over the last decade, Ireland has maintained its attractiveness for corporate taxation but is now one of the five EU countries with the highest tax burden on highly skilled employees.

In our study, Southern EU Member States are represented by the two largest economies in this region, i.e., Italy and Spain. Both countries significantly reduced their effective average corporate tax burden over the last decade. While Italy remained nearly constant on the effective tax burden on labour, Spain compensated part of the decrease on capital taxation with increasing taxes on the more immobile factor labour. Nevertheless, throughout the observation period, both countries provide above-average effective tax rates on capital as well as on labour.

The group of Eastern EU Member States shows an ambivalent development in the last decade. In an international comparison, the considered Eastern EU countries remain the most fiscally competitive, at least when looking at corporate taxation. Except for Slovakia, all countries in this group show at least a slightly declining effective average corporate tax burden. Hungary, however, is an exception, having almost halved its effective corporate tax burden to just over 10%. In contrast to their reputation as low-tax countries for corporate taxation, there is no clear trend among Eastern EU countries in the taxation of highly skilled employees. The declining corporate tax burden contrasts with a slight increase in effective labour taxation in the majority of the Eastern EU countries. Hungary also stands out here because it has significantly reduced its effective average tax burden on highly skilled labour, unlike all other countries in this cluster. Hungary has thus developed from a location with a rather moderate tax burden to a low-tax country for both indicators. Except Slovenia providing above-average taxation on labour, all other countries in this cluster are characterised by below-average taxation on capital as well as on labour.

Among the non-EU countries, a distinction must be made between several country clusters. Brazil, China and Norway tax corporations and highly skilled labour on a moderate level close to the average effective tax burden of the comparison countries. In contrast, Russia and Switzerland follow a clear low-tax strategy for corporate as well as labour taxes. Finally, India, Japan and the US differ remarkably from all other countries analysed. In 2009, the tax burden on companies was among the highest of all countries considered. Japan and the US significantly reduced the EATR on corporate taxpayers during

the observation period but are still among the high-tax countries in 2019. In contrast, highly qualified labour is taxed quite moderately or even at a comparably low level. Thus, their strategy consists of very moderate taxation of highly skilled employees combined with a (rather) substantial tax on corporate income. Especially the latter group, i.e., Japan and the US, drives the trend of convergence of effective corporate tax burdens towards the average tax burden in 2019. India did not have substantial changes in the last decade and thus, occupies the last position for corporate investments over the whole observation period. In contrast to all other non-European countries, China slightly increased its overall tax burden on highly skilled employees, whereas it remained nearly constant or even slightly decreased in other non-EU countries. Over the entire observation period, Russia holds the top position with the lowest tax burden for highly skilled employees.

Overall, based on the EATRs for the majority of the countries considered, a clear pattern can be identified in terms of the tax strategies chosen for corporate investment and labour in 2019. Thus, the countries analysed can either pursue a strategy in which both indicators are taxed at a high or low tax rate (relative to the average) or in which a mix of these two strategies is chosen.

First, it is noticeable that the considered Eastern EU Member States – except for Slovenia – as well as Russia and Switzerland follow a classic low-tax strategy for both indicators. By contrast, representatives of the second strategy – namely Belgium, France, Italy and Spain – impose above-average effective tax burdens on corporations and highly skilled labour. Therefore, these countries offer the least attractive conditions from a tax perspective for corporate investments and employing highly skilled employees, whereas countries belonging to the first group are the most attractive.

Besides these two strategies, we can clearly distinguish between two (regional) groups that pursue a mixture of both strategies by taxing one indicator above average and the other below average. The considered Northern EU Member States, as well as Ireland and Slovenia, are characterized by a below-average effective average tax burden on mobile capital income, whereas the less mobile factor labour, in our analysis highly qualified employees, face above-average EATRs. In the fourth strategy, the tax burden on both indicators is reversed: India, Japan and the US tax corporations above and highly-skilled employees below average. Thus, these countries offer attractive investment conditions for one indicator but are less attractive for the other.

Finally, over the last decade, we can perceive serval changes in countries' location attractiveness, which led in parts to a reallocation of countries between the four groups mentioned above. The reasons for it are twofold: On the one hand, some countries actively influenced their position via tax reforms (e.g., DK, HU, US). On the other hand, due to the tax competition of several considered countries, passive states that lack major tax reforms lost ground and got, in general, less attractive for investments in capital and labour (e.g., BR, DE).

4. Future developments and challenges

Against the background of current political developments and progressing digitalisation, it is unclear whether the "race to the bottom" with regard to statutory corporate tax rates will continue in the future. Immediately after the end of our observation period, hence in the years 2020 and 2021, we can still observe some countries improving their location attractiveness for corporate investments by reducing their statutory corporate income tax rate. For example, Belgium decreased its statutory tax rate from 29% to 25% in 2020. France, a high-tax European country, also showed improvements in its location attractiveness by gradually reducing its statutory tax rate from 33.3% in 2019 to 27.5% in 2021. Due to these reforms and a lack of action in Germany, France eliminated the EATR difference of 4.5 percentage points in 2019 between these two countries and became equally attractive from a tax perspective. However, not only middle to high-tax countries showed positive developments in this regard but also Switzerland that follows a classic low-tax strategy, improved its position even further (EATR 2019: 18.6%; 2020:17.4%[57]).

Nevertheless, in the short run, the economic consequences of the Corona crisis that hit countries worldwide unexpectedly in 2020 might impact the further development of tax competition. In order to delay the spread of the virus, contact and exit restrictions have been issued, private and public events have been banned and business closings have been ordered (so-called lockdown). This led to both a drop in demand and supply, which were exacerbated by the disruption of international supply chains. As a result, corporations of several industries which were profitable before the crisis faced enormous revenue declines leading to a loss-making situation. Therefore, at least in the short run, the tax policy focus has changed. As a primary goal, governments worldwide have utilised tax policy instruments to ensure a firms' liquidity and enhance its cash flow. In the mid-term, measures like accelerated or enhanced depreciation schemes will be (temporarily) implemented aiming at the economic recovery by boosting corporate investments and consumption. It is evidently clear that tax, as well as non-tax measures, increased government spending drastically. Hence, in the long run, these additional expenditures have to be financed by fiscal consolidation measures. Therefore, as the crisis hit all economies worldwide, it seems less likely that the race to the bottom concerning statutory tax rates will continue in the near future. In contrast, we may even observe increases in statutory tax rates like already passed by the UK (increase in statutory tax rate from 19% to 23% until 2023). However, the current location attractiveness of a country might impact the discussion on whether to increase the tax burden on corporate investments. Finally, in a downturn of the economy, lowering statutory tax rates can counteract the introduced tax measures since it will decrease the tax shield of enhanced depreciation regimes and losses that can be offset against future profits.

[57] Simultaneously, CH abolished the preferential tax treatment for holding companies that were not or only to a minor extent liable to profit tax at the cantonal level. Due to the model assumptions, this is not included in our calculations. For further detailed information see Federal Department of Finance (Schweizerische Eidgenossenschaft) (2021).

Another current political development might curb the trends in tax competition on corporate investments that we have observed over the last decades, namely, a global minimum tax. As of 9 July 2021, over 130 member countries of the OECD/G20 Inclusive Framework on BEPS have agreed on a two-pillar solution to address the tax challenges arising from the digitalisation of the economy.[58] The second pillar constitutes the global minimum tax. Although several details on the exact design of the regulations are still unclear, the agreement includes the minimum tax level, with a rate of at least 15%. This minimum level sets the benchmark against which the effective corporate tax payable in a country is assessed, whereby the current blueprint focuses on a country-by-country analysis for multinational enterprises.[59] The major argument on its introduction is based on the strong dispersion of effective corporate tax rates across countries (see section 3.1.2) and empirical findings (see section 2.1), demonstrating that firms do not necessarily choose investment locations according to productivity but according to tax differentials. As a sufficiently large number of countries has agreed to levy minimum taxes, low tax countries could be inclined to increase their national corporate tax rate up to the minimum tax rate in the future as this would not increase the firms' tax burden (since these corporations would pay the minimum tax rate anyway). A minimum tax reduces these tax differentials and, thus, lowers the distortion-induced efficiency losses, i.e., it sets a floor for tax competition clearly above 0%.

With regard to our estimates of the EATR, two of the countries considered are significantly below the 15% threshold (HU: 11.1%, IE: 14.1%), assuming that the corresponding tax base of the minimum tax would be in line with our model assumptions. Thus, for MNEs operating from or making payments to these countries, cross-border activities would increase the effective tax burden up to the determined minimum tax level. However, we have to treat these observations as a rough approximation as the impact of the minimum tax depends on several conditions: First, the final scope of the minimum tax, second, the exact design of the tax base, and third, the specific investment mix of an MNE, as this can significantly affect the effective tax burden.[60]

In addition, the tremendous pace of new digital innovation and digital transformation raises the relevance of an attractive tax environment for highly skilled labour. With an increasing international demand for highly qualified workers due to growing investments in digitalisation[61] and a limited labour supply, MNEs face an intensifying international competition. As a result, it is even more difficult to pass on the tax burden to employees and thus increases the employer's non-wage labour costs. A (comparatively) high taxation of labour income can therefore not only lead to new jobs tending to be created in low-tax countries but also to the relocation of existing jobs abroad.[62] The increasing digitalisation of business models and working conditions, i.e. remote working, amplifies this trend of

[58] See OECD (2021).
[59] For the details of the OECD blueprint, see OECD (2020).
[60] For an overview on the effective tax burden on investments in digital business models, see Spengel et al. (2018).
[61] See Balsmeier/Woerter (2019), p. 103765-1.
[62] See Niemann/Schreiber (2020), p. 10.

international flexibility of highly skilled labour demand. In particular, services that can also be provided digitally (e.g., IT services) require fewer locally bound employees. Current analyses show that especially highly skilled employees benefit from this trend as remote working opportunities are increasingly found in this group. In addition, employees with remote-working jobs seem to receive higher remunerations.[63] Hence, a cross-country relocation of highly skilled employees could – from a country perspective – not only pose risk on revenues from the personal income taxation and the social security system, but also negatively affect spillover effects associated with these earners such as higher propensity to consume or the transfer of knowledge.[64] Hence, from this perspective, a reduction in the tax wedges, which are comparatively high in most countries analysed and particularly among Central and Western EU countries, is required to remain or improve the location attractiveness for investments in the knowledge-based, digital economy. As empirical evidence indicates, providing tax incentives for labour is a promising tax instrument, especially for small economies, as the elasticities of worker mobility are particularly high for them. Therefore, they gain most from the introduction of preferential tax schemes for foreigners. However, introducing such incentives are prone to generate tax competition across EU countries.[65]

Against the backdrop of increasing restrictions on corporate tax planning as well as the relevance of labour in digitalisation processes, countries might explore new paths to keep or improve their location attractiveness for corporate and labour investments. For example, to avoid an increasing corporate tax burden for domestic MNEs because of the minimum tax, countries could classify existing non-profit taxes as a kind of profit tax to be taken into account when determining the effective tax burden of an MNE within one country. As a different alternative, they could reduce other business charges of MNEs, such as non-wage labour costs, to improve their location attractiveness. In the context of our results, we found a large spread in the effective labour tax burden on the countries concerned (RU: 16.3%; SE: 56.2%) and thus a varying scope for reductions in non-wage tax costs faced by the employer. While the Eastern EU Member states (except Slovenia), Russia and Switzerland pursue a low-tax strategy for employees, the leeway is most limited in Russia and Hungary due to the already implemented flat tax and comparatively low statutory tax rates of 13% and 15%, respectively. In the other countries affected, and in particular, among the Scandinavian countries, being characterized by relatively high EATRs, the burden could be reduced by either increasing the progression schedule at which the proportional (top) tax rates take effect, as well as by introducing or extending existing tax incentives for highly qualified employees. Such – temporarily restricted – preferential tax regimes for highly skilled foreigners in the form of partial tax holidays on labour income or by a favourable flat tax rate are well-established tax instruments (e.g., NL: 1985, DK: 1991, FI: 1999, SE: 2001, FR: 2004, ES: 2005, IT: 2011) among European countries, especially in the Member States with an above-average tax burden to mitigate the

[63] See Dingel/Neimann (2020), p. 104235-2.
[64] See de la Feria/Maffini (2021), p. 164.
[65] See Kleven et al. (2014), pp. 336, 376.

negative impact of high taxes on the recruitment of internationally mobile foreigners, especially experts and managers.

5. Conclusion

Globalisation has led to a reduction in trade barriers and transportation costs, which has increased capital mobility and the transmission of ideas and meanings through labour mobility. Thus, governments compete on establishing an attractive environment for investments of multinational corporations to strengthen their competitiveness and comparative advantages at the international level. The fast digital transformation process of companies, including a change in employees' working environment, exacerbates the competition among states. To decide on the best location for corporate investments and employing highly skilled employees, multinational firms include tax as well as-non tax factors in their decision-making. According to previous literature, it is well-known that governments lowered especially corporate tax rates over the last decades to attract corporate investments. However, since there is a shift from routine to non-routine tasks in the course of digitalisation, providing an attractive tax environment for highly skilled employees will become increasingly important. Consequently, this study does not only focus on the trends in effective tax burdens of corporations but enriches the analysis by elaborating on a countries' tax environment for highly skilled employees. The synthesis of both indicators provides valuable insights regarding the tax strategy of a country and allows us to draw conclusions on the scope for future tax competitions, including an analysis of ongoing political developments.

Analysing the development of tax burdens on corporations and highly skilled employees for 26 countries from 2009 to 2019, we find that the declining trend in statutory as well as effective corporate tax burdens continues. However, compared to previous works studying a longer time horizon, it turns out that the downward trend of the effective average tax burden on corporations slowed down over the last decade. The results regarding the trends in taxation of highly skilled employees differ significantly compared to the developments on effective corporate tax burdens. While we observe increases in the top statutory tax rates for high-income earners, which in some countries resembles the intention of a wealth surcharge on the superrich, the average effective tax burden on labour for a disposable income of EUR 100'000 remained relatively constant.

The synthesis of both indicators offers additional insights: Eastern EU Member States – except for Slovenia – as well as Russia and Switzerland, impose below-average effective tax burdens on corporations and highly skilled labour. Hence, these countries follow a clear low-tax strategy offering the most attractive investment conditions from a tax perspective. By contrast, Belgium, France, Italy and Spain can be classified as high-tax countries compared to the sample average, indicating they are least attractive in this context. In addition, several considered countries pursue a mixture of both strategies. Northern EU Member States, as well as Ireland and Slovenia, are characterized by a below-average effective average tax burden on corporations, whereas the less mobile factor labour faces above-

average EATRs. The reversed situation can be observed in India, Japan and the US that tax corporations above and highly-skilled employees below average. Thus, these countries offer attractive investment conditions for one indicator but are less attractive for the other. Overall, we perceive several changes in countries' location attractiveness between 2009 and 2019, leading in parts also to changes in the above-mentioned tax strategies. The reasons for it are twofold: On the one hand, some countries passed tax reforms with significant changes, especially regarding the tax rate, like Denmark, Hungary and the US. On the other hand, due to the tax competition of several considered countries, passive states, like Brazil or Germany, that lack major tax reforms lost ground and got, in general, less attractive for investments in capital and labour.

In the short run, the corona crisis will affect the future development of corporate tax competition. Necessary measures to delay the spread of the virus have led to a supply and demand shock and a drastic decline in corporate revenues. To counteract the economic consequences of the crisis, governments worldwide have imposed (temporary) tax measures such as extended loss-reliefs, enhanced depreciation regulations, etc., to support the recovery process of corporations. However, the additional government spending has to be financed by fiscal consolidation measures. Therefore, as the crisis hits all economies worldwide, it seems less likely that the race to the bottom concerning statutory tax rates will continue in the near future – we might even observe the opposite. Furthermore, the agreement of over 130 OECD countries on a minimum tax for large corporations might significantly impact corporate tax competition in the long run and can set a new lower bound in the "race to the bottom" regarding corporate tax rates. In addition, the decision on a corporate minimum tax and the fast-approaching digitalisation of firms might shift the focus of tax competition from corporate tax burdens to effective tax levels on highly skilled employees.

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7. Appendix

7.1. Results

Table 3: Company taxation: Statutory tax rates and effective average tax rates at the corporate level, 2009 and 2019

Corporation	(1) Statutory tax rates (%)		(3) Combined profit tax rates (%)		(5) Domestic EATR (%)	
	2009	2019	2009	2019	2009	2019
EU member states						
Austria	25.0	25.0	25.0	25.0	22.7	23.1
Belgium	33.0	29.0	34.0	29.6	24.7	25.0
Czech Republic	20.0	19.0	20.0	19.0	17.5	16.7
Denmark	25.0	22.0	25.0	22.0	22.6	19.8
Finland	26.0	20.0	26.0	20.0	23.6	19.6
France	33.3	33.3	34.4	35.4	34.7	33.5
Germany	15.0	15.0	30.9	31.6	28.0	28.9
Hungary	16.0	9.0	21.4	11.1	19.5	11.1
Ireland	12.5	12.5	12.5	12.5	14.4	14.1
Italy	27.5	24.0	31.3	27.7	27.5	23.8
Luxembourg	21.0	17.0	28.6	24.9	25.0	21.8
Netherlands	25.5	25.0	25.5	25.0	22.2	22.5
Poland	19.0	19.0	19.0	19.0	17.5	16.0
Slovakia	19.0	21.0	19.0	21.0	16.8	18.7
Slovenia	21.0	19.0	21.0	19.0	19.1	17.3
Spain	30.0	25.0	35.7	30.6	32.8	29.0
Sweden	26.3	21.4	25.7	21.4	23.2	19.4
United Kingdom	28.0	19.0	28.0	19.0	28.3	20.2
Third countries						
Japan	30.0	23.2	40.7	31.3	41.7	34.1
Norway	28.0	22.0	28.0	22.0	26.5	20.8
Switzerland	21.2	21.1	21.2	21.1	18.7	18.6
United States	35.0	21.0	38.8	28.0	37.4	27.5
Brazil	24.0	24.0	34.0	34.0	25.9	25.0
China	25.0	25.0	25.0	25.0	23.9	23.9
India	30.0	30.0	45.2	46.3	39.9	40.8
Russia	20.0	20.0	20.0	20.0	20.7	19.1
Mean overall	24.5	21.6	27.5	24.7	25.2	22.7
Standard deviation	5.7	5.0	7.5	7.3	7.0	6.5
Mean EU member states	23.5	20.8	25.7	23.0	23.3	21.1
Standard deviation	5.8	5.6	6.0	6.2	5.3	5.4
Mean Third countries	26.7	23.3	31.6	28.5	29.3	26.2
Standard deviation	4.7	3.0	8.8	8.2	8.4	7.2

Table 4: Effective average tax rates on corporate investment, 2009-2019

		2009	2011	2013	2015	2017	2019	Mean	Min	Max	Δ Max-Min	Δ 2019-2009
AT	**Austria**											
EATR		22.7	23.0	23.0	23.0	23.1	23.1	23.0	22.7	23.1	0.4	0.4
Δ to previous year			0.3	0.0	0.0	0.1	0.0					
BE	**Belgium**											
EATR		24.7	25.9	26.5	27.8	29.3	25.0	26.5	24.7	29.3	4.6	0.3
Δ to previous year			1.2	0.7	1.3	1.5	-4.4					
CZ	**Czech Republic**											
EATR		17.5	16.7	16.7	16.7	16.7	16.7	16.8	16.7	17.5	0.9	-0.9
Δ to previous year			-0.9	0.0	0.0	0.0	0.0					
DK	**Denmark**											
EATR		22.6	22.6	22.0	21.3	20.1	19.8	21.4	19.8	22.6	2.8	-2.8
Δ to previous year			0.0	-0.7	-0.6	-1.3	-0.2					
FI	**Finland**											
EATR		23.6	24.7	22.7	18.9	19.5	19.6	21.5	18.9	24.7	5.7	-4.0
Δ to previous year			1.0	-2.0	-3.7	0.6	0.1					
FR	**France**											
EATR		34.7	32.8	34.7	38.3	33.4	33.5	34.6	32.8	38.3	5.5	-1.2
Δ to previous year			-1.8	1.8	3.6	-4.9	0.1					
DE	**Germany**											
EATR		28.0	28.2	28.2	28.2	28.8	28.9	28.4	28.0	28.9	0.9	0.9
Δ to previous year			0.2	0.0	0.0	0.6	0.1					
HU	**Hungary**											
EATR		19.5	19.3	19.3	19.3	11.1	11.1	16.6	11.1	19.5	8.4	-8.4
Δ to previous year			-0.2	0.0	0.0	-8.2	0.0					
IE	**Ireland**											
EATR		14.4	14.4	14.4	14.1	14.1	14.1	14.3	14.1	14.4	0.3	-0.3
Δ to previous year			0.0	0.0	-0.3	0.0	0.0					

		2009	2011	2013	2015	2017	2019	Mean	Min	Max	Δ Max-Min	Δ 2019-2009
IT	**Italy**											
EATR		27.5	24.9	25.1	23.8	23.7	23.8	24.8	23.7	27.5	3.8	-3.7
Δ to previous year			-2.6	0.2	-1.3	-0.1	0.2					
LU	**Luxembourg**											
EATR		25.0	25.0	25.5	25.5	23.7	21.8	24.4	21.8	25.5	3.7	-3.1
Δ to previous year			0.0	0.6	0.0	-1.8	-1.8					
NL	**Netherlands**											
EATR		22.2	21.8	21.7	22.5	22.5	22.5	22.2	21.7	22.5	0.9	0.3
Δ to previous year			-0.4	-0.1	0.9	0.0	0.0					
PL	**Poland**											
EATR		17.5	17.5	17.5	17.5	17.5	16.0	17.2	16.0	17.5	1.5	-1.5
Δ to previous year			0.0	0.0	0.0	0.0	-1.5					
SK	**Slovakia**											
EATR		16.8	16.8	20.3	19.6	18.7	18.7	18.5	16.8	20.3	3.4	1.9
Δ to previous year			0.0	3.4	-0.7	-0.9	0.0					
SI	**Slovenia**											
EATR		19.1	18.2	15.5	15.5	17.3	17.3	17.1	15.5	19.1	3.6	-1.8
Δ to previous year			-0.9	-2.7	0.0	1.8	0.0					
ES	**Spain**											
EATR		32.8	31.9	32.9	31.5	29.0	29.0	31.2	29.0	32.9	3.9	-3.8
Δ to previous year			-0.9	1.0	-1.4	-2.5	0.0					
SE	**Sweden**											
EATR		23.2	23.2	19.4	19.4	19.4	19.4	20.7	19.4	23.2	3.8	-3.8
Δ to previous year			0.0	-3.7	0.0	0.0	-0.1					
UK	**United Kingdom**											
EATR		28.3	26.9	24.3	21.5	20.5	20.2	23.6	20.2	28.3	8.1	-8.1
Δ to previous year			-1.5	-2.6	-2.8	-1.0	-0.3					

		2009	2011	2013	2015	2017	2019	Mean	Min	Max	Δ Max-Min	Δ 2019-2009
JP	**Japan**											
EATR		41.7	41.7	40.1	35.7	34.3	34.1	37.9	34.1	41.7	7.6	-7.6
Δ to previous year			0.0	-1.6	-4.4	-1.5	-0.2					
NO	**Norway**											
EATR		26.5	26.5	26.5	25.1	22.7	20.8	24.7	20.8	26.5	5.6	-5.6
Δ to previous year			0.0	0.0	-1.3	-2.4	-1.9					
CH	**Switzerland**											
EATR		18.7	18.7	18.6	18.6	18.6	18.6	18.6	18.6	18.7	0.0	0.0
Δ to previous year			0.0	0.0	0.0	0.0	0.0					
US	**USA**											
EATR		37.4	36.5	36.5	36.5	36.5	27.5	35.2	27.5	37.4	9.9	-9.9
Δ to previous year			-0.9	0.0	0.0	0.0	-9.0					
BR	**Brazil**											
EATR		25.9	26.1	27.2	26.7	24.5	25.0	25.9	24.5	27.2	2.7	-0.9
Δ to previous year			0.3	1.1	-0.5	-2.2	0.5					
CN	**China**											
EATR		23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	0.0	0.0
Δ to previous year			0.0	0.0	0.0	0.0	0.0					
IN	**India**											
EATR		39.9	38.4	39.9	40.5	40.5	40.8	40.0	38.4	40.8	2.4	0.9
Δ to previous year			-1.5	1.5	0.6	0.0	0.3					
RU	**Russia**											
EATR		20.7	20.9	19.1	19.1	19.1	19.1	19.7	19.1	20.9	1.8	-1.7
Δ to previous year			0.2	-1.8	0.0	0.0	0.0					

Note: Effective tax rates are calculated for a corporation of the manufacturing sector and under the assumption that the top corporate income tax rate is applicable. The table lists the effective tax rate for every second year and the delta to the previously reported effective tax burden.

Source: Spengel et al. (2021); own calculations for transition economies (2009-2019).

Table 5: Labour taxation: Statutory tax rates and effective average tax rates at the employee level, 2009 and 2019

Labour	(1)	(2)	(3)	(4)
	Statutory tax rates (%) [tax bracket, EUR]		EATR (%) [EUR 100'000]	
	2009	2019	2009	2019
EU member states				
Austria	50.0 [60'000]	55.0 [1'000'000]	38.3	41.3
Belgium	53.5 [34'330]	57.6 [40'480]	57.6	59.5
Czech	15.0 [1]	22.0 [49'315]	21.4	26.4
Denmark	57.8 [46'748]	50.9 [69'126]	51.9	44.1
Finland	48.0 [64'500]	49.3 [76'100]	52.7	52.2
France	40.0 [69'505]	45.0 [156'244]	46.6	42.0
Germany	47.5 [250'000]	47.5 [265'326]	40.6	39.8
Hungary	36.0 [6'732]	15.0 [1]	46.9	37.0
Ireland	41.0 [36'400]	43.2 [35'300]	42.0	48.6
Italy	44.9 [75'000]	45.5 [300'000]	52.7	52.2
Luxembourg	39.0 [39'885]	45.8 [200'004]	34.7	40.1
Netherlands	52.0 [54'776]	51.8 [68'507]	42.9	46.2
Poland	32.0 [19'505]	32.0 [19'505]	32.8	29.0
Slovakia	19.0 [1]	25.0 [36'256]	34.7	33.5
Slovenia	41.0 [14'821]	50.0 [70'907]	46.0	46.2
Spain	42.9 [53'407]	43.5 [60'000]	40.9	44.7
Sweden	54.7 [59'072]	54.8 [75'573]	53.6	56.2
UK	40.0 [54'839]	45.0 [219'941]	39.4	39.2
Third countries				
Japan	50.0 [121'990]	57.1 [271'089]	28.1	28.4
Norway	40.0 [89'710]	38.2 [120'781]	42.9	36.9
Switzerland	40.0 [486'016]	40.0 [515'211]	31.8	31.2
US	45.6 [1'061'571]	49.3 [608'259]	40.3	36.6
Brazil	27.5 [16'569]	27.5 [20'648]	39.9	39.8
China	45 [119'142]	45 [95'314]	39.7	42.0

Labour	(1)	(2)	(3)	(4)
	Statutory tax rates (%) [tax bracket, EUR]		EATR (%) [EUR 100'000]	
	2009	2019	2009	2019
India	41.2 [16'313]	46.4 [163'132]	35.7	36.3
Russia	13.0 [1]	13.0 [1]	15.3	16.3
Mean overall	40.6	42.1	40.2	40.3
Standard deviation	11.5	12.4	9.8	9.3
Mean EU member states	41.9	43.3	42.8	43.4
Standard deviation	11.4	12.0	9.1	8.3
Mean Third countries	37.8	39.6	34.4	33.4
Standard deviation	12.0	13.8	8.6	7.6

Table 6: Effective average tax rates on highly skilled labour, 2009-2019

		2009	2011	2013	2015	2017	2019	Mean	Min	Max	Δ Max-Min	Δ 2019-2009
AT	**Austria**											
EATR		38.3	38.4	40.2	40.3	41.2	41.3	40.0	38.3	41.3	3.0	3.0
Δ to previous year			0.1	1.8	0.1	0.9	0.1					
BE	**Belgium**											
EATR		57.6	57.8	56.6	60.7	60.5	59.5	58.8	56.6	60.7	4.1	1.9
Δ to previous year			0.2	-1.2	4.1	-0.2	-1.0					
CZ	**Czech Republic**											
EATR		21.4	24.9	25.6	25.6	25.8	26.4	25.0	21.4	26.4	5.0	5.0
Δ to previous year			3.5	0.7	0.0	0.2	0.6					
DK	**Denmark**											
EATR		51.9	50.9	47.3	46.9	45.8	44.1	47.8	44.1	51.9	7.8	-7.8
Δ to previous year			-1.0	-3.6	-0.4	-1.1	-1.7					
FI	**Finland**											
EATR		52.7	52.0	52.2	52.6	53.5	52.2	52.5	52.0	53.5	1.5	-0.5
Δ to previous year			-0.7	0.2	0.4	0.9	-1.3					
FR	**France**											
EATR		46.6	46.4	46.5	47.0	47.9	42.0	46.1	42.0	47.9	5.9	-4.6
Δ to previous year			-0.2	0.1	0.5	0.9	-5.9					
DE	**Germany**											
EATR		40.6	40.8	40.4	40.4	40.2	39.8	40.4	39.8	40.8	1.0	-0.8
Δ to previous year			0.2	-0.4	0.0	-0.2	-0.4					
HU	**Hungary**											
EATR		46.9	32.2	42.7	40.5	37.7	37.0	39.5	32.2	46.9	14.7	-9.9
Δ to previous year			-14.7	10.5	-2.2	-2.8	-0.7					
IE	**Ireland**											
EATR		42.0	48.6	49.4	49.0	46.6	48.6	47.4	42.0	49.4	7.4	6.6
Δ to previous year			6.6	0.8	-0.4	-2.4	2.0					

		2009	2011	2013	2015	2017	2019	Mean	Min	Max	Δ Max-Min	Δ 2019-2009
IT	**Italy**											
EATR		52.7	53.1	52.8	52.8	52.9	52.5	52.8	52.5	53.1	0.6	-0.2
Δ to previous year			0.4	-0.3	0.0	0.1	-0.4					
LU	**Luxembourg**											
EATR		34.7	39.8	40.5	41.3	40.1	40.1	39.4	34.7	41.3	6.6	5.4
Δ to previous year			5.1	0.7	0.8	-1.2	0.0					
NL	**Netherlands**											
EATR		42.9	43.5	44.8	46.4	46.1	46.2	45.0	42.9	46.4	3.5	3.3
Δ to previous year			0.6	1.3	1.6	-0.3	0.1					
PL	**Poland**											
EATR		31.3	31.3	31.8	32.0	32.3	32.6	31.9	31.3	32.6	1.3	1.3
Δ to previous year			0.0	0.5	0.2	0.3	0.3					
SK	**Slovakia**											
EATR		30.6	30.9	32.3	32.6	32.1	32.8	31.9	30.6	32.8	2.2	2.2
Δ to previous year			0.3	1.4	0.3	-0.5	0.7					
SI	**Slovenia**											
EATR		46.0	46.1	48.2	48.1	46.3	46.2	46.8	46.0	48.2	2.2	0.2
Δ to previous year			0.1	2.1	-0.1	-1.8	-0.1					
ES	**Spain**											
EATR		40.9	43.3	47.5	44.1	44.3	44.7	44.1	40.9	47.5	6.6	3.8
Δ to previous year			2.4	4.2	-3.4	0.2	0.4					
SE	**Sweden**											
EATR		53.6	56.2	56.4	55.6	56.9	56.2	55.8	53.6	56.9	3.3	2.6
Δ to previous year			2.6	0.2	-0.8	1.3	-0.7					
UK	**United Kingdom**											
EATR		39.4	42.6	41.8	41.6	40.5	39.2	40.9	39.2	42.6	3.4	-0.2
Δ to previous year			3.2	-0.8	-0.2	-1.1	-1.3					

		2009	2011	2013	2015	2017	2019	Mean	Min	Max	Δ Max-Min	Δ 2019-2009
JP	**Japan**											
EATR		27.9	27.7	28.1	28.1	28.1	28.4	28.1	27.7	28.4	0.7	0.5
Δ to previous year			-0.2	0.4	0.0	0.0	0.3					
NO	**Norway**											
EATR		42.9	42.4	41.3	40.1	40.2	36.9	40.6	36.9	42.9	6.0	-6.0
Δ to previous year			-0.5	-1.1	-1.2	0.1	-3.3					
CH	**Switzerland**											
EATR		31.8	31.8	31.2	31.1	31.3	31.2	31.4	31.1	31.8	0.7	-0.6
Δ to previous year			0.0	-0.6	-0.1	0.2	-0.1					
US	**USA**											
EATR		40.3	38.7	39.8	39.7	40.1	36.6	39.2	36.6	40.3	3.7	-3.7
Δ to previous year			-1.6	1.1	-0.1	0.4	-3.5					
BR	**Brazil**											
EATR		40.1	40.1	40.0	39.9	39.7	39.8	39.9	39.7	40.1	0.4	-0.3
Δ to previous year			0.0	-0.1	-0.1	-0.2	0.1					
CN	**China**											
EATR		39.7	39.7	41.7	43.3	43.5	42.0	41.7	39.7	43.5	3.8	2.3
Δ to previous year			0.0	2.0	1.6	0.2	-1.5					
IN	**India**											
EATR		37.0	35.4	36.1	35.7	36.0	36.3	36.1	35.4	37.0	1.6	-0.7
Δ to previous year			-1.6	0.7	-0.4	0.3	0.3					
RU	**Russia**											
EATR		15.3	15.9	15.9	15.3	15.7	16.3	15.7	15.3	16.3	1.0	1.0
Δ to previous year			0.6	0.0	-0.6	0.4	0.6					

Note: Effective tax rates are calculated under the model assumption of a single employee with no children and a disposable income of EUR 100’000. The table lists the effective tax rate for every second year and the delta to the previously reported effective tax burden.

Source: BAK Taxation Index **(**BAK Economics and ZEW, 2020); own calculation for transition economies (2009-2013).

7.2. Parameters

Table 7: Foreign exchange rates used for the calculation of the effective average tax rates on highly skilled labour, fixed for all years

		National currency	2009 - 2019
AT	**Austria**	EUR	1.000
BE	**Belgium**	EUR	1.000
CZ	**Czech Republic**	CZK	31.827
DK	**Denmark**	DKK	7.427
FI	**Finland**	EUR	1.000
FR	**France**	EUR	1.000
DE	**Germany**	EUR	1.000
HU	**Hungary**	HUF	252.525
IE	**Ireland**	EUR	1.000
IT	**Italy**	EUR	1.000
LU	**Luxembourg**	EUR	1.000
NL	**Netherlands**	EUR	1.000
PL	**Poland**	PLN	4.385
SK	**Slovakia**	EUR	1.000
SI	**Slovenia**	EUR	1.000
ES	**Spain**	EUR	1.000
SE	**Sweden**	SEK	9.121
UK	**United Kingdom**	GBP	0.682
JP	**Japan**	JPY	147.553
NO	**Norway**	NOK	7.988
CH	**Switzerland**	CHF	1.466
US	**USA**	USD	0.942
BR	**Brazil**	BRL	2.711
CN	**China**	CNY	10.072
IN	**India**	IND	61.300
RU	**Russia**	RUB	37.422

Note: The exchange rates are given as EUR 1 = CZK 31.827. The years on which the fixed exchange rate is based depend on when the respective countries were included in the BAK-Taxation Index. For example, for Brazil, Russia, India, and Japan, it corresponds to the average exchange rate from 2006-2010.

Source: Oanda und Eurostat

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