THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

EIQ Europe in Question
Discussion Paper Series at LSE

Measuring Fiscal Asymmetry: Effective Tax Rates on Capital and Labour in 29 European Countries, 1998–2021

Ye Zhang and Toon Van Overbeke

EIQ Paper No. 196/2026
May

lse.ac.uk/ei

EIQ
Europe
in Question
Discussion Paper Series at **LSE**

Measuring Fiscal Asymmetry: Effective Tax Rates on Capital and Labour in 29 European Countries, 1998–2021

Ye Zhang* and Toon Van Overbeke*

Abstract

We introduce a harmonised dataset of effective tax rates on capital (ETRC) and labour (ETRL) for 29 European countries covering 1998–2021. Building on and extending the investment-centred approach of Acemoglu et al. (2020), the dataset combines statutory provisions with observed revenue and macro-account data to capture the actual fiscal incentives facing firms and workers. Our preliminary findings are fourfold. First, labour is consistently taxed at higher effective rates than capital across most European countries; this labour-capital gap is persistent and comparatively stable. Second, unlike in the United States, European ETRC rose modestly on average over the last quarter century while the labour-capital gap remained broadly constant. Third, effective taxation on capital is markedly more volatile than on labour, suggesting European governments treat capital taxation as a more discretionary policy instrument. Fourth, ETR patterns in Europe do not map cleanly onto standard comparative-political-economy regime types. By integrating these empirical regularities into the study of growth regimes, production models, and distributive institutions, the dataset provides a foundation for comparative work on fiscal bias and the evolution of European capitalism.

Keywords: Europe; political economy; taxation.

JEL classification: H20; P16.

.

* University of Maastricht;

Corresponding Author: toon.vanoverbeke@maastrichtuniversity.nl

Table of Contents

Measuring Fiscal Asymmetry: Effective Tax Rates on Capital and Labour in 29 European Countries, 1998–2021

1. Introduction

Taxation provides the basis for any modern political economic system (Levi, 1988). Through taxation, the state not only generates revenue and redistributes resources, but also creates powerful incentives that influence private economic behaviours such as work, savings, and investments. Consider the United Kingdom's response to reduced investment during COVID-19. In April 2021, the UK introduced a "Super Deduction" scheme which allowed businesses to benefit from a 130% first-year capital allowance on qualifying new plant and machinery assets, thereby strongly incentivising firms to make new productive investments. Despite comparative capitalism's theoretical interest in the political and institutional drivers of production regimes (Baccaro & Pontusson, 2016) and firm strategies (Hall & Soskice, 2001), we know surprisingly little about how and why taxation regimes (re)allocate resources within the private sector to support some types of productive activities over others (Haffert, 2021).

Taxation not only provides the necessary revenues for government to function, but also contains important stabilising and allocative implications for economic governance (Musgrave, 1959). Existing literature in comparative political economy gives us many insights into these first two dimensions, but offers only an incomplete picture about the last. Scholarship has notably studied how countries finance their spending (Beramendi & Rueda, 2007; Genschel, 2002; Meltzer & Richard, 1981). The stabilising function of the fiscal system has also been well-understood by Keynes

(1936) and even gained renewed importance in academic debates during the Financial Crisis (Bernardi, 2011). By contrast, taxation's allocative role has been examined primarily through a redistributive lens (Beramendi & Rueda, 2007; Limberg, 2020; Martin, 1991), leaving its role in shaping productive incentives comparatively underexplored. Consequently, we know much more about the politics of tax burdens than about the incentives embedded in fiscal institutions.

One reason for this conspicuous omission might lie in the complexity of most tax systems, which means that statutory rates alone cannot capture the true effects of all interacting incentives (Acemoglu et al., 2020; Devereux & Griffith, 2003; Gorter & de Mooij, 2001; King & Fullerton, 1984; Kostarakosyz & Varthalitis, 2020; Mendoza et al., 1994). Measures of effective taxation address this problem by evaluating the actual burdens borne by individuals and businesses, thereby providing a more accurate estimate of how changes in taxation policy impact the allocative effect of fiscal policies on the productive sector of the economy. Consequently, comprehensive and comparable data on effective taxation are essential for advancing both theoretical and empirical research, not only in the comparative study of public finance, but also in comparative political economy more generally.

This paper introduces a new dataset designed to address this issue. Adapting Acemoglu et al. (2020)'s new approach to effective taxation to European economies, we construct harmonised estimates of effective tax rates on capital (ETRC) and labour (ETRL) for 29 European countries between 1998 and 2021. This dataset aims to capture the actual tax burdens reflected in observed revenues and macroeconomic accounts, thereby offering a realistic picture of where states draw their revenues and, critically, how these fiscal rules incentivise capital-labour substitution and resource allocation.

The dataset advances CPE scholarship in three ways. First, this new data demonstrates a systematic fiscal asymmetry between taxation of capital and labour in Europe. In doing so it uncovers how European taxation regimes bias firm incentives towards capital investments and away from workers. Second, this new dataset provides new

important avenues for research. We believe it provides a new empirical foundation for studying the fiscal dimension of growth models — how states use taxation to balance investment, employment, and welfare financing. At the same time it enables systematic analysis of fiscal asymmetry: the persistent gap between capital and labour taxation that underpins distributive and political conflict. Finally, it opens new opportunities to study how fiscal regimes evolve under conditions of globalisation, automation, and EU-level coordination.

This paper proceeds as follows. We first introduce the literature on effective taxation, weighing up the different methodological approaches for measuring effective taxation. We then outline our approach, which builds on Acemoglu et al. (2020). Finally, we offer a brief presentation of the top-line insights from our new dataset.

2. Background and Literature

2.1 Taxing Labour and Capital

Over the last several centuries, European states came to play an increasing role in taxing incomes from economic activities and thereby in shaping these activities. In the medieval and early-modern periods, constraints in economic structure and bureaucratic capacity made land taxes, corvées, poll taxes, excises, as well as tolls and custom taxes, the most common types of taxation. Few of these instruments—with, perhaps, the exception of land taxes and the tithe—taxed gains from factor inputs directly. Although Britain introduced the first (temporary) measure of personal income tax during the Napoleonic Wars, most European countries did not have a standing personal income taxation until the late-19th century or the early-20th century, as these states faced growing fiscal demands and were supported by expanding bureaucracies.[1] By comparison, the taxation on corporate profits came even later. Some countries introduced taxation on business profits at the same time as the

[1] Prussia in 1891 (Mares 2020), the Netherlands in 1892/3 (Fritschy, 1997), and France not until July 1914 with the *impoˆt sur le revenu*.

personal income tax (e.g. the Netherlands in 1892/3). Most Western European countries, however, witnessed the genesis—and increasing sophistication—of their corporate taxation regime in the years following the Second World War.

This expansion of government's fiscal capacities has had at least two important consequences for economic allocation. On the one hand, they directly enable the use of discretionary fiscal spending to shape the productive landscape of the economy. Spending through subsidies, infrastructure projects and social policies directly dictate where resources land in the economy. Political economy and public economics have paid great attention to these types of expenditures, (Alesina, 2009; Barro, 1990; Blanchard & Quah, 1988; Keynes, 1936), arguing that well-calibrated spending can be an important driver of growth over the business-cycle. On the other hand, the intersection of different levies itself also plays an important, if less visible, role in shaping how actors allocate resources in the economy (Acemoglu et al., 2020; Devereux & Griffith, 2003; King & Fullerton, 1984). With the increasing intervention of fiscal regimes into the realms of economic production, these levies started to take a place alongside regulation and subsidies as a powerful factor that shaped labour and capital inputs in the economy.

However, the overall incentives laid out by fiscal frameworks are often opaque. This is because the tax system's overall effects on labour and capital inputs are produced by the confluence of multiple historically contingent and often intersecting (tax) policies. In today's advanced economies, taxes on labour typically include personal income taxes as well as payroll taxes. Withheld benefits, such as pensions, also constitute a cash flow to the state that, despite promises of future returns, reduces the worker's income today. Taxes on capital can be even more complicated. Some taxes, such as wealth and inheritance taxes, fall on accumulated wealth. By contrast, taxes on corporate profits directly target income from corporate activities, while taxes on dividends and capital gains are levied on shareholders. Meanwhile, corporate investments are subject to a vast array of depreciation allowances and deductions. As

a result, a holistic approach to taxation's effects on labour and capital should be able to predict how a stream of income passes through this complex web of tax rules.

For scholars of comparative political economy interested in how fiscal rules shape allocative decisions and therefore broader economic models, several alternative measures are available to capture these effects. On one end of the theoretical spectrum, statutory tax rates represent tax law "on the book." Statutory rates are legally prescribed, headline rates set by law that apply to their respective tax bases (such as wages, profits or capital gains). They typically do not account for deductions, exemptions or timing effects, and therefore represent the nominal tax burden without revealing the true burden of taxation. These statutory rates equally neglect the rise of opportunities for corporate profit shifting in the globalised economy. On the other end, the economic incidence of taxation represents the actual distribution of the tax burden across economic agents, taking into account market adjustments, without accounting for who makes the tax payment.

In this study, we opt for a measure that occupies the theoretical middle ground between statutory taxation and economic incidence. Effective tax rates represent the actual tax burden borne by taxpayers, folding the effects of deductions, exemptions, credits, timing, and other aspects of fiscal policy into one rate that modifies the statutory rate: In the context of measuring taxation of labour vs. capital, effective tax rates represent the actual tax burden borne by holders of a given factor of production (labour or capital), introduced as a wedge between the total income generated by that factor and the income received after-tax. Thus, unlike statutory tax rates, effective tax rates attempt to measure the real-world impact of taxes, and unlike economic incidence, effective tax rates measure these effects on the taxpaying agents (Gorter & de Mooij, 2001).

2.1 Effective Taxation: State of the Literature

Since the 1990s, estimates of effective tax rates have played an increasingly important role in the evaluation of the effects of tax policy on economic decisions such as

investment, human resource training and capital relocation (Devereux & Griffith, 1998; Mendoza et al., 1994). As increased globalisation and capital mobility motivated studies of cross-border investment incentives, effective tax rates provide an indispensable common metric to compare the tax burden faced by firms across different jurisdictions. More broadly, in the study of comparative tax laws, ETRs are used to assess national competitiveness and to evaluate in the advocacy and formulation of tax policy (Spengel et al., 2025). However, the popularity of ETRs is accompanied by a proliferation of divergent theoretical assumptions and methodological choices surrounding their estimation.

Building on Gorter and de Mooij (2001), we identify five dimensions of theoretical and methodological divergence on how effective taxation on labour and capital is estimated. First, effective taxation measures differ in their theoretical focus. One strand of the literature focuses on the balance between the tax burden on capital and labour income (Acemoglu et al., 2020; Devereux & Griffith, 1998, 2003; Mendoza et al., 1994), in particular the wedge between pre- and after-tax income. This approach caters towards an understanding of how tax policy affects firm behaviour, thus typically treating tax policy as an independent variable. Other scholars have defined taxation on capital more broadly to capture the effects of taxation on wealth in general. For example, Bachas et al. (2022)'s worldwide dataset on capital and labour taxation defines capital taxation to include taxation on corporate income, property, wealth and inheritance. Treating taxation as a dependent variable, their study investigates the effect of globalisation on states' ability to tax capital, defined broadly.

Second, effective tax rates can be estimated using marginal or average approaches. Marginal ETRs (METRs) measure the wedge between pre-and post-tax returns on projects and, in doing so, capture the incentives of taxes on the marginal investment decisions (Gorter & de Mooij, 2001). This approach is particularly useful for scholars who are interested in the allocative effects of fiscal policy since METRs give us direct insight into how taxes shape the behaviour of profit-maximising agents in the market.

Average effective taxation rates (AETRs), on the other hand, measure the overall tax burden on a typical investment.

Table 1: Dimensions of effective tax rate (ETR) estimation approaches.

Dimension	**Approach 1**	**Approach 2**
Theoretical focus	Investment-focused	Wealth-focused
Marginal vs. average	Marginal tax rate	Average tax rate
Temporal orientation	Forward-looking	Backwards-looking
Computational source	Statutory tax rate	Observed tax revenue
Level of analysis	Micro-level (firm-level)	Macro-level (national-level)

Third, effective taxation measures can have diverging temporal orientations. Forward-looking rates focus on taxes applicable to future investments, while backwards-looking rates focus on taxes collected on past income. These temporal orientations imply a tradeoff in concept and in purpose: Forward-looking measures seek to capture the (typically marginal) tax wedge that will apply to a hypothetical new project using simulated scenarios, with a focus on incentives produced by current law. Backwards-looking measures, by contrast, are estimated based on historical data of tax payments, making no distinction between the effects of legal provisions and of agents' behavioural responses to the former. Nor do they attempt to capture the effects of new policies coming into effect.

Fourth, different theoretical approaches imply different sources of data. Forward-looking rates mostly rely on statutory tax rates in their overall computation of effective taxation rates, with the key advantage that they can measure the impact of a new project. Backwards-looking approaches, on the other hand, use the actual paid rates as the basis of their computation. This approach recognises that there are many cases where actors do not actually face statutory rates. Especially in a more globalised context where capital is much more agile and able to circumvent the statutory rates, these backwards-looking rates generally offer a more realistic picture.

Finally, existing approaches can also be distinguished by their use of micro-level or macro-level data in the estimation. Micro-level approaches typically simulate (rarely observe) firm-level or project-level tax burdens, accounting for project returns, the firm's income, financing structure, and legal position. By contrast, macro-level approaches aim to estimate broad-based rates, usually at a country-level using macroeconomic data, without accounting for micro-level heterogeneity.

Based on these dimensions, current estimates on ETRC/ETRL for Europe can be divided broadly into two approaches: The first approach comprises project-based, forward-looking methods, such as the Devereux and Griffith (2003) approach underlying the Mannheim Tax Index (Spengel et al., 2025). Such approaches simulate a hypothetical future investment project, applying statutory tax parameters to calculate marginal and/or average effective tax rates on investment returns. While these approaches provide useful simulation results for investment decisions, they rely heavily on statutory tax rates and thus can diverge significantly from the actual tax incentives faced by firms.

The second approach comprises country-level, backwards-looking methods that estimate effective historical tax rates by allocating observed tax revenues to macro-level tax bases (Bachas et al., 2022; Kostarakosyz & Varthalitis, 2020; Mendoza et al., 1994). While these methods more accurately capture the actual amounts of taxes paid and provide invaluable insights into economy-level incentives, their usefulness in the analysis of investment incentives is often limited by relatively broad definitions. For example, Bachas et al. (2022)'s definition of capital taxation—including taxes on property, wealth, and inheritance—can diverge significantly from the tax incentives faced by investing firms.

Methodological choices, therefore, map directly onto the substantive questions that researchers seek to answer. Forward-looking, project-based measures provide a clear instrument for analysing marginal investment incentives, while backwards-looking, revenue-based measures capture how tax codes operate in practice. Neither approach,

we believe, provides a sufficiently realistic and relevant way to study how taxation skews labour-capital substitution and produces distributional consequences at this level.

3. A New Dataset of Effective Taxation

Given the gaps in existing measures of effective taxation, we propose a new approach for the study of labour- and capital-targeting taxation, and of its effects on hiring and investment incentives in Europe. In their work on automation in the U.S., Acemoglu et al. (2020) proposes a new methodology for the estimation of effective tax rates as applied to the U.S. In this section, we discuss the Acemoglu et al. (2020) approach's promise for studying comparative taxation and questions of comparative political economy more broadly and provide details on how the approach can be adapted to European data.

3.1 The Acemoglu et al. (2020) Approach

Acemoglu et al. (2020)'s approach to effective taxation combines a micro-level, task-based model of automation with the macro-level perspective of optimal tax policy. Methodologically, they depart both from purely marginal, forward-looking measures of effective tax rates, and equally from historical, backwards-looking measures. While their theoretical orientation focuses on the marginal task, they recognise that statutory rates only represent part of the incentives faced by firms. Similarly, while the approach begins with a theoretically forward-looking orientation, historical data is used extensively in the estimation, and data sources include both statutory tax rates (for depreciation allowances) and observed tax rates (for personal and corporate taxation). This methodological choice allows the estimates to capture—albeit imperfectly—the effects of deductions, exemptions, and other policies.

This pragmatic approach thus moves beyond existing methodologies to bridge "the best of both worlds" for policy-level analysis of taxation-driven incentives. Compared to existing estimates of effective tax rates on capital and labour, it is especially well-

suited to studying the political economy of investment decisions for three reasons: First, it better represents the incentives faced by firms. Corporate decision-making is characterised by bounded rationality, often operating on imperfect information and short-to-medium-term planning horizons. Investment and financing decisions are made based on a combination of historical data and forward-looking forecasts. Therefore, Acemoglu et al. (2020)'s mixture of statutory and historical rates depicts a more realistic picture than either the pure-statutory or the pure-historical alternatives.

Second, and relatedly, statutory tax rates often used in forward-looking approaches provide a very imperfect estimate of the tax incentives faced by firms. Firms take advantage of deductions, exemptions, credits and other tax-reducing provisions to reduce their effective corporate tax rates. In the consideration of future investments, these deductions undoubtedly play a role. Because this approach estimates ETRC based on dividing total corporate tax revenues by total net corporate operating surpluses, it also accounts for subsidies that firms might receive from the government. As such, Acemoglu et al. (2020)'s backwards-looking estimation of corporate tax rate paid is a more faithful representation of firm-level expectations on future tax rates.

Finally, depreciation allowances constitute a critical part of firm incentives on investment, effectuated through tax policy. Accelerated depreciation schedules can substantially lower a firm's immediate tax liability, thereby offsetting new capital outlays with tax savings in the foreseeable future. However, most backwards-looking measures of effective taxation on capital do not account for this effect. By integrating the net present value of depreciation allowances on new investments, the Acemoglu et al. (2020) approach captures this important dimension in firm investment decisions.

3.2 Adapting to the EU: Data Sources and Coverage

While the Acemoglu et al. (2020) approach holds great promise for important allocative and distributional questions in comparative political economy, its use for comparative research is significantly limited by its sole focus on U.S. data. We therefore propose an adapted version of their method to expand the scope of the

analysis to the European Union and other select European countries between 1998 and 2021.

Our adaptation largely follows Acemoglu et al. (2020)'s theoretical and methodological choices. The ETRC computation condenses household-level tax on capital, corporate income tax, and depreciation allowances into a single rate, accounting also for interest rates, inflation and investment price changes. The ETRL computation similarly accounts for both income and payroll taxes, adjusting for worker valuation of benefits. Our data sources include the European Central Bank for household equity holdings; Eurostat for data on tax revenues, net operating surplus, and inflation; the EUKLEMS project for capital consumption; the Mannheim Tax Project for depreciation schedules and statutory tax rates; and the MSCI Europe Index for return on equity. This allows us to cover 29 European countries between 1998 and 2021.[2] Further details about data sources, choices of measurements and robustness/sensitivity checks can be found in Appendix A: Methodological Note and Appendix B: Robustness and Sensitivity Checks.

Several pragmatic divergences from Acemoglu et al. (2020) arise from cross-national heterogeneity in data availability and in governing legal frameworks. First, there is no European series of bond return rates equivalent to Moody's AAA corporate bond yield data, and prevailing borrowing rates can differ drastically across European economies. European economies also have divergent provisions for pass-through taxation subject to national governing frameworks. Therefore, to ensure comparability across the dataset, we restrict attention to equity-financed investments by incorporated companies (C-corp equivalent).

Second, Acemoglu et al. (2020) assume that 60% of capital gains are subject to short-term tax rates at the household level, 20% are subject to long-term qualified rates, while the remaining

[2] Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Norway, and Switzerland.

20%, held until death, are effectively untaxed under the United States' step-up in basis rule. Most European countries do not distinguish between short-term versus long-term capital gains, and the few that do have widely divergent holding-period requirements.[3] Therefore, we assume all gains realised before death are subject to the same tax rate, and—like (Acemoglu et al., 2020)—that 80% of gains are realised before death (see Figure 14 in the Appendix for sensitivity analysis related to this assumption). We then rely on national-level inheritance taxation rules to determine whether these gains are taxed according to the standard capital gains rate (following either a normal or carry-over system), or avoid taxation due to the existence of a step-up in basis system similar to the U.S. (see Table 2 in the Appendix).

Third, in the computation of the tax base for the corporate tax rate, Acemoglu et al. (2020) first add back economic depreciation and then subtract depreciation allowances to arrive at the fiscal tax base. Since there is no harmonised country-level data on depreciation allowances claimed for tax purposes, we forego this step and instead use reported corporate income before tax as the tax base in calculating the corporate tax rate. As depreciation allowances are often oversized compared to economic depreciation, this likely results in a larger tax base, which in turn leads to underestimation in the tax rate. However, because depreciation allowances only constitute a small part in the calculation of a firm's profits, and the difference between depreciation allowances and economic depreciation is an even smaller part, we do not believe this solution substantially changes the estimates.

It is worth mentioning that the effort to create comparable ETR figures across Europe runs into limitations regarding several Central and Eastern European (CEE) countries. Specifically, Eurostat data from CEE countries is highly volatile and possibly less reliable in the late 1990s and early 2000's. We attribute these inconsistencies to the post-socialist transition that CEE economies were undergoing during this period. In particular, this deep institutional reconfiguration means that these countries were a)

[3] The exceptions are the Czech Republic (required holding period 0.5 year), Finland (10 years), Hungary (5 years), Luxembourg (0.5 year), and Slovenia (20 years) (Harding, 2013).

subject to sudden and structural policy changes and b) operating with administrative systems that were still consolidating, which might have affected the reliability of fiscal data. For these reasons, we interpret early results for CEE countries with caution and consider them indicative rather than definitive.

A final limitation concerns the extent to which our estimated rates apply to individual firms and workers. Because our analysis relies on historical data, our results necessarily reflect the ETR paid by a representative firm or individual, rather than the full range of outcomes observed in practice. Individual circumstances will inevitably diverge from these averages, and we caution against interpreting our estimates as precise predictions for any single firm or worker. In particular, we assume that larger firms are likely to possess the expertise, resources, and strategic flexibility to manage their tax positions more effectively than the average entity in our dataset. As a result, they may be able to achieve tax outcomes that differ—potentially substantially—from the levels implied by our aggregate estimates.

3.3 Comparisons with Existing Measures

Compared to existing measures of effective taxation on capital, our investment-centric estimates often reflect similar trends but are typically lower (see Figure 1 comparing our estimates of effective tax rates on labour and capital for 29 European countries with prior estimates). We attribute this divergence to two main reasons, reflecting some of the theoretical motivations that prompted us to base the dataset on the Acemoglu et al. (2020) methodology over previous methodologies:

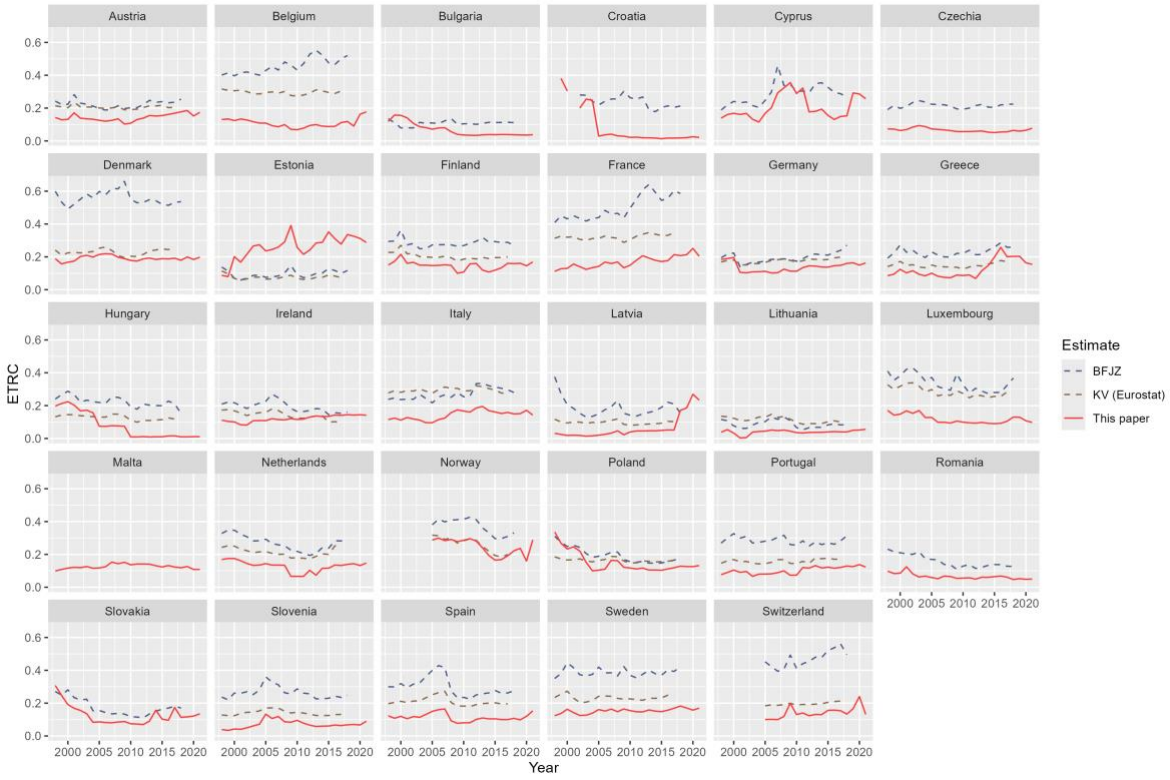

Figure 1: Our estimates of ETRC compared with the estimates of Bachas et al. (2022) and Kostarakosyz and Varthalitis (2020) for 29 European countries.

First, our approach isolates corporate income taxes from other taxes on capital, such as taxes on wealth or inheritance. Studies such as Bachas et al. (2022) amalgamate various types of taxation of capital to calculate effective tax rates. While these approaches provide a useful measure for *overall* taxation on capital, their estimates do not fully represent taxation on capital investments. Our approach focuses largely on corporate taxation to approximate the tax incentive structure relevant for corporate investment decisions. This results in estimates that align more closely with the tax obligations that firms consider when evaluating new capital investments. We believe this to be particularly relevant to explore allocative and redistributive questions in comparative political economy.

Second, our estimates incorporate depreciation allowances in a manner that represents their effects on firms' tax liabilities more realistically. Depreciation allowances allow firms to deduct a substantial portion of capital investment

expenditures over time, effectively lowering the net present value of expected tax liabilities. Neglecting to account for depreciation allowances, as is often the case in existing estimates, results in systematic over-estimation of taxation on capital. By integrating such fiscal incentives, we show that corporations are taxed much less on capital investments than the book rate may indicate.

Similarly, our estimates of effective tax rates on labour are systematically lower than those of existing studies. This is a result of our more comprehensive—and arguably more accurate— methodological approach. Whereas most existing estimates of ETRL treat benefits and pension contributions financed out of wages as taxation (Kostarakosyz & Varthalitis, 2020), our estimates also account for the implicit value that workers assign to these benefits. While this prior approach rightly recognises that workers face a direct tax bill to cover these welfare state expenses, it misses that individuals place real economic value on the welfare state benefits accrued. In the absence of such provisions, individuals would be required to personally set part of their salary aside to cover the costs of potential illness, spells of unemployment and old-age, which would reduce their disposable income in ways similar to taxation. Our approach, therefore, incorporates a discount rate based on research across Europe and the U.S. that suggests that these benefits are valued at 65% of the total taxed cost to workers (Gruber & Krueger, 1991; Melguizo & González-Páramo, 2016). Accounting for the value placed on these benefits means that this approach reflects the microfoundational decisions on hiring and labour market participation more closely. Notably, for countries where benefits are not financed out of wages (e.g. Denmark and Sweden), our estimates are similar to prior estimates (see Figure 2).

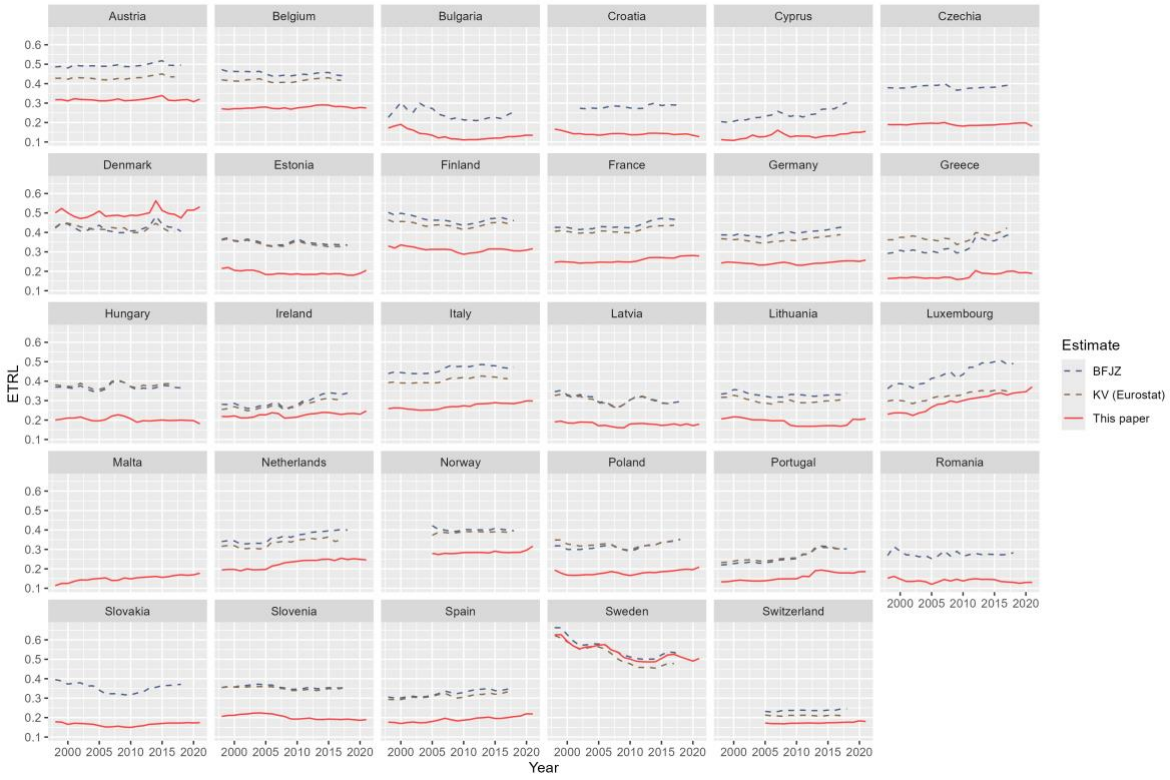

Figure 2: Our estimates of ETRL compared with the estimates of Bachas et al. (2022) and Kostarakosyz and Varthalitis (2020) for 29 European countries.

The considerably lower estimates that we have produced thus underscore the substantial distortions driven by methodological choices. Taxation rates on wealth frequently exceed taxation rates on corporate income, and depreciation allowances significantly reduce the present value of tax payments on new capital investments. Benefits and pensions, meanwhile, also provide real economic value to individual taxpayers. Thus, existing estimations of effective tax rates on capital may substantially overstate the level of taxation faced by firms and workers on capital investment and hiring decisions. By taking these complex and intersecting incentives into consideration, our adaptation of the Acemoglu et al. (2020) approach to Europe shows that real taxation of capital and labour is often lower than previously believed.

4. Substantive Findings

So, what does this new data on effective capital and labour taxation tell us? First of all, whereas Acemoglu et al. (2020) observed a steep decline in effective taxation on capital in the

U.S., our data demonstrates an increase in both ETRC and ETRL at the European level (see Figures 3 and 4). Where the mean ETRC (weighted by GDP) in 1998 stood around 14.5%, this number is 16.1% in 2021. Average ETRL evolved from 25.5% to 26.8% in that same period (see Table 5 in the Appendix). Put together, this means that the wedge between the total income generated by factor investments and their respective post-tax income has grown by 1.6% for capital and 1.3% for labour across Europe between 1998 and 2021. However, this evolution has been anything but linear. Both European-wide ETRL and ETRC initially came down sharply around 2009-2010 (bottoming out at 11.9% and 24.4%, respectively), only to shoot back up in the last decade. We speculate that this stark reversal could be the result of the fiscal pressure experienced by many member states following the Financial Crisis, as well as the development of stronger EU-level monitoring and coordination of fiscal policy by the Commission during this period. At the same time, the Base-Erosion and Profit-Shifting process initiated by the OECD during the same period could also help explain why we see an almost uniform upward trend in ETRC from the 2010s onwards.

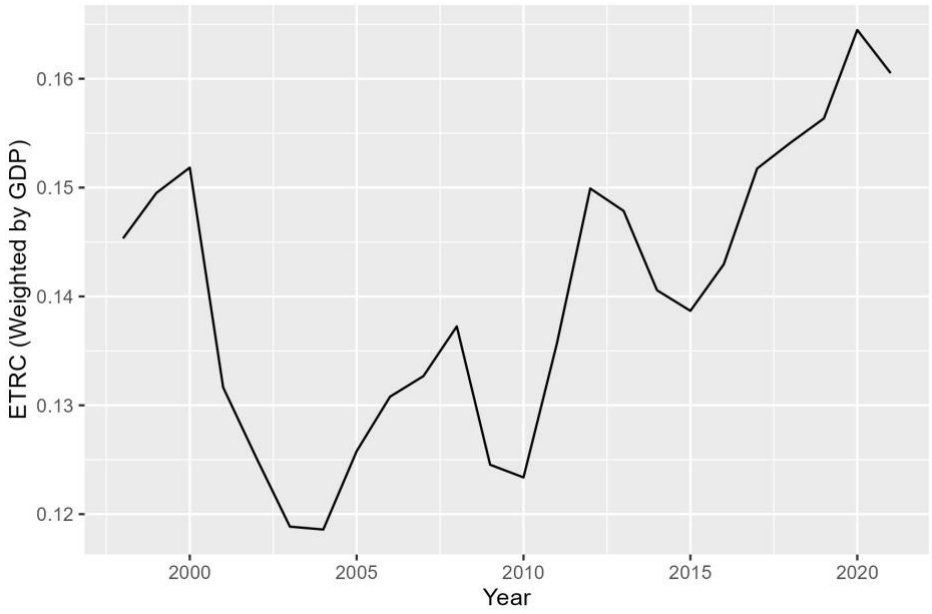

Figure 3: Averages for 29 European countries (outliers removed) using our estimations of effective tax rate on capital (ETRC), weighted by GDP.

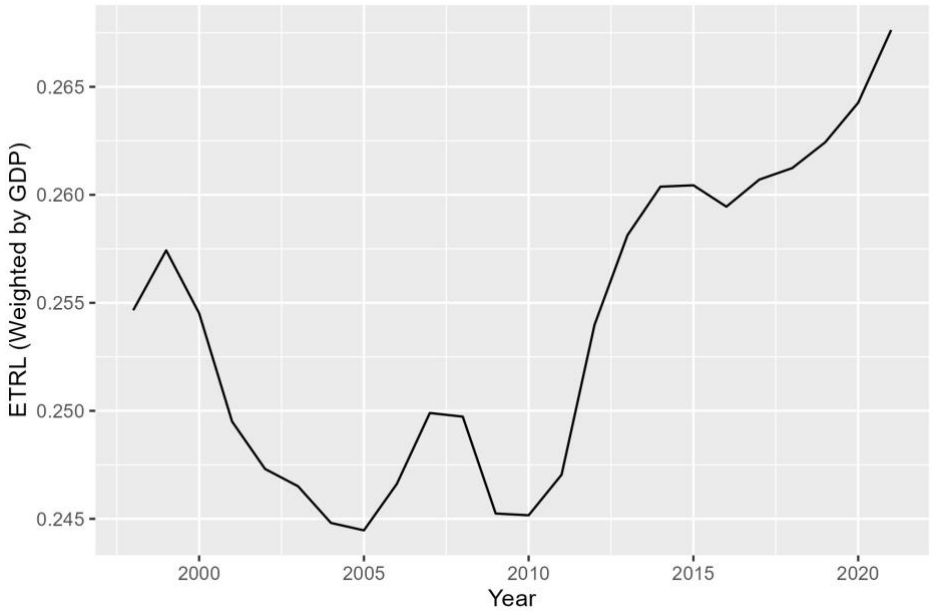

Figure 4: Averages for 29 European countries (outliers removed) using our estimations of effective tax rate on labour (ETRL), weighted by GDP.

Second, while there is a gap between taxation on labour and on capital in European economies, the gap does not seem to be growing as in the U.S. Taxation on labour is almost universally higher than taxation on capital (Acemoglu et al., 2020; Kostarakosyz & Varthalitis, 2020; Mendoza et al., 1994). This is also substantiated by

our findings: ETRL remained at a much higher level compared to ETRC across most European countries during the entire period studied. In fact, the only countries where ETRL exceeded ETRC on average were Estonia and Cyprus (see Figure 5). There are several good explanations for this observation. Scholars have pointed out that the technical nature of taxation makes it particularly susceptible to powerful interest groups bending capital taxation in their favour (Hettich & Winer, 1999; Olson, 1965; Steinmo, 1996). Labour is also much less mobile than capital, making it a safer source of revenues for states seeking to finance their structural welfare state commitments (Genschel, 2002).

However, while Acemoglu et al. (2020) found the gap to be growing in the U.S., there was no such increase in the EU broadly speaking, and trends in labour and capital taxation moved together (see Figures 3 and 4). In 1998, EU-level ETRL was, on average, 11% higher than ETRC. In 2021, the difference was 10.7%—almost the same as it was a quarter of a century ago (see Table 5 in the Appendix). For the 24 years within our sample, the difference never dropped below 10% or increased above 13%. The institutional configurations of European political economies likely played a critical role in this outcome.

Third, notwithstanding its overall stability, ETRC is much more volatile than ETRL at the country level. Common across almost all countries is the observation that ETRC oscillates significantly while ETRL remains very stable. As Figures 6 and 7, as well as Table 6 in the Appendix demonstrate, within-country variance is much larger for ETRC than for ETRL.

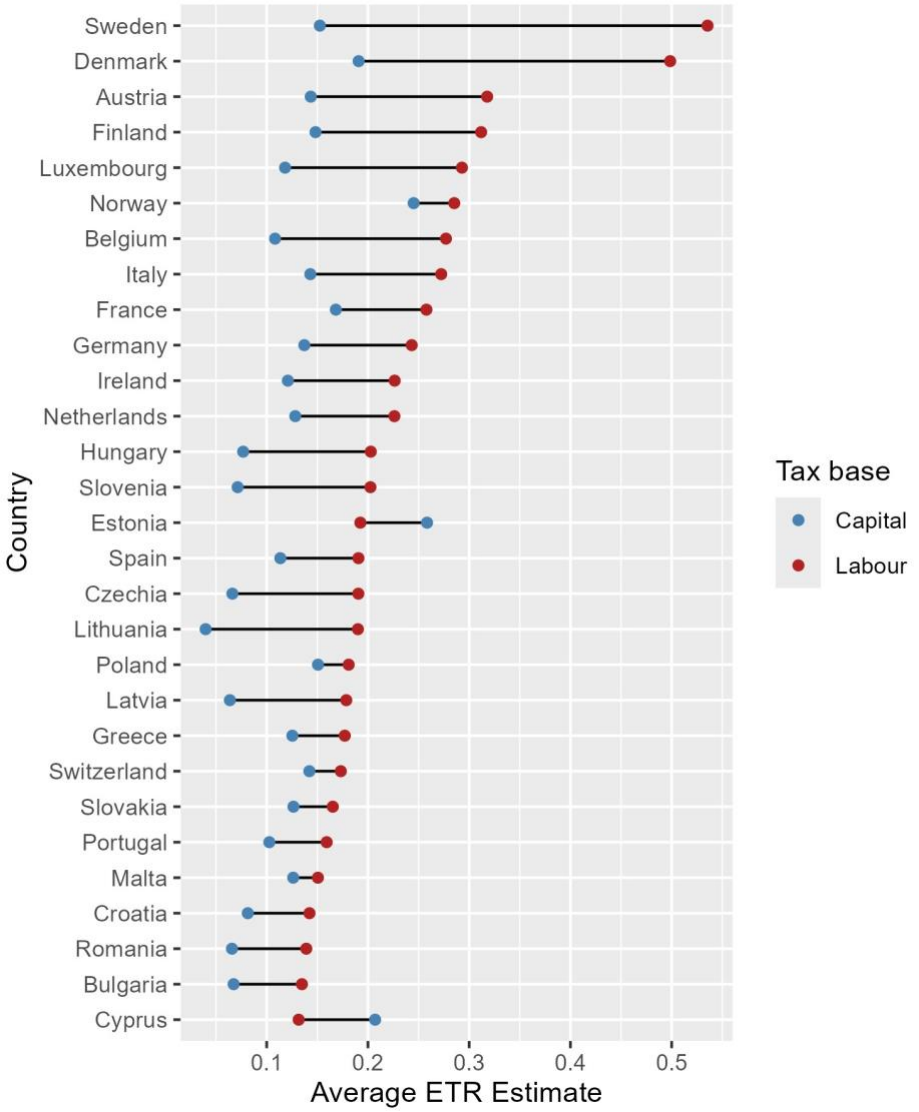

Figure 5: Estimation of ETRC and ETRL compared, averaged by country with outliers removed.

In our sample, Sweden stands out as the country that undergoes the biggest evolution in ETRL, moving from over 60% in 1998 to around 50% in 2021. In that same period, no fewer than 11 countries[4] made similar or greater jumps in ETRC. This seeming unwillingness or inability to let ETRL fluctuate in the same way as ETRC does also reinforces the argument that European countries strongly rely on stable revenues from labour taxation to finance their expensive welfare states (Genschel, 2002). It could also be the case that governments simply believe they might be able to attract foreign

[4] Croatia, Cyprus, Estonia, France, Greece, Hungary, Latvia, Norway, Poland, Slovakia and Switzerland.

investments by lowering the ETRC, while international labour is not so sensitive to such fiscal signals, making changes to ETRL less impactful in this regard. Additionally, governments may prioritise stimulating domestic investment—by reducing ETRC—as a more effective strategy for driving long-term economic growth, viewing it as more valuable than boosting employment through reductions in ETRL in the immediate term.

Fourth, underlying these top-line figures, our data indicates significant variation across Europe (see Figures 5, 8 and 9). In some ways, we cannot talk about *European* ETRC and ETRL,

since we observe vast differences in both the overall levels of effective taxation and the balance those respective regimes strike between capital and labour. On the low end of the spectrum we find most CEE countries, many of which have a cumulative effective tax burden on capital and labour around or below 30%. This stands in stark contrast to Scandinavian economies, which, despite economic liberalisation (Bergh & Erlingsson, 2009), all tax capital and labour cumulatively at more than 40% (see Table 6 in the Appendix).

Countries also differ in how they balance ETRL and ETRC. As discussed above, capital is taxed at much lower rates than labour in most countries, but variations abound. Scandinavian

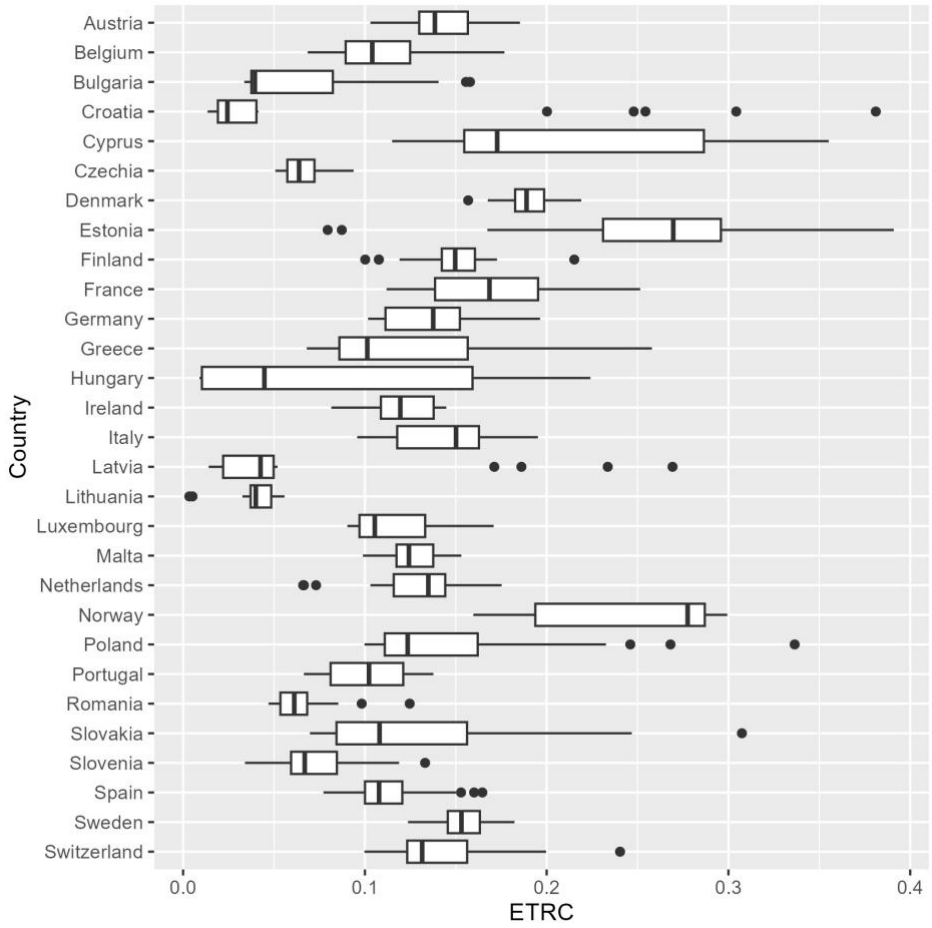

Figure 6: Boxplot indicating the range of ETRC values by country. A wider range indicates larger movements within the period under consideration.

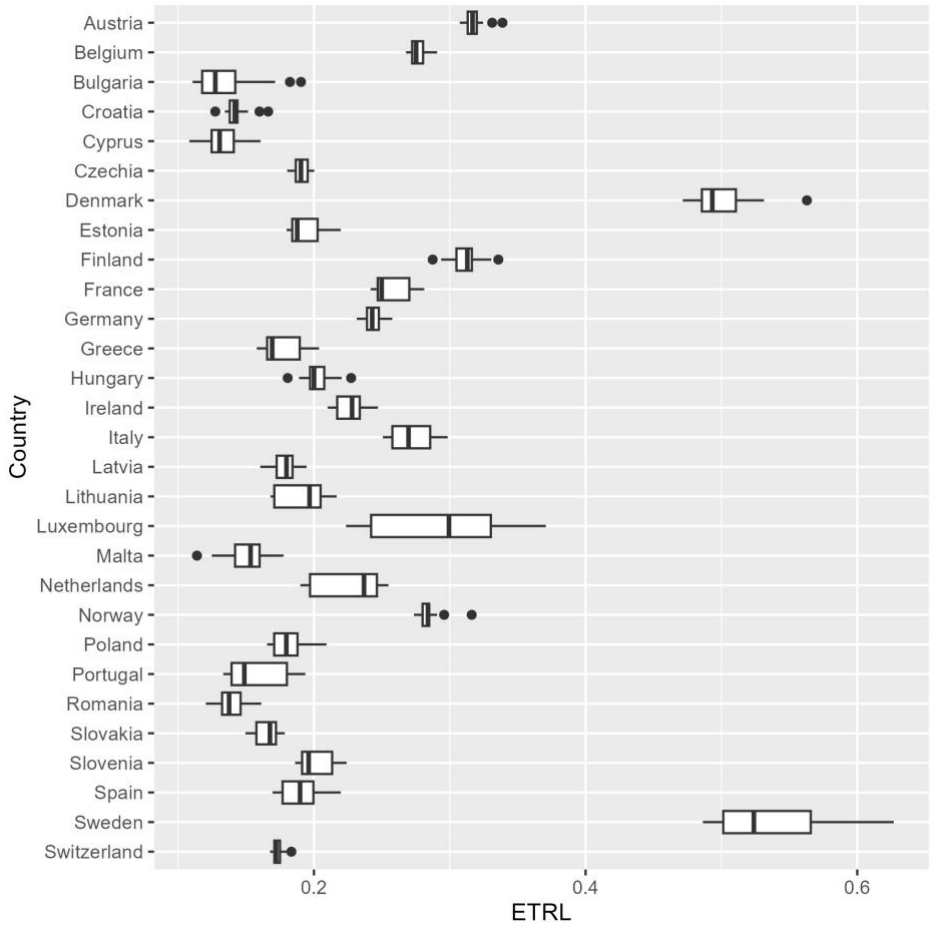

Figure 7: Boxplot indicating the range of ETRL values by country. A wider range indicates larger movements within the period under consideration.

countries such as Sweden and Denmark, by virtue of their particularly high labour taxation, exemplify the widest gap between ETRL and ETRC on average since 1998, in part due to their very high levels of ETRL. Interestingly, while corporatist Western European economies have much lower levels of ETRL, they tax capital at roughly the same rates as Scandinavian economies (see Figure 5). The difference between ETRC and ETRL is much smaller in most CEE economies, as well as in Switzerland and Norway. Finally, Estonia and Cyprus are the only countries that tax capital more than labour.

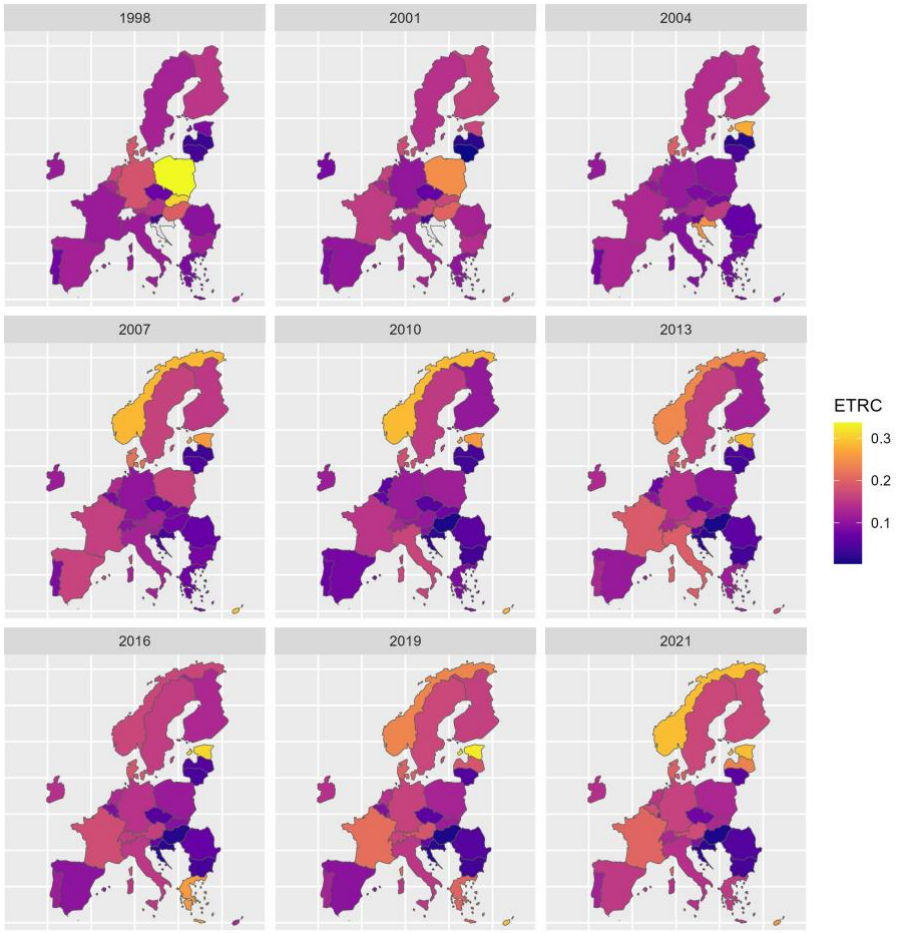

Figure 8: Changing levels of ETRC across European countries, 1998–2021.

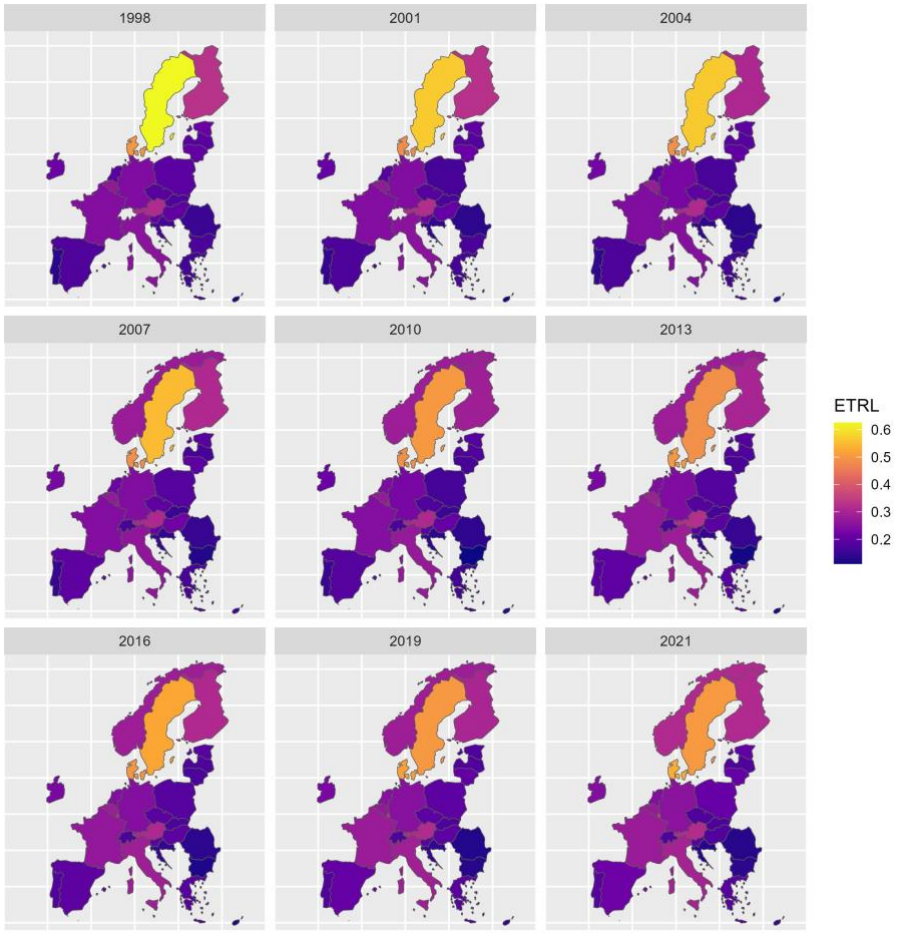

Figure 9: Changing levels of ETRL across European countries, 1998–2021.

Fifth, while European countries tax machinery and buildings relatively lightly, taxation on intangibles can be heavier and, in some cases, even heavier than that on labour. As Figure 10 shows, many Western European economies, including Germany, France, Italy, the Netherlands and Belgium, tend to tax intangibles at rates similar to machinery. By contrast, other countries tax intangibles at a rate significantly higher than that applicable to machinery. These include Greece, Spain, Portugal, as well as a number of CEE economies, including Czechia, Estonia, and Slovenia. Other CEE economies have very low tax rates overall, including on intangibles. These countries include Poland, Hungary, Romania, Bulgaria, and Croatia, among others.

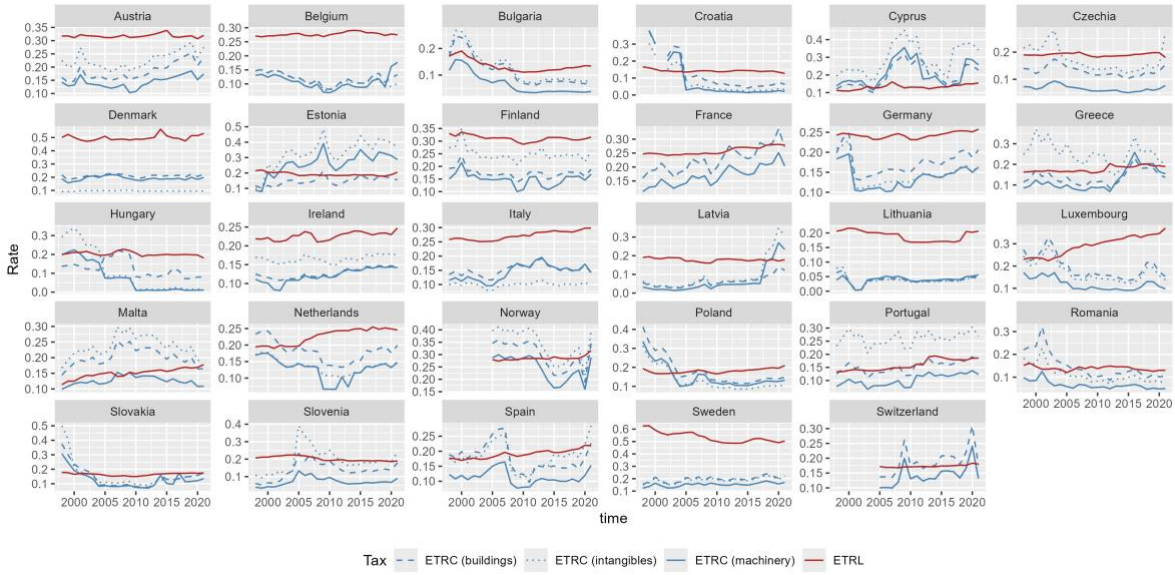

Figure 10: ETRC estimates for three types of assets (buildings, intangibles, machinery), compared with ETRL estimates.

Finally, while there is great variation in how countries strike the balance between incentivising businesses to employ capital or labour, it is not entirely obvious to us that these ETR patterns neatly align with existing CPE ideal types (Baccaro et al., 2022; Hall & Soskice, 2001). On the one hand, we observe some clustering by economy classification for ETRL but not for ETRC in recent years. Figures 11 and 12 tell this story. Scandinavian economies, expectedly, tax labour very highly, as do traditionally corporatist economies such as Germany, Austria and Belgium. CEE countries, by contrast, universally levy comparatively low effective taxes on labour. Patterns in ETRC are much noisier. Here, we observe significant variation within all possible regime types. Within the Mediterranean economies, we see high levels of ETRC in Cyprus but very low levels in Malta. Similarly, Lithuania diverges very significantly from the comparatively high levels of capital levies found in Estonia and Latvia. On the other hand, Figure 13 suggests that these within-type differences have evolved over time. Corporatist economies, in particular, demonstrated considerable homogeneity in how they calibrated ETRC and ETRL in 1998, but have started to pull apart since then.

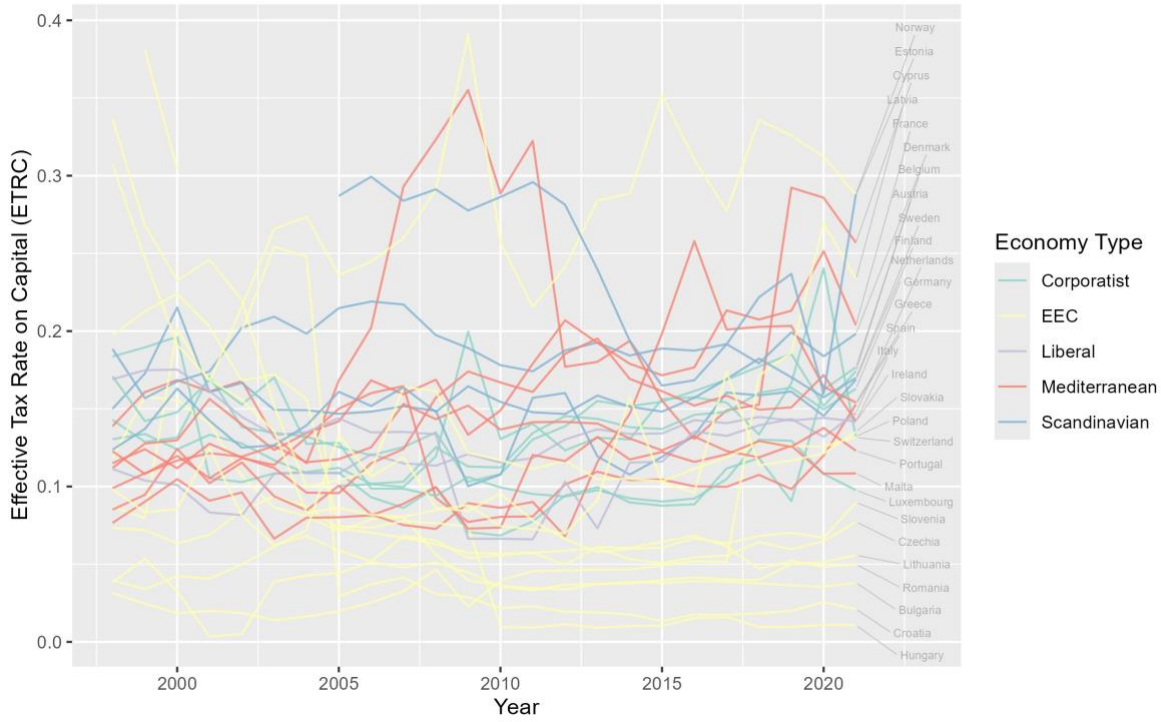

Figure 11: Estimated ETRC levels across European countries, 1998–2021.

To summarise, we draw six topline conclusions from this new data. First, in contrast to

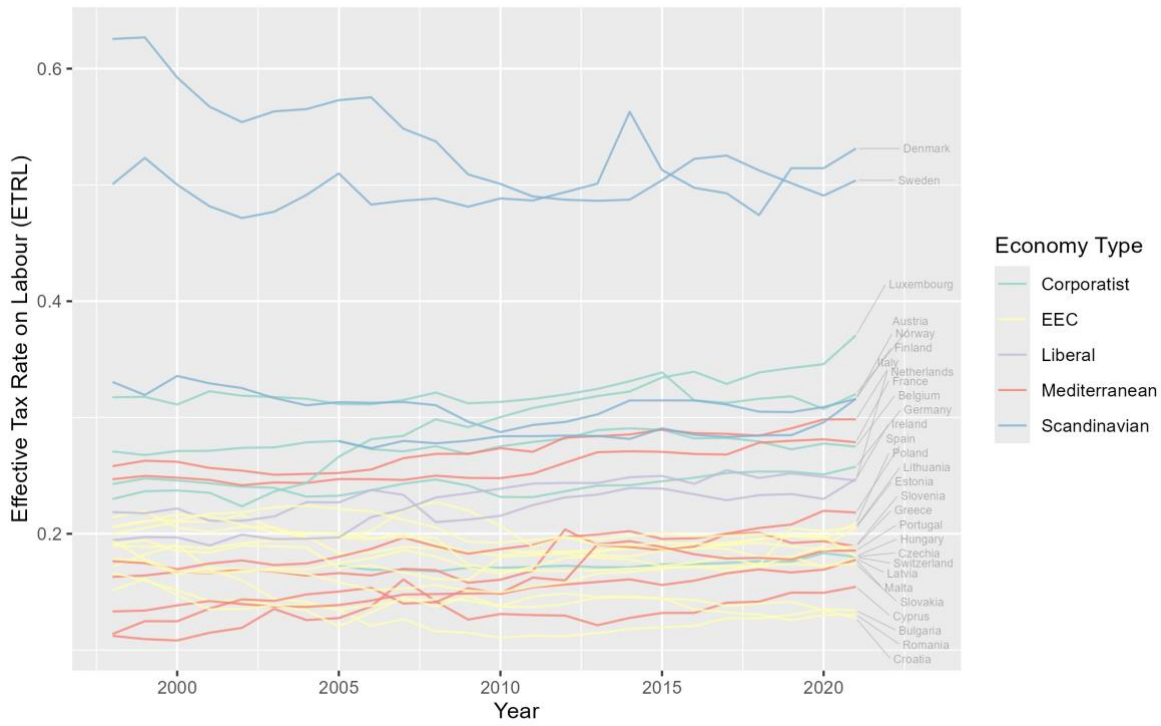

Figure 12: Estimated ETRL levels across European countries, 1998–2021.

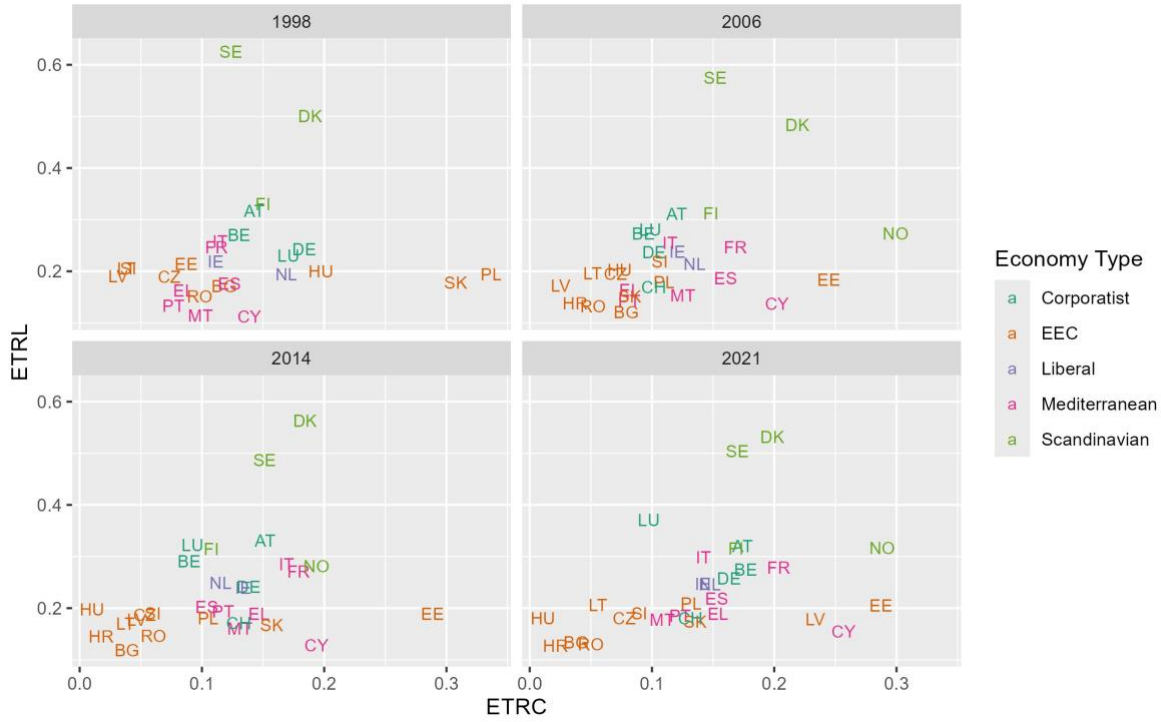

Figure 13: Snapshots of ETRC/ETRL at four different points in time between 1998 and 2021.

the U.S., EU-wide ETRC and ETRL have both increased between 1998 and 2021. Second, while we observe a preference for capital over labour in most European taxation regimes, the difference has remained largely constant, also in contrast to the U.S. Third, we observe far greater levels of volatility in ETRC than in ETRL: governments "play around" with taxation on capital to a much greater degree. Fourth, underlying these European trends is a great degree of country-level variation. Some countries like Sweden cumulatively tax capital and labour at more than 60%, while the Bulgarian state barely taxes 20%. Fifth, there is also heterogeneity in how different asset classes are taxed, with an especially pronounced division in ETRC for intangibles. Finally, this new taxation data opens up many new questions about how to square the observed patterns of ETR with existing theories about capitalist divergence (Baccaro et al., 2022; Hall & Soskice, 2001).

5. Extensions and Further Research

For the next stage of our research, we will exploit major country-level shifts in ETRC/ETRL as quasi-experimental treatments and trace their effects on firm behaviour using micro-level data both at the firm level (Orbis) and at the sectoral level (IFR). We plan to estimate effects on investment, employment, and automation, exploiting where possible existing similarities between European economies.

Future work will also attempt to construct firm-level ETRC/ETRL estimates using Orbis data to identify substitution mechanisms. However, heterogeneity in reporting standards and possible reporting bias may limit the extent to which inferences can be drawn. Firm-level measures can both validate country-level trends and expose more micro-level dynamics.

6. Conclusion

This paper introduced a new dataset on effective tax rates on capital and labour across 29 European countries between 1998 and 2021—an empirical contribution that opens novel avenues for inquiry in comparative political economy. By adapting and extending the Acemoglu et al. (2020) methodology for ETR estimation to the European context, this dataset captures the actual fiscal incentives facing firms and workers.

In doing so, the paper makes several contributions. First, our original data demonstrates the persistent fiscal asymmetry between taxation of capital and labour in Europe. We believe that the insight that almost every EU economy makes hiring workers fiscally less attractive than investing in capital is particularly important in the context of rapidly evolving AI. Secondly, this new dataset provides new important avenues for research. The comparative variation we document, both in the levels and the balance of effective taxation on labour and capital, highlights the diverse ways in which European political economies reconcile fiscal extraction with economic coordination. This opens up new questions of how these patterns map onto existing ideal types. We believe this provides a new empirical foundation for studying the

fiscal allocative dimension of growth models — how states use taxation to balance investment, employment, and welfare financing. At the same time it enables systematic analysis of fiscal asymmetry: the persistent gap between capital and labour taxation that underpins distributive and political conflict. Finally, our work opens new opportunities to study how fiscal regimes drive as well as evolve under conditions of globalisation, automation, and EU-level coordination. By providing comparable measures of effective taxation on labour and capital over time, the dataset allows scholars to examine how national tax systems respond to competitive pressures, technological change, and supranational constraints. This makes it possible to analyse not only convergence and divergence in fiscal strategies across member states, but also the political and distributive trade-offs involved in adjusting taxation under shared European rules.

In bringing taxation more squarely into the analytical core of CPE, this dataset enables scholars to re-evaluate key debates on institutional change, the evolution of growth models, and the political foundations of distributive conflict (Baccaro et al., 2022; Hall & Soskice, 2001; Korpi, 2006; Streeck & Thelen, 2005). For one, we believe that by quantifying the asymmetry between capital and labour taxation, the dataset provides a systematic measure of one of the key institutional parameters underlying the distributive conflict central to power-resource theory (Korpi, 2006). At the same time, by highlighting how effective taxation regimes fail to map onto existing CPE ideal types, our work raises new questions about the fiscal underpinnings of capitalist diversity and the extent to which tax structures constitute a distinct dimension of institutional variation. Future research may therefore explore how tax policy mediates between firm strategies and macroeconomic outcomes, how fiscal structures align with coalitional politics, or how cross-national differences in taxation contribute to divergent paths of technological adaptation and structural adjustment. In this way, we respond to calls for a more integrated understanding of fiscal institutions as constitutive elements of contemporary capitalism (Haffert, 2021; Hakelberg and Seelkopf, 2021).

7. References

Acemoglu, D., Manera, A., & Restrepo, P. (2020). Does the US Tax Code Favor Automation? *Brookings Papers on Economic Activity*.

Alesina, A. (2009). Large Changes in Fiscal Policy: Taxes Versus Spending. *National Bureau of Economic Research*, (15438).

Alvaredo, F., Garbinti, B., & Piketty, T. (2017). On the Share of Inheritance in Aggregate Wealth: Europe and the USA, 1900–2010. *Economica*, *84*(334), 239–260.

Baccaro, L., Blyth, M., & Pontusson, J. (2022). *Diminishing Returns: The New Politics of Growth and Stagnation*. Oxford University Press.

Baccaro, L., & Pontusson, J. (2016). Rethinking Comparative Political Economy: The Growth Model Perspective. *Politics & Society*, *44*(2), 175–207.

Bachas, P., Fisher-Post, M. H., Jensen, A., & Zucman, G. (2022). *Capital Taxation, Development, and Globalization: Evidence from a Macro-Historical Database* (Working Paper No. 29819). National Bureau of Economic Research.

Barro, R. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, *98*(5), 103–125.

Beramendi, P., & Rueda, D. (2007). Social Democracy Constrained: Indirect Taxation in Industrialized Democracies. *British Journal of Political Science*, *37*(4), 619–641.

Bergh, A., & Erlingsson, G. (2009). Liberalization Without Retrenchment: Understanding the Consensus on Swedish Welfare State Reforms. *Scandinavian Political Studies*, *32*(1), 71–93.

Bernardi, L. (2011). *Economic crisis and taxation in Europe*. MPRA Paper.

Blanchard, O., & Quah, D. (1988). The Dynamic Effects of Aggregate Demand and Supply Disturbances. *National Bureau of Economic Research*, (2737).

Devereux, M. P., & Griffith, R. (1998). Taxes and the Location of Production: Evidence from a Panel of US Multinationals. *Journal of Public Economics*, *68*(3), 335–367.

Devereux, M. P., & Griffith, R. (2003). Evaluating Tax Policy for Location Decisions. *International Tax and Public Finance*, *10*(2), 107–126.

ECB. (2020). The Household Finance and Consumption Survey: Results from the 2017 wave. *Statistics Paper Series*, *36*.

EUKLEMS. (2019). Industry Level Growth and Productivity Data with Special Focus on Intangible Assets.

Fritschy, W. (1997). A History of the Income Tax in the Netherlands. *Revue belge de Philologie et d'Histoire*, *75*(4).

Genschel, P. (2002). Globalization, Tax Competition, and the Welfare State. *Politics & Society*, *30*(2), 245–275.

Gorter, J., & de Mooij, R. A. (2001). Capital Income Taxation in Europe: Trends and Trade-Offs. *CPB Netherlands Bureau for Economic Policy Analysis Discussion Paper*, (007).

Gruber, J., & Krueger, A. (1991). The Incidence of Mandated Employer-Provided Insurance: Lessons from Workers' Compensation Insurance. *Tax Policy and the Economy*, 111–143.

Haffert, L. (2021). Size and structure of the tax state in comparative perspective. In L. Hakelberg & L. Seelkopf (Eds.), *Handbook on the Politics of Taxation* (pp. 113–127). Edward Elgar.

Hakelberg, L., & Seelkopf, L. (2021). Introduction to the Handbook on the Politics of Taxation. In L. Hakelberg & L. Seelkopf (Eds.), *Handbook on the Politics of Taxation* (pp. 1–16). Edward Elgar.

Hall, P. A., & Soskice, D. (2001). *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford University Press.

Harding, M. (2013). Taxation of Dividend, Interest, and Capital Gain Income. *OECD Taxation Working Papers*.

Hettich, W., & Winer, S. L. (1999). *Democratic Choice and Taxation: A Theoretical and Empirical Analysis*. Cambridge University Press.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. Macmillan.

King, M. A., & Fullerton, D. (1984). *The Taxation of Income from Capital: A Comparative Study of the United States, the United Kingdom, Sweden, and West Germany*. University of Chicago Press.

Korpi, W. (2006). Power Resources and Employer-Centered Approaches in Explanations of Welfare States and Varieties of Capitalism: Protagonists, Consenters, and Antagonists. *World Politics*, *58*(2), 167–206.

Kostarakos, I., & Varthalitis, P. (2020). Effective Tax Rates in the EU: An updated database over 1995–2017. *Working Paper*.

Levi, M. (1988). *Of Rule and Revenue*. University of California Press.

Limberg, J. (2020). What's fair? Preferences for tax progressivity in the wake of the financial crisis. *Journal of Public Policy*, *40*(2), 171–193.

Martin, C. (1991). *Shifting the Burden: The Struggle over Growth and Corporate Taxation*. University of Chicago Press.

Melguizo, A., & González-Páramo, J. (2016). Who bears labour taxes and social contributions? A meta-analysis approach. *SERIEs 4*.

Meltzer, A. H., & Richard, S. F. (1981). A Rational Theory of the Size of Government. *Journal of Political Economy*, *89*(5), 914–927.

Mendoza, E. G., Razin, A., & Tesar, L. L. (1994). Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption. *Journal of Monetary Economics*, *34*(3), 297–323.

Musgrave, R. A. (1959). *The Theory of Public Finance: A Study in Public Economy*. McGraw-Hill.

OECD. (2021). Inheritance Taxation in OECD Countries. *OECD Tax Policy Studies*, *28*.

Ohlsson, H., Roine, J., & Waldenström, D. (2020). Inherited Wealth over the Path of Development: Sweden, 1810–2016. *Journal of the European Economic Association*, *18*(3), 1123–1157.

Olson, M. (1965). *The Logic of Collective Action: Public Goods and the Theory of Groups*. Harvard University Press.

Spengel, C., et al. (2025). *Mannheim Tax Index Update 2024 — Effective Tax Levels using the Devereux/Griffith Methodology*. Mannheim Taxation Project (ZEW Mannheim).

Steinmo, S. (1996). *Taxation and Democracy: Swedish, British and American Approaches to Financing the Modern State*. Yale University Press.

Streeck, W., & Thelen, K. (2005). *Beyond continuity: institutional change in advanced political economies*. Oxford University Press.

8. Appendices

Appendix A: Methodological Note

Effective Taxation on Capital

As discussed in the main text, due to national disparities in business law and data availability limitations, we focus on effective taxation on capital for equity-financed investments made by incorporated entities (equivalent to U.S. C corporations), and do not estimate ETRC for European equivalents of U.S. S corporations (pass-throughs) and for debt-financed investments. Following the Acemoglu et al. (2020) methodology, for an equity-financed C corporation, ETRC is estimated as:

$$\frac{1}{1-\tau^{k,j}_{\text{c-corp,equity}}} = \frac{1}{1-\tau^{e,c}} \cdot \left(\frac{r^e + \tilde{\delta}^j}{r^e} \frac{1-\alpha^j \cdot \tau^c}{1-\tau^c} - \frac{\tilde{\delta}^j}{r^e} \right),$$

where $\tau^{e,c}$ represents tax rate on income resulting from ownership of public equity, τ^c represents the corporate income tax rate, r^e is the pretax return to equity holders, δ^j is the total depreciation of the asset inclusive of investment price changes, and $\alpha^j \in (0,1)$ represents the present discounted value of depreciation allowances.

Tax on household-level income from ownership of public equity ($\tau^{e,c}$)

Acemoglu et al. (2020) estimates $\tau_t^{e,c}$ as:

$$\begin{aligned} \tau_t^{e,c} = \text{share directly owned}_t \cdot (&\text{share short-term ordinary}_t \cdot \tau_t^o \\ &+ \text{share long-term qualified}_t \cdot \tau_t^q \\ &+ \text{share held until death}_t \cdot 0\%). \end{aligned}$$

Acemoglu et al. (2020) assumes 60% of all capital gains are subject to the short-term rate, 20% are taxed at the (lower) long-term qualified rate, whereas the last 20% avoid all capital gains taxation because they are passed on through inheritance. This

methodological approach reflects the American tax system, but deviates considerably from those in many European countries. First, the U.S. tax system separates the long-term capital gain tax rate from the "ordinary" short-term capital gains and subjects it to a lower tax rate. Most European countries do not follow this practice for shareholding. The limited number of countries (the Czech Republic, Finland, Hungary, Luxembourg, and Slovenia) that separate short-term from long-term rates also have very different policies and wide-ranging holding-period requirements (ranging from 0.5 to 20 years) (Harding, 2013, p.33). As estimating holding percentages for this small minority of countries is not practicable, we—more conservatively—simplify the assumptions and assume all shares are taxed at the standard rate unless they are held until death. Following (Acemoglu et al., 2020), we assume 80% of shares have their gains realised before death, while the rest are subject to inheritance rules.

Second, the U.S. applies the step-up in basis rule on the death of the shareholder, which means that assets passed on at death are "stepped-up" to the fair market value at the time of the transfer, thereby leaving unrealised capital gains untaxed. This rule underlies the Acemoglu et al. (2020) assumption that shares held until death are untaxed on capital gains. Many European countries have different approaches in their tax systems. We rely on national-level inheritance taxation legislation (OECD, 2021) to divide countries into two groups. The first group consists of countries that directly tax unrealised capital gains at death (like Denmark or Hungary) and countries that apply a carry-over rule (e.g. Portugal, Spain and Finland), which implies that capital gains on inherited assets will eventually be taxed when the asset is sold. For these countries, the normal capital gains tax rate effectively applies to 100% of the assets. The second group consists of countries which either do not levy estate taxes or (like the U.S.) apply a step-up in basis rule, which leaves capital gains that are unrealised at death untaxed. For this group of countries, the remaining assets (20% by our standard assumption following Acemoglu et al. (2020)) are essentially subject to a 0% capital gains tax. For these countries, therefore, only 80% of all capital gains are taxed at the individual level.

Thus, we simplify the European version of the formula as:

$$\tau_t^{e,c} = \text{share directly owned}_t \cdot \text{share subject to taxation}_t \cdot \tau_t^o,$$

where the first term is equivalent to:

$$\frac{\text{equity held by households and non-profit organizations serving households}}{\text{total corporate equity}},$$

and the second term = 1 in direct taxation and carry-over countries, or = 1−% held until death in step-up in basis countries.

This allows us to estimate household-level taxation as:

$$\tau_t^{e,c} = \frac{\text{equity held by households}}{\text{total corporate equity}} \cdot \% \text{ subject to taxation} \cdot \tau_t^o.$$

This is generally equivalent to Acemoglu et al. (2020)'s computation, even as they used a composite term for the product of the first two terms, with the adjustments as documented above. We source household-held equity and total corporate equity from the ECB's 2021 data (the earliest available year) for the Euro area,[5] yielding an estimated share of approximately 22.9%. While this is likely an overestimate, it remains the best available estimate and is comparable to U.S. levels.

5 Fixed area EU27 data are not available.

Table 2: Taxation on unrealised capital gains upon death: classification of approaches.

Country	**System**	**Source**
Austria	Carry-over basis	OECD (2021)
Belgium	Step-up in basis	Taxpatria
Bulgaria	Step-up in basis	Accountancy Bulgaria
Croatia	Step-up in basis	PWC
Cyprus	Step-up in basis	PWC
Czech Republic	Step-up in basis	PWC
Denmark	Direct tax on capital gains	OECD (2021)
Estonia	Carry-over basis	OECD (2021)
Finland	Carry-over basis	OECD (2021)
France	Step-up in basis	OECD (2021)
Germany	Carry-over basis	OECD (2021)
Greece	Step-up in basis	IAPR
Hungary	Direct tax on capital gains	OECD (2021)
Ireland	Carry-over basis	OECD (2021)
Italy	Carry-over basis	OECD (2021)
Latvia	Step-up in basis	OECD (2021)
Lithuania	Step-up in basis	OECD (2021)
Luxembourg	Carry-over basis	OECD (2021)
Malta	Step-up in basis	Griffith Associates
the Netherlands	Carry-over basis	Dutch Tax Office
Norway	Carry-over basis	OECD (2021)
Poland	Step-up in basis	Tax Office Poland
Portugal	Step-up in basis	OECD (2021)
Romania	Step-up in basis	Kontas Management
Slovakia	Step-up in basis	OECD (2021)
Slovenia	Step-up in basis	OECD (2021)
Spain	Step-up in basis	OECD (2021)
Sweden	Carry-over basis	OECD (2021)
Switzerland	Carry-over basis	OECD (2021)

Although we follow the Acemoglu et al. (2020) assumption of 20% to maximise comparability and to ensure our estimates are conservative, we recognise that this figure is potentially below the actual rate at which financial assets are passed on. Data from the ECB Household Finance and Consumption Survey (ECB, 2020) indicates that financial assets make up around 35% of all household wealth in Europe. The best estimates indicate that 45% to 60% of this European wealth is inherited wealth (Alvaredo et al., 2017; Ohlsson et al., 2020). We therefore also run a robustness test where we increase the inheritance assumption to 40%. (See Figure 14 below.)

To estimate τ_{t^0}, (Acemoglu et al., 2020) used data on actual taxes paid on short-term dividends and capital gains. However, this is only practicable for the United States, whose large financial market allows for the assumption that most residents invest in the home market and are taxed at home. A similar assumption cannot be made for most smaller European economies. Therefore, we conservatively estimate the household rate with book rates as reported by the Mannheim Tax Project.

The Mannheim Tax Project's data input includes nine options on household-level taxation: tax rates on dividends, capital gains, and interests, each segmented by zero-rate, non-qualified top rate, and qualified top rate taxpayers. We believe zero-rates and rates on interest income are unlikely to be relevant to equity-financed investments. As our focus is on investment decisions, the incentives of qualified shareholders carry more weight than those of non-qualified shareholders.[6] In any case, differences between non-qualified and qualified top rates are generally not very significant.

The decision between using the dividend-rate versus the capital-gains-rate is trickier. In most other countries, capital gains tax rates tend to be lower than dividend tax rates; however, with a few exceptions (e.g. Belgium), these differences converge around

[6] We are grateful to Raymond Luja for this insight.

2005–2010. Thus, while we use the capital gains rate for our main results due to its important distributional consequences, we also run a check in which ETRC is computed with the qualified top dividend rate (see Figure 14 below).

Corporate income tax rate (τ^c)

Acemoglu et al. (2020) estimates the average marginal corporate income tax rate, τ_t^c simply as:

$$\tau_t^c = \frac{\text{corporate tax revenue}}{\text{net operating surplus of corporations}}.$$

In the Acemoglu et al. (2020) estimation, to arrive at the "true" tax base, the reported economic depreciation is added back, and the fiscal depreciation (tax allowance) is then subtracted. There is no European country-level data on total depreciation allowance claimed, and harmonisation of national-level data is difficult due to country-level reporting differences.[7]Therefore, we do not perform the same corrective exercise as (Acemoglu et al., 2020) and calculate the rate of corporate taxation based on net operating surplus after depreciation. We obtain data on the net operating surplus of corporations and on corporate tax revenue from
Eurostat (B2A3N and D51B C2, respectively).[8]

Pretax return to equity holders (r^e) and bond holders (r^b)

Pretax return on equity is necessary to calculate discount rates for equity holders. Acemoglu et al. (2020) uses the S&P 500 index to estimate r^e. We choose the MSCI Europe Index as a European equivalent to measure return on equity (ROE) as it provides a broad and diversified representation of the European equity market, and is widely used by institutional investors and researchers. The long time span and

[7] This has also been confirmed by the Mannheim Taxation Project researchers.
[8] D51B C2 is favoured over D51B as D51B is unreported for a large number of countries, and the two variables are substantially similar for the reported countries.

consistent methodology of the MSCI Europe Index also ensure comparability over time.

The average return on equity derived from MSCI data (almost 5%) is significantly higher than the S&P 500's 4.3% used by Acemoglu et al. (2020) for the United States. This is due to the differing time frames in the two datasets: while the Acemoglu et al. (2020) data incorporate S&P 500 returns from 1980 onward, the European dataset only extends back to 1998 due to issues of data availability, thereby capturing a period of higher market performance. The MSCI index is not unique in this fashion: most indices experienced comparatively high returns during the period in question. We include robustness checks using the S&P 500 for the same period below (see Figure 17 in Appendix B and accompanying text).

Depreciation allowance (fiscal)

The net present values of depreciation allowances are calculated at the book rates following the formulation (Acemoglu et al. (2020, A.64)):

$$\text{NPV of allowance}_t^j = d_0^j + \sum_{s=0}^{\infty} d_{s+1}^j \cdot \prod_{k=0}^{s} \frac{1 - d_k^j}{1 + r_{t+k+1}},$$

whered_s^j represents the discount schedule, or "the fraction of the investment that a firm is allowed to subtract from its tax liabilities s years after the purchase" (p.250). We use the depreciation schedule as supplied by the Mannheim Tax Project, which provides the raw depreciation schedule and the method of depreciation (straight-line, double-declining, switch or a specific schedule), and compute the allowance NPV accordingly for each of the asset categories: machinery, industrial buildings and intangibles.

Depreciation (economic)

Acemoglu et al. (2020) estimates economic depreciation as the difference in two variables: capital consumption and investment price changes. Capital consumption is calculated as the average value of:

$$\delta_t^j = \frac{\text{Fixed capital consumption}_t^j}{\text{Total fixed capital}_t^j}.$$

Unfortunately, for European economies, data on capital consumption is only available at the level of all fixed assets. This creates a significant problem for us, as we are interested in the portion of fixed assets that may substitute for labour—machinery, not buildings. Therefore, we obtain estimated capital consumption rates by asset class from EUKLEMS (EUKLEMS, 2019, p.42).

KLEMS classifies assets into the following ten types: computing equipment, communications equipment, computer software and databases, transport equipment, other machinery and equipment, non-residential buildings, residential buildings, cultivated assets, research and development, and other IPP assets (EUKLEMS, 2019, p.27). In the absence of the percentage composition of these asset categories in the pool of total fixed assets, we match the Mannheim asset categories to the category likely closest. Machinery is matched to other machinery and equipment, which includes all general-purpose machinery excepting computing, communication and transport equipment. Industrial buildings are matched to non-residential buildings. Finally, we use a middling R&D rate to approximate the level of economic depreciation for intangibles. Sensitivity analysis using a higher software depreciation rate can be found in Appendix B (Figure 16). All depreciation rates are for the market sector, excluding real estate, public administration, education, health, social work and activities of households (EUKLEMS, 2019, p.11).

While we believe EUKLEMS asset-type-level estimations provide the most accurate estimate of asset depreciation in the European context, we also obtain from Eurostat data on fixed capital consumption (P51C), as well as data on fixed assets (N11G and N11N). The quotient of the two provides a pooled estimate of EU capital consumption,

which—expectedly—is considerably lower than EUKLEMS estimate for machinery depreciation. See Appendix B (Figure 15) for how the two estimates compare.

Finally, the estimation of economic depreciation also incorporates investment price changes, which are derived from Eurostat inflation statistics, specifically the price level indices for gross fixed capital formation (PLI EU27 2007). This value is subtracted from all estimated capital consumption.

Summary

Our approach captures most of the methodological features of the Acemoglu et al. (2020)

ETR estimation. (1) We account for both firm-level and household-level taxation such that the ETR estimation reflects the full after-tax return that firms and owners consider. (2) We incorporate the net present value of depreciation allowances into the estimation of ETRC, such that accelerated allowances, which materially change near-term tax liabilities, are reflected in the estimation. (3) Instead of statutory rates alone, we use realised taxes to estimate corporate tax rates, on the premise that firms form investment decisions based on experienced fiscal outcomes. Important divergences have been discussed in the main text. For an overall comparison between data sources used for EU countries, see Table 3.

Effective Taxation on Labour

The Acemoglu et al. (2020) method of estimating the effective tax rate on labour is analogous to that on capital. It is defined as:

$$\tau^l = \frac{\text{salary} \cdot (\tau^h + \tau^p) + \text{benefits} \cdot (1 - \phi)}{\text{compensation}},$$

where τ_h represents personal income tax based on personal income taxes actually collected by the IRS; τ^p represents payroll taxes based on statutory rates; ϕ represents the discount rate of how benefits are imperfectly valued by workers (estimated at ϕ = 0.65 is based on previous literature). Our approach largely follows this formula, though two components are noteworthy: (1) The level of payroll taxes in EU countries (τ^p) is generally very low. However, τ_p can be computed for the few countries that levy payroll taxes directly using Eurostat data. (2) There are potentially cultural differences in how benefits are valued by American versus European workers. Acemoglu et al. (2020) uses an estimation of 65% based on Gruber & Krueger (1991). As similar results are reported for Europe by (Melguizo & Gonzalez-Paramo, 2016) and to avoid introducing heterogeneity, we use the same estimate for all European countries. For a comparison between U.S. and EU data sources, see Table 4.

Variable	Component	US Computation	EU Computation
$\tau_{e,c}$	% shares owned by households	FRED corporate equities owned by households data	ECB corporate equities owned by households (2021 data only)
	% shares realised shortterm	OTA data	Assume 80% for all realised before death (same as Acemoglu et al. (2020))
	Average household tax rate (short-term)	OTA data (taxes paid on short-term dividends/capital gains)	Mannheim statutory rates
	% shares realised longterm	Assumed half of remaining (20%)	N/A
	Average household tax rate (long-term)	OTA data (taxes paid on long-term capital gains)	N/A
τ_c	Total corporate tax collected	BEA NIPA Tables	Eurostat taxag series
	Corporate net operating surplus	BEA NIPA Tables	Eurostat nf tr series
	Consumption of fixed capital	BEA NIPA Tables	Assume consumption = allowance
	Capital consumption allowance	BEA NIPA Tables	Assume consumption = consumption allowance
r_e	Realized inflation	FRED data	Eurostat prc hicp aind series
	Return on equity	S&P 500	MSCI Europe Index (also S&P 500)
δ_j	Asset depreciation	BEA fixed asset tables	EUKLEMS estimation (by class); Eurostat nf tr & nf bsa series
	Change in investment prices	BEA fixed asset tables	Eurostat nama 10 gdp series (CLV)
α_j	Depreciation allowances	IRS Publication 946 etc.	Mannheim statutory rates

Table 3: Adaptation of EU sources to the Acemoglu et al. (2020) method of ETRC estimation.

Variable	US Computation	EU Computation

Compensation	BEA NIPA Table	Eurostat nf tr series
Benefits	BEA NIPA Table	Eurostat taxag series
Income tax	IRS SOI Tax Stats (bottom 95%)	Eurostat taxag series (all)
Income tax base	IRS SOI Tax Stats (bottom 95%)	Eurostat nf tr series (all)
Payroll tax rate (τ^p)	Social Security Administration website (statutory)	Eurostat taxag series (actual)
Valuation of benefits (ϕ)	65% (Gruber & Krueger, 1991)	Similar to US levels (Melguizo & González-Paramo, 2016)

Table 4: Adaptation of EU sources to the Acemoglu et al. (2020) method of ETRL estimation.

Appendix B: Robustness and Sensitivity Checks

Household-level Tax Rate

Figure 14 shows different ETRC (machinery) estimations using the qualified top dividend rate versus the qualified top capital gains rate at a 60% realised capital gains ratio and at an 80% realised capital gains ratio.

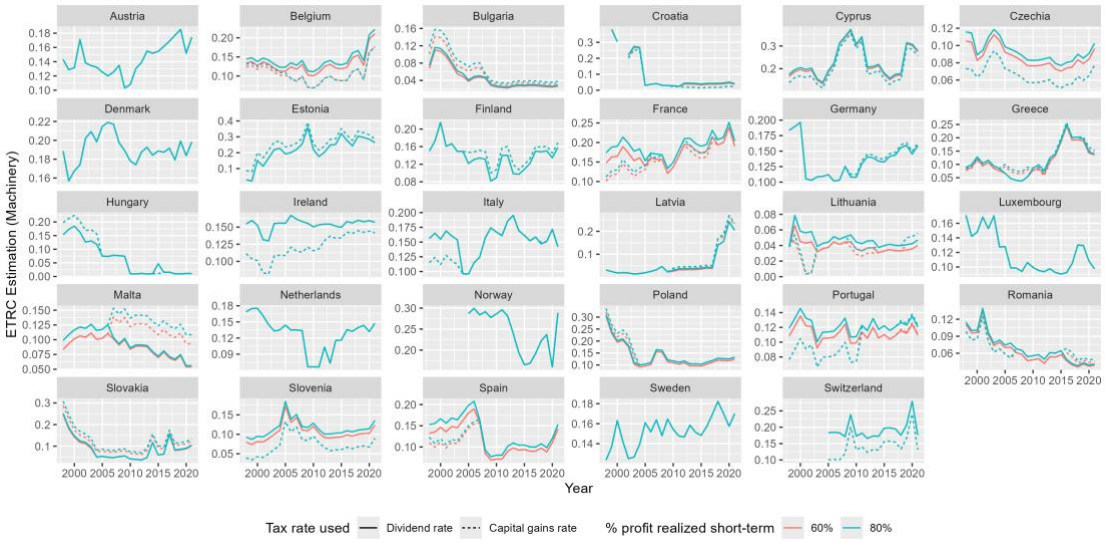

Figure 14: ETRC (machinery) estimation with different assumptions on the percentage of capital gains realised before shareholder death (note that for countries that do not follow the step-up in basis rule, there is no difference), calculated at the dividend tax rate and at the qualified capital gains tax rate, respectively.

Rates of Economic Depreciation

Figure 15 shows how ETRC (machinery) estimations differ when the Eurostat pooled depreciation rate is used instead of the EUKLEMS asset class rate. As expected, using the lower (pooled) economic depreciation rate—while depreciation allowances stay the same—translates into more fiscal generosity.

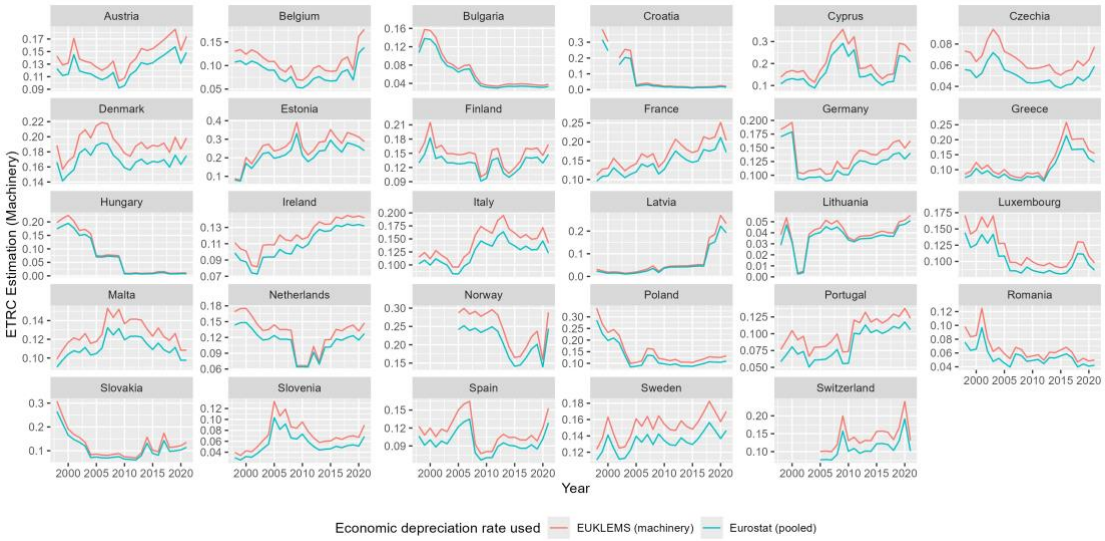

Figure 15: ETRC (machinery) estimated with EUKLEMS machinery category estimation of annual economic depreciation, versus estimated with Eurostat pooled economic depreciation.

For the estimation of ETRC (intangibles), our main results have used a 20% annual rate of economic depreciation. Figure 16 shows how the estimates change when a higher rate of depreciation (31.5% for software/database) is used.

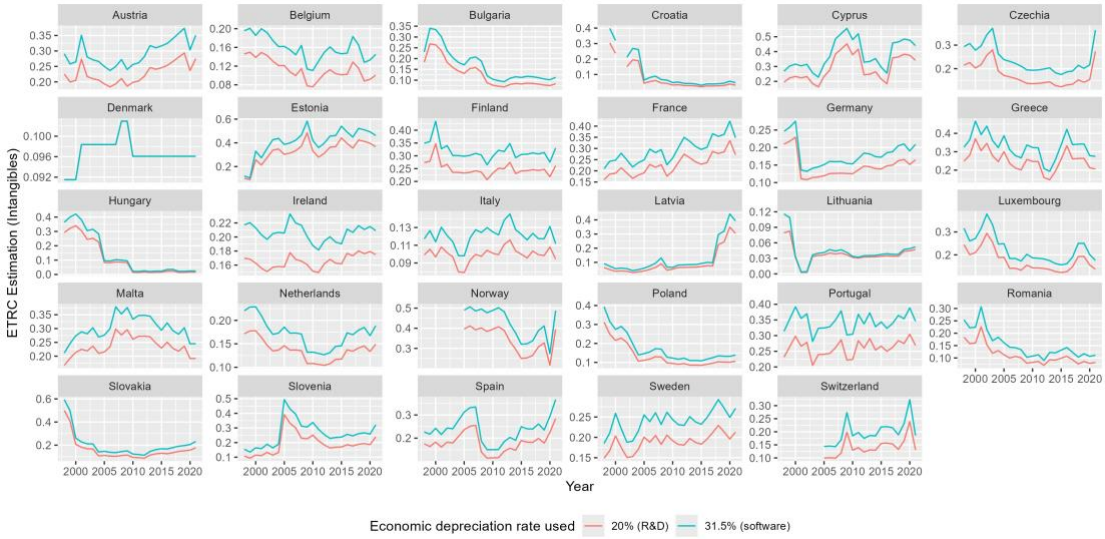

Figure 16: ETRC (intangibles) estimated with R&D-level economic depreciation (20%) versus software-level economic depreciation (31.5%) (both from EUKLEMS).

Rates of Return (Equity)

For return on equity, the S&P 500 index is more suitably employed to capture firms with a global orientation, and the MSCI Europe Index is more representative of companies focused on the European market. Returns on the S&P 500 are substantially higher than those on the MSCI Europe Index during the period 1998–2021, leading to a lower overall estimated depreciation allowance. As Figure 17 shows, using the S&P 500 Index yields an estimate that is consistently higher by several percentage points compared to that estimated with the MSCI Europe Index, but the estimates are not substantially different in terms of cross-national and inter-temporal variations.

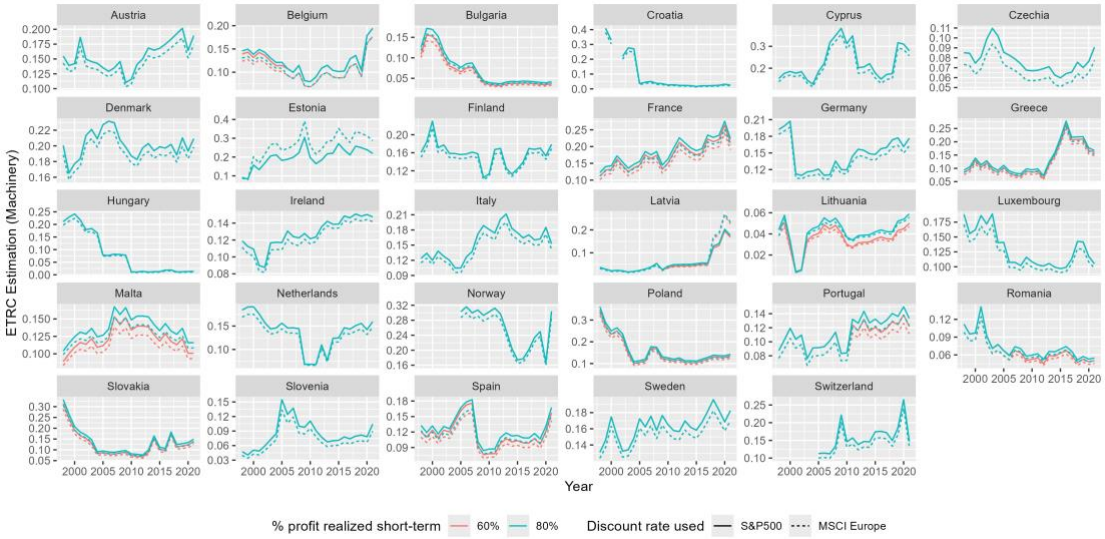

Figure 17: ETRC (machinery) estimated with the MSCI Europe Index and with the S&P 500 Index average returns, respectively, under different assumptions of realised capital gains.

Appendix C: ETRC and ETRL 1998–2021, European Averages

	Year	ETRC (weighted)	ETRL (weighted)	ETRL−ETRC
1	1998	0.145	0.255	0.109
2	1999	0.150	0.257	0.108
3	2000	0.152	0.255	0.103
4	2001	0.132	0.250	0.118
5	2002	0.125	0.247	0.122
6	2003	0.119	0.247	0.128
7	2004	0.119	0.245	0.126
8	2005	0.126	0.244	0.119
9	2006	0.131	0.247	0.116
10	2007	0.133	0.250	0.117
11	2008	0.137	0.250	0.112
12	2009	0.125	0.245	0.121
13	2010	0.123	0.245	0.122
14	2011	0.136	0.247	0.111
15	2012	0.150	0.254	0.104
16	2013	0.148	0.258	0.110
17	2014	0.141	0.260	0.120
18	2015	0.139	0.260	0.122
19	2016	0.143	0.259	0.116
20	2017	0.152	0.261	0.109

21	2018	0.154	0.261	0.107
22	2019	0.156	0.262	0.106
23	2020	0.164	0.264	0.100
24	2021	0.161	0.268	0.107

Table 5: Average effective tax rates on capital (machinery) and labour across 29 European countries, 1998–2021, weighted by GDP, and with outliers (Croatia 1998 & 2001) removed.

Appendix D: Country-level ETRC and ETRL, Totals, Differences and Range 1998–2021

	Country	Mean ETRC	Mean ETRL	Total ETR	ETRC-ETRL	Range ETRC	Range ETRL
1	Austria	0.144	0.318	0.461	-0.174	0.082	0.031
2	Belgium	0.108	0.277	0.385	-0.169	0.108	0.023
3	Bulgaria	0.067	0.135	0.202	-0.067	0.124	0.080
4	Croatia	0.081	0.142	0.224	-0.061	0.368	0.039
5	Cyprus	0.207	0.132	0.339	0.075	0.240	0.052
6	Czechia	0.066	0.191	0.257	-0.124	0.043	0.020
7	Denmark	0.191	0.499	0.689	-0.308	0.062	0.091
8	Estonia	0.258	0.193	0.451	0.066	0.311	0.040
9	Finland	0.148	0.312	0.460	-0.164	0.115	0.048
10	France	0.168	0.258	0.426	-0.089	0.140	0.040
11	Germany	0.137	0.243	0.380	-0.106	0.095	0.026
12	Greece	0.125	0.177	0.302	-0.052	0.190	0.046
13	Hungary	0.077	0.203	0.280	-0.126	0.215	0.047
14	Ireland	0.121	0.226	0.347	-0.105	0.063	0.037
15	Italy	0.143	0.272	0.415	-0.129	0.099	0.048
16	Latvia	0.064	0.179	0.242	-0.115	0.255	0.034
17	Lithuania	0.040	0.190	0.230	-0.150	0.052	0.049
18	Luxembourg	0.118	0.293	0.411	-0.175	0.081	0.147
19	Malta	0.126	0.151	0.277	-0.024	0.054	0.064
20	Netherlands	0.128	0.226	0.354	-0.098	0.109	0.065
21	Norway	0.245	0.285	0.530	-0.040	0.140	0.043
22	Poland	0.151	0.181	0.332	-0.030	0.237	0.044
23	Portugal	0.103	0.159	0.262	-0.057	0.071	0.060
24	Romania	0.066	0.139	0.205	-0.073	0.078	0.041
25	Slovakia	0.126	0.165	0.292	-0.039	0.238	0.029
26	Slovenia	0.071	0.202	0.274	-0.131	0.099	0.038
27	Spain	0.113	0.191	0.304	-0.077	0.087	0.050
28	Sweden	0.152	0.535	0.688	-0.383	0.059	0.141
29	Switzerland	0.142	0.173	0.315	-0.031	0.141	0.016

Table 6: ETRC/ETRL mean, sum, difference and range by country, across 1998–2021.