Why Is Corporate Tax Revenue Stable While Tax Rates Fall? Evidence from Firm-Level Data

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Abstract

While corporate tax rates in OECD countries declined over the last decades, revenues from corporate taxation relative to GDP remained remarkably stable. This paper uses a comprehensive firm-level dataset to provide an explanation for this rate-revenue puzzle in corporate taxation. Focusing on the period 1995-2016, we show that the reduction in corporate tax rates was counterbalanced by a pronounced increase in corporate profits before taxes. We decompose the rise in profits into changes in EBITDA, depreciation, and financial profits. On average, these three factors contributed almost equally to the tax base expansion, albeit differently across sectors, countries, and firm sizes.

JEL-Codes: H250.

Keywords: corporate income taxation, corporate tax revenues, corporate profitability.

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1   Introduction

Corporate tax rates in most countries declined considerably over the last two decades. Between 1995 and 2016, the average rate in the OECD fell by more than a third, from 37.3% to 24.5% (Figure 1). At the same time, the share of corporate tax revenues in GDP did not decrease, averaging 3.0% both at the beginning and the end of the sample period. Thus, corporate income taxation continues to be an important source of revenue for governments. These developments of corporate income tax (CIT) rates and revenues seem contradictory at first glance and are sometimes referred to as the rate-revenue puzzle in corporate taxation (Nicodème *et al.*, 2018).

This paper uses firm-level data to explain why CIT revenues have not declined despite the pronounced decrease in statutory tax rates. Our analysis is based on a comprehensive firm-level dataset from Bureau van Dijk's Orbis database, covering 33 OECD countries over the period of 1995-2016. The main dataset contains unconsolidated financial information for more than 12 million firm-year observations from over 2.5 million companies. We use this comprehensive dataset to first describe the developments of corporate taxes paid and the corporate tax base measured by pre-tax profits.[1] In a second step, we exploit the firm-level data to decompose changes in pre-tax profits into three components: earnings before interest, taxes, depreciation, and amortization (EBITDA), depreciation, and financial profit/loss.

The development of corporate tax revenues in our firm-level dataset closely mirrors the trends observed in country-level data. Even though reduced statutory CIT rates also translated into lower effective tax rates, an expansion of the tax base counterbalanced these changes, resulting in stable tax revenues. For our main sample, we find an increase in pre-tax profits relative to added value of 8.57 percentage points or 63.4% between 1995 and 2016. This substantial increase in the tax base was partially due to a reduction in the share of depreciation in added value by 3.17 percentage points, accounting for 37% of the expansion of the tax base. Higher financial profits explain another 37% of the rise in the tax base. The remaining 26% were the result of rising EBITDA. Moreover, our firm-level data allows for an analysis of heterogeneous developments in different sub-groups, based on firm size, industry, and location. For instance, the largest percent of companies in our sample experienced a much stronger increase in EBITDA, accounting for over 40% of the tax base expansion in this group. Results on the tax base components also differ strongly between industries and countries.

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[1] While we take the downward trend in corporate tax rates as given and focus on the development of tax revenues, there exists a large body of literature aiming to explain the decline in corporate tax rates. Early models on the impact of tax competition on tax rates come from Zodrow & Mieszkowski (1986) and Wilson (1986). Devereux *et al.* (2008), for instance, provide empirical evidence on the downward pressure on tax rates due to tax competition. Altshuler & Goodspeed (2015) discuss the role of the United States as a Stackelberg leader inducing tax cuts in many other countries with its 1986 tax reform.

Our firm-level analysis of corporate tax revenue complements the existing literature in this area, which mostly relies on aggregate data not allowing for more detailed decompositions or the construction of sub-samples. Previous work on corporate tax revenues comes from Sørensen (2007), who looks at the development of corporate income tax revenues in OECD countries over the period of 1982-2004. In line with De Mooij & Nicodème (2007), Sørensen (2007) concludes that stable revenues are partially driven by an increasing share of the corporate sector in the economy. Similar results are reported by Piotrowska & Vanborren (2008) for a sample of European countries. Several papers investigate changes in the definition of the corporate tax base. Loretz (2008) approximates the tax base definition by the net present value of capital allowances and finds that reductions in corporate tax rates over the last decades were often accompanied by base-broadening reforms. This is in line with the findings of Kawano & Slemrod (2016) and Nicodème et al. (2018). Blouin et al. (2014) focus on caps in interest deductibility and report an increase in the number of countries with thin capitalization regimes over time. A small number of papers use sectoral or firm-level data to investigate revenue trends for individual countries. Devereux et al. (2004) analyze the development of corporate tax revenue in the United Kingdom and emphasize the role of rising profits in the financial sector. Auerbach (2007) focuses on the United States and argues that the increase in the average CIT rate observed in the early 2000s is largely resulting from loss offset limitations. Lastly, some papers look at the experiences of developing countries going beyond our focus on OECD countries. As shown by Abramovsky et al. (2014), tax rate cuts in developing countries where often accompanied by a narrowing of the tax base contrasting the trend seen in developed countries (also see Keen & Simone, 2004).

While the analysis of firm-level data in this paper provides new insights on the underlying developments driving corporate tax revenues, our results should be interpreted in light of the limitations of the data we use. First of all, the firms in our datasets are unlikely to be perfectly representative. In addition, book-tax differences imply that the information retrieved from financial accounting data can only serve as imperfect proxies for actual developments of tax payments and the tax base. However, our dataset covers a significant part of total economic activity, the development of tax revenue in our data is very similar to the developments found for aggregated tax revenue measures, and our main results are robust to a number of tests.

The remainder of the paper is structured as follows: Section 2 introduces the conceptual framework of our analysis, Section 3 describes the data. The results of our analysis are presented in Section 4. Section 5 discusses our findings, before Section 6 offers a short conclusion.

2 Conceptual framework

The standard approach to explore developments of corporate tax revenues over time is based on Sørensen (2007) and decomposes changes in CIT revenues relative to GDP into three factors as follows:

$$\frac{CIT\ Revenue}{GDP} = \frac{CIT\ Revenue}{C} \cdot \frac{C}{B} \cdot \frac{B}{GDP} \tag{1}$$

where C represents total corporate income and B total business income.[2] Consequently, changes in the effective tax burden relative to total profits from the corporate sector are measured by ($CIT\ Revenue/C$), (C/B) describes changes in the structure of the business sector, and (B/GDP) stands for changes in the size of the business sector.

Our conceptual framework, in contrast, may be regarded as a 'bottom-up approach': we use firm-level data, which we aggregate by year over all countries and firms in our sample. This allows us to disentangle the different components of the corporate tax base and to quantify their respective contributions to aggregate CIT revenue. At the firm level, tax payments are equal to the product of the statutory tax rate applicable (τ) and the tax base. Aggregate revenue in country j in year t can then be calculated as the sum of revenues over all firms i:

$$\sum_{i,j} CIT\ Revenue_{i,j,t} = \sum_{i,j}(\tau_{i,j,t} \cdot Tax\ Base_{i,j,t}) \tag{2}$$

This paper focuses on changes in the composition of the tax base. At the firm level, the closest equivalent to the tax base available in our data are pre-tax profits. These can be decomposed into three components: ($EBITDA$), financial profit/loss ($FinPL$), and $Depreciation$. Making use of this decomposition, we can rewrite Equation (2) in the following way:

$$\sum_{i,j} CIT\ Revenue_{i,j,t} = \sum_{i,j}[\tau_{i,j,t} \cdot (EBITDA_{i,j,t} + FinPL_{i,j,t} - Depreciation_{i,j,t})] \tag{3}$$

$EBITDA$ indicates how much profit a firm generates with its present assets and ordinary business activities. This measure allows for a comparison of profitability across firms despite differences in leverage, location, or collection of assets as it does not take into account interest payments, taxation, and depreciation. $FinPL$ is the financial result, defined as the difference between financial revenues and financial expenses, including interest payments. $Depreciation$ represents depreciation and amortization. In the following, we will use this decomposition to investigate the drivers of the developments observed in the corporate tax base.

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[2] Sørensen (2007) refers to B as "total profit earned in the economy as a whole" (p. 8). B therefore includes profits that are not attributed to the corporate sector.

3 Data

3.1 Sources and sample

The analysis is mostly based on firm-level data from Bureau van Dijk's Orbis database. We complement our firm-level data with country-level information on gross value added, GDP, and the size of the corporate sector from the OECD Annual National Accounts Statistics. Data on statutory tax rates is taken from KPMG's Corporate Tax Surveys and EY's Annual Worldwide Corporate Tax Guides.[3]

Our main sample is unbalanced and covers the period of 1995-2016. To construct this sample, we obtained unconsolidated financial information on all companies from OECD countries for which such data is available in Orbis. We excluded company-year observations with missing information on one or more of the main variables used in the analysis (pre-tax profits, taxes paid, depreciation, EBITDA, financial profit/loss, and added value). In addition, we excluded observations for which Orbis reports negative or zero total assets, negative or zero added value, or a negative number of employees, as well as firms not active in the corporate sector. The latter were identified based on their NACE-industry code. Lastly, we dropped companies with extreme values in the share of the main variables in added value.[4] The resulting sample comprises 12,063,836 firm-year observations for 2,608,778 unique companies from 33 OECD countries. Table A.1 in the Appendix gives an overview on the number of firms and observations in the sample by country.

Naturally, the unbalanced sample changes over time in terms of the total number of observations available. To account for this, we express all relevant variables in the analysis as shares in added value. Added value at the firm level reflects the value of goods or services produced after accounting for intermediate inputs. Aggregate added value is a close proxy for GDP as shown by Figure A.1 in the Appendix and therefore allows for an intuitive interpretation of results.[5]

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[3] All CIT rates used are the top statutory rates taking into account all levels of government on 1 January of the respective year. CIT rates of countries with different regional or local taxes reflect national averages.

[4] To be more specific, we excluded the observations below the 1st and above the 99th percentile of the distribution in these ratios. In a robustness check, we construct a sample where instead all companies with values above a fixed threshold in these ratios are dropped.

[5] The ratio of gross value added to GDP is largely constant over time at around 0.9. As we only look at changes over time, the small level difference has no major impact on our results.

3.2   Summary statistics

Section A of Table 1 reports summary statistics in terms of absolute values at the firm level. Detailed variable definitions are provided in the Appendix (Table A.2). The average firm in our sample has around 60 employees and total assets of about EUR 15.7 million. The mean value of financial profits is negative, which implies that on average, firms' financial expenses including interest payments exceed their financial revenues. Depreciation is defined positively with a mean of EUR 0.45 million. EBITDA and pre-tax profits of our average firm are EUR 1.25 million and EUR 0.72 million respectively. Our full sample also contains loss-making firms and firms with negative tax payments in order to provide a full picture on the distribution of profits within the corporate sector.[6]

Taxes paid reflect tax payments of the firm as indicated in the financial statements of the firm. We are aware that book-tax differences exist and that the information from accounting data is only an imperfect proxy of actual tax payments.[7] While financial statements are compiled following international financial reporting standards (IFRS) or generally accepted accounting principles (GAAP), actual tax payments are determined by national tax laws. Similarly, our measure of the tax base – pre-tax profits – and the values for depreciation are not perfect in this regard. Given that we are mainly interested in developments over time at the aggregate level, we are still confident that our data picks up the relevant trends.

The substantial difference between mean and median values for most variables shows that the sample comprises many small firms. By weighing all relevant variables by added value at the firm level, we account for the fact that these firms do not significantly contribute to overall tax revenue. Part B of Table 1 shows the shares of the main variables in added value. They are computed by summing the respective variable over all firms in a given year and dividing by the sum of added value in that year. The mean share of pre-tax profits in added value is 20.7%, which can be constructed as the sum of EBITDA (35.8%) and financial profit/loss (-2.2%), minus the value of depreciation (12.9%). The average share of taxes paid in added value is 5.7%, resulting in a mean effective tax rate (taxes paid in pre-tax profits) of 27.6%.

The suitability of pre-tax profits as a measure for the tax base is confirmed by Figure A.2 in the Appendix which plots the development of actual aggregate tax payments in our sample alongside a measure of hypothetical tax revenue. This measure is calculated by multiplying aggregate pre-tax profits from our data with the statutory tax rate of the firm's location country.

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[6] In Section 4.2, we report results for a sample that excludes firms with negative profits and show that results are not distorted by including them in our main analysis.

[7] Graham *et al.* (2012) as well as Hanlon & Heitzman (2010) provide overviews of the accounting literature on book-tax differences.

Throughout the sample period, the two measures yield very similar results and develop largely in parallel.

3.3 Coverage

Table 2 shows the coverage of our main sample in terms of added value relative to total added value according to country-level data. Since coverage of US firms is low but the United States makes up close to 50% of total added value of the sample countries, we also report coverage without US companies. Average coverage for all countries without the Unites States is 23.1% of total added value between 1995 and 2016. In general, coverage increases over time, from about 6% between 1995 and 1999 to 36.1% for the years 2010-2016. If the United States and US firms in the sample are taken into account, total coverage is 13.4% on average. At the same time, coverage varies considerably between countries. Over the full sample period, our sample covers more than a third of added value for Spain (37.89%), Italy (34.68%), and the Czech Republic (33.72%), but less than 1% of added value for the United States (0.97), Greece (0.52), and Turkey (0.22).[8]

For the validity of our analysis, it is crucial that our firm-level sample is able to reproduce the main developments visible at the aggregate level. Figure 2 shows the development of CIT revenues relative to added value according to our firm-level sample and the development of CIT revenues in GDP based on country-level data from the OECD Global Revenue Statistics. While there are small differences in levels, the development over the full sample period of 1995-2016 is very comparable. This provides support for the suitability of our sample to disentangle the developments of the tax base components at the firm level.

4 Results

4.1 Main sample

In this section, we first investigate the developments of CIT rates, corporate tax payments, and the tax base measured by pre-tax profits based on our firm-level dataset. In a second step, we decompose the developments of the tax base into changes in EBITDA, depreciation, and financial profit/loss.

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[8] The substantial variation in coverage across countries is similarly reported by Kalemli-Ozcan *et al.* (2015). Note that we attribute a companies' unconsolidated financial results to a country based on the country a firm is registered in. As companies may have business activities in several countries, this can only be a rough approximation. However, our data does not allow to sensibly divide the information of an individual company across different countries.

CIT rates, tax payments, and tax base

As discussed above, country-level data shows that the sharp decline in statutory CIT rates has not resulted in reduced revenues from corporate taxation. Figure 3 looks at this development based on our firm-level sample for the period of 1995-2016. All variables are aggregated across firms, whereas individual firms are weighted by their added value. The weighted mean of statutory tax rates declined by 16.4 percentage points from 42.9% in 1995 to 26.5% in 2016.[9] The effective tax rate defined as tax payments in pre-tax profits developed almost identically to the statutory tax rate. Between 1995 and 2016, the effective tax rate fell from 37.7% to 23.4%.[10]

In contrast, tax payments expressed as share in added value remained relatively stable between 5% and 6%. The values of 1995 and 2016 only differ by 0.1 percentage points (5.2% and 5.1%, respectively). One explanation for this is the significant increase in pre-tax profits as a measure of the tax base. The share of pre-tax profits in added value for the firms in our sample rose from 13.5% in 1995 to 22.1% in 2016 (+8.6 percentage points).

To further investigate the timing of the developments, Panel A of Figure 4 shows percentage point changes in CIT rates, taxes paid in added value, and pre-tax profits in added value for four sub-periods: 1995-2000, 2000-2005, 2005-2010, and 2010-2016. The CIT rate decreased in all four of these sub-periods, but the decline was stronger in the first three with an average of 4.70 percentage points. From 2010-2016 the decrease in statutory rates was only half this size with 2.35 percentage points. Corporate tax payments increased in the first half of the sample period by a total of 1.74 percentage points in added value, but declined by 1.46 percentage points between 2005 and 2010. Between 2010 and 2016 tax payments remained more or less constant (-0.20 percentage points). The decline in tax payments from 2005-2010 was due to a combination of lower rates and smaller tax base after the 2008/09 financial crisis. In all other periods, the tax base measured by pre-tax profits in added value increased and offset or even overcompensated the effects of the declining statutory rate. The strongest increase in the share of pre-tax profits in added value occurred between 2000 and 2005 (+6.13 percentage points).

Table A.3 in the Appendix presents the results expressed as changes in percent. It includes an additional column showing the hypothetical revenue (statutory CIT rate times pre-tax profits). The differences between the hypothetical revenue and the actual taxes paid are small, again confirming the suitability of our tax base measure. According to Table A.3, the percentage change in hypothetical revenue of 0.76% over the full sample period is explained by a change

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[9] Note that we rely on statutory tax rates of the country a company is registered in.

[10] In relative terms, this implies a reduction of 38.0%, compared to a reduction of 38.3% in the statutory rate.

in CIT rates of -38.35% and a base change of +63.44%.[11] The actual revenue change in our data of +1.34% is close to the development expected based on this calculation.

Decomposing the changes in the tax base

The detailed firm-level data allows us to decompose the development of the tax base. Pre-tax profits as our tax-base measure can be broken down into three components: EBITDA, depreciation, and financial profit/loss (Equation (3) in Section 2). Panel B of Figure 4 summarizes the changes of the different components for the sub-periods as defined above in percentage points, the full developments over time are shown by Figure A.3.

The strong increase in the tax base over the first half of the sample period by a total of 8.79 percentage points is driven by a rising share of financial profits in added value (+3.62 percentage points in total between 1995 and 2005) and lower depreciation (-3.38 percentage points). The share of EBITDA in added value only increased by 1.79 percentage points between 1995 and 2005. The additive relationship between the different components of the tax base allows to calculate their respective contributions in percent. Between 1995 and 2005, higher financial income of firms contributed 41.2% to the increase in the tax base, lower depreciation contributed 38.4%. Higher EBITDA of firms account for the remaining share of 20.4%.

The contraction of the tax base from 2005-2010 by 2.56 percentage points was primarily the result of a decline in EBITDA of 2.58 percentage points, potentially due to the global financial crisis which falls in this period. In addition, lower financial profits offset the reduction in deprecation. In the last sub-period of 2010-2016, the tax base expanded by 2.34 percentage points in total. Again, this development was mainly driven by changes in EBITDA, which increased by 3.06 percentage points. Financial profits remained almost unchanged (+0.15 percentage points), while depreciation rose by 0.87 percentage points, partially offsetting the increase in EBITDA.

For the full sample period, the increase in pre-tax profits by 8.57 percentage points can be decomposed as follows: EBITDA rose by 2.26 percentage points, accounting for 26.4% of the change in the tax base. 36.6% of the increase in the tax base can be attributed to higher financial income of firms (+3.14 percentage points). A decline in depreciation by 3.17 percentage points accounts for 37.0% of the growth in the tax base.

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[11] This can be calculated as follows: $0.76\% = -38.35\% + 63.44\% + (-38.35\% \cdot 63.44\%)$.

4.2 Robustness checks

Excluding loss-making firms

The main sample includes loss-making firms and companies with negative tax payments. Yet, negative tax payments often reflect subsidies that are unrelated to CIT rates, but reflect other institutional arrangements in the respective countries or may even be determined on a case by case basis. Negative profits in one year may lead to loss-carryforwards influencing tax payments in subsequent years and thereby weaken the relationship between our yearly measure of the tax base and the tax rate. For these reasons, Table 3 shows the main results for (I) a sample that only includes companies with positive tax payments and pre-tax profits and (II) for a sample that excludes all companies that report negative pre-tax profits in any year of the sample period. While especially the second restriction reduces the number of observations substantially, the developments in the key variables for these sample are similar to those for the full sample. We find a substantial decline in the weighted CIT rate of more than 16 percentage points which was offset by an expansion of the tax base resulting in largely unchanged tax payments. Regarding the development of the tax base components, however, there are some differences to the main sample. When firms with negative pre-tax profits or taxes paid are excluded, the increase in EBITDA was only responsible for 16.8% of the rise in the tax base. Lower depreciation, in contrast, accounted for more than 50%. If firms with negative pre-tax profits in any year of the sample period are excluded, this change becomes even more pronounced. For this sample, lower depreciation accounted for 63.3% of the tax base expansion, the increase in EBITDA only contributed 10.8%.

Reweighting by industry

The industry composition of our main sample is not necessarily representative. To test whether this affects the results, we reweigh our sample by using industry-level added value from country-level data provided by the OECD's National Accounts database. The reweighting is conducted by NACE-letter groups. If our sample is not representative in terms of industry coverage, but representative within sectors, the reweighting should eliminate potential biases from this source. The development of the main variables between 1995 and 2016 for the reweighted sample are shown in Row (III) of Table 3.[12] The main findings on the CIT rate, corporate taxes paid, and the tax base remain largely unchanged by the reweighting. A difference that stands out relative to the main sample is the large increase in EBITDA by 6.46 percentage points. This change accounts for 71.4% of the increase in pre-tax profits in the reweighted sample. The larger increase in EBITDA may be caused by a more pronounced rise in the profitability of sectors not covered well in Orbis compared to sectors that are covered better. In general, the results of

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[12] As the sectoral data is not available for all countries, the number of observations is slightly lower than in the main sample.

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the reweighting should be treated with some caution, as the number of firms in some sectors is relatively low, especially in the early years of the sample period. Below, we will provide a more detailed analysis of individual sectors.

Fixed cutoffs

Instead of excluding outliers based on percentiles, we also construct a dataset in which outliers are dropped based on fixed cutoffs. Specifically, we drop all observations, for which any of the main ratios in added value (pre-tax profits, taxes paid, EBITDA, financial profit/loss, and depreciation) exceed 100% or are below -100%. The number of observations in the resulting sample is similar to the main sample. Row (IV) of Table 3 shows the changes in the main variables over the sample period. The main results again closely reflect the findings for the main sample. The largest difference can be observed in the financial profit/loss, which increased by 5.78 percentage points in the sample with fixed cutoffs, compared to an increase of 3.14 percentage points in the main sample. This also leads to a larger rise of pre-tax profits in added value (+11.19 percentage points).

Balanced sample

As a last robustness check, we construct a balanced dataset. Looking at a balanced sample helps to check for potential biases stemming from the increasing coverage of Orbis and resulting changes in the sample composition over time. The construction of the balanced panel involves a trade-off between the length of the panel and the number of companies that can be included. Due to the limited number of observations in the early years of the sample, we only use half of our previous sample period for the balanced sample (2005-2015). The resulting sample contains 1,072,005 firm-year observations of 97,455 unique firms from 21 countries. Summary statistics for the balanced sample are provided in Table A.4 in the Appendix. When comparing the summary statistics of the unbalanced and balanced panels, it has to be kept in mind that the sample period and the country composition of the two samples are different. Nevertheless, all variables show similar magnitudes in terms of their means. This holds for levels as well as for shares in added value.

Table 4 shows the results for the balanced sample, as well as corresponding results for the same time period from the unbalanced sample.[13] Even though the exact numbers differ slightly, the overall picture emerging from the two samples is comparable. In our balanced sample, the weighted average of CIT rates declined by 5.35 percentage points. As pre-tax profits in added value fell slightly in that period as well, tax revenues contracted (-1.64 percentage points). The small reduction in the tax base was driven by a decline in EBITDA of 1.93 percentage points, only partially offset by lower depreciation and higher financial profits.

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[13] Table A.5 shows the corresponding changes in the balanced sample for different sub-periods.

One advantage of the balanced sample is that it allows for a sensible analysis of absolute values of tax payments and pre-tax profits. The changes in absolute terms are summarized in Table 5, alongside the development of total added value to allow for a comparison with the changes of shares in added value. In 2005, the sum of pre-tax profits in the balanced sample was EUR 92.90 billion, the sum of tax payments from our balanced sample stood at EUR 29.56 billion. Until 2015, pre-tax profits increased to EUR 104.33 billion (+ EUR 11.43 billion). However, added value increased even stronger (+ EUR 72.79 billion), explaining the negative development of the share of pre-tax profits in added value. Despite the expansion of the tax base in absolute terms, taxes paid declined by EUR 3.01 billion to EUR 26.55 billion. This is due to cuts in CIT rates, also resulting in lower effective tax rates. The decomposition of the changes in pre-tax profits shows that their increase was primarily resulting from growing EBITDA (+ EUR 15.42 billion). Depreciation rose by EUR 5.73 billion between 2005 and 2015. Financial profits only increased by EUR 1.73 billion. Nevertheless, this reduced total financial losses by about a third.

Overall, the results for the balanced sample are similar to those for the unbalanced sample over the same sample period. This provides additional credibility for our main results. Yet, the balanced panel is not without imperfections as well, especially when it comes to the description of developments over longer periods of time. For example, it does not reflect structural changes in the economy affecting the overall firm and industry composition. These factors may be relevant for the development of tax revenues in the long run. For such longer periods an unbalanced sample, allowing for firm drop-outs and entries, may be better suited.

4.3 Heterogeneity

This section shows the results for a number of sub-samples, testing for heterogeneity in the developments described above. First, we look at the largest firms in the sample. We then show the results for a sub-sample of companies located in high-tax countries, before looking at heterogeneity across countries and industries.

Large firms
As much of the debate on profit shifting and the 'fair' contribution of companies to tax revenues revolves around large multinational enterprises, we first assess whether the developments in tax payments and the tax base for the largest companies in our sample differ from those reported above. To this end, we create a sub-sample which only contains firms with added value above EUR 25 million, representing approximately the largest percentile of companies in the sample.

The corresponding changes in the CIT rate, taxes paid, and the tax base for these companies from 1995-2016 are summarized in Panel A of Figure 5. The overall changes in these

variables are very similar to those reported for the full sample.[14] Nonetheless, there are two notable differences when looking at the development of the tax base in more detail (Panel B of Figure 5 and Table A.6 in the Appendix): First, the tax base of the largest companies expanded much stronger before the financial crisis compared to the full sample (+11.38 percentage points from 1995-2005), but also declined almost twice as much in the sub-period covering the financial crisis (-4.79 percentage points between 2005 and 2010). Second, the overall change of pre-tax profits was primarily driven by an increase in EBITDA which rose by 3.69 percentage points and accounted for 40.6% of the increase in the tax base. The decline in depreciation (-2.51 percentage points) was less important for the largest firms compared to the full sample.

High-tax countries

Tax competition might have a particularly negative effect on the tax base in high-tax countries. This is why we look at a sub-sample of companies, located in countries with comparably high tax rates throughout the sample period, namely Germany, France, and Italy.[15]

An overview of results is again provided by Figure 5. Results by sub-period are summarized in Table A.7. As most countries, the group of high-tax jurisdictions substantially cut their CIT rates over the sample period. In percentage points, this cut is even slightly more pronounced than in the full sample. In percent, however, the rate cut is very similar (37% in the high-tax sample vs. 38% in the full sample), such that the classification as high-tax countries did not change.[16] The developments of taxes paid and the tax base in the high-tax sample are very similar to the full sample, as we find stable revenues and an expansion of the tax base by 8.19 percentage points. At the same time, there are considerable differences in the development of the tax base components. In the high-tax sample, EBITDA fell slightly between 1995 and 2016 and hence made a negative contribution to the development of the tax base. This was primarily caused by reduced EBITDA of Italian companies (see below). The overall increase in pre-tax profits was therefore driven by a large reduction in depreciation in the first half of the sample period and improved financial results of companies.

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[14] Looking at levels, the mean of tax payments as a share of added value and the weighted statutory tax rate are almost identical for large firms and the full sample. The share of pre-tax profits in added value is slightly higher in the sample of large firms (20.4% vs. 18.6% in the full sample).

[15] The average of taxes paid in added value from 1995-2016 for this sub-sample is almost identical as in the full sample (around 5.7%), while the mean share of pre-tax profits in added value is slightly lower than in the full sample (15.8% and 18.6%, respectively). By construction, the mean CIT rate is higher in the high-tax group (37.6% vs. 33.9% in the full sample). We refrain from constructing a sample of companies located in low-tax countries, as the group of low-tax countries changes substantially over our sample period of more than 20 years.

[16] Germany, for example, cut its tax rate from close to 60% on average to just below 30% between 1995 and 2016, but still remained one of the countries with the highest statutory rates.

Heterogeneity across countries

In this section, we look at five countries in more detail: France, Germany, Italy, Spain, and the United Kingdom. These five countries are major European economies, offer variation in their CIT rate, and are covered comparably well in Orbis. Looking at individual countries allows for a more thorough analysis of tax reforms and their impact on tax revenues.

Figure 6 shows the results for the five countries over the full sample period. Changes by sub-period are provided by Table A.8 in the Appendix. As shown in Panel A of Figure 6, all five countries cut their statutory CIT rates between 1995 and 2016, but the cut was most pronounced in Germany (-29.28 percentage points) and Italy (-21.80 percentage points). France only lowered its statutory rate by 3.36 percentage points. The tax base grew in all of the five countries, but the increase was much smaller in Italy than in the other countries. In France and Germany, the tax base expanded by over ten percentage points which more than doubled the levels of 1995 in both countries. When looking at tax payments, Italy again is an outlier. Taxes paid rose slightly in France, Germany, Spain, and the United Kingdom over the 22-year period, but declined in Italy.

The decomposition of the tax base shown in Panel B of Figure 6 reveals that, while the tax base rose in all five countries, the driving forces behind this development varied. In Germany and the United Kingdom, most of the tax-base expansion can be attributed to rising EBITDA. Financial profits changed very little in the two countries. Lower depreciation had a small positive effect on the tax base in Germany. In the United Kingdom, depreciation even increased by 2.62 percentage points, and thus negatively affected the tax base.

The rise in pre-tax profits in France and Spain was mostly caused by substantial increases in the financial profits of firms (+7.55 percentage points in France and +6.92 percentage points in Spain). EBITDA remained largely unchanged in the two countries over the full sample period. Depreciation only fell in France explaining the overall larger increase in the tax base compared to Spain. In Italy, the share of EBITDA in added value declined by 13.70 percentage points between 1995 and 2016. Rising financial profits and especially lower depreciation counteracted this development, resulting in a small expansion of the tax base (+2.00 percentage points).

Heterogeneity across industries

Lastly, we divide the sample into industry groups based on NACE-letter codes. Figure 7 shows the changes in CIT rates, tax payments, and pre-tax profits for five of these groups (manufacturing, construction, wholesale & retail, finance, and real estate). The industries were selected

based on their overall economic significance and the number of companies available in Orbis.[17] Table A.9 in the Appendix provides details on the developments across different sub-periods.

In all five industry groups, tax rates declined over the sample period. Differences in the size of the reduction can be explained by the distribution of firms in the respective sectors across countries. While the tax base expanded in all industries, there are differences in the extent. In the financial sector, the share of pre-tax profits in added value rose by 13.64 percentage points – despite a reduction of 8.01 percentage points between 2005 and 2010 (Table A.9). The tax base in real estate even expanded by 20.50 percentage points. In contrast, pre-tax profits in the construction sector only increased by 6.01 percentage points. These differences are reflected in the development of tax revenues as well. Taxes paid increased strongest in the financial sector (+2.47 percentage points) and in real estate (+1.58 percentage points), but fell by 0.71 percentage points in the construction sector.

Differences in the changes of the tax base components between sectors are even more pronounced (Panel B of Figure 7). In the manufacturing sector as well as in wholesale & retail, all three components of the tax base contributed to its increase. In manufacturing, the increase in financial profits was the main factor and responsible for 43.8% of the tax base expansion, while increasing EBITDA was the main driver in wholesale & retail (41.8%). In the construction sector, EBITDA declined slightly between 1995 and 2016. The expansion of the tax base in this sector was therefore only the result of a reduction in depreciation (accounting for about two thirds) and an increase in financial profits (accounting for the remaining third). In the financial and real estate sectors, the increase in pre-tax profits where exclusively due to rising EBITDA. An increase in depreciation and a reduction in financial profits attenuated the total effect.

5 Discussion of results and additional factors

The previous section showed that the decline in statutory tax rates over the last two decades was compensated by an expansion of corporate profits. The rise in pre-tax profits was due to higher EBITDA, lower depreciation, and improved financial results of firms. Potential drivers of these developments are considered in Section 5.1. Since our firm-level sample – by construction – only covers developments within the corporate sector, Section 5.2 discusses additional factors that might have contributed to the stability of corporate tax revenues.

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[17] As coverage in the financial and real estate sectors is low in 1995, leading to distortions in the results, we calculate changes for these two industry groups for the period 1996-2016. For the other industry groups, changes are based on the sample period of 1995-2016.

5.1 Discussion of the tax base components

Increase in EBITDA

For our main sample, we find an increase in the share of EBITDA in added value by 2.26 percentage points between 1995 and 2016. There are a number of potential reasons for this increase in corporate profitability.

First of all, it is well documented that market power as measured by concentration or cost markups increased in many industries since the late 1990s. Grullon *et al.* (2019) as well as De Loecker *et al.* (2020) report that the increase in market power was accompanied by higher profit margins of those firms gaining market share. Autor *et al.* (2020) describe a general trend towards a 'winner-takes-most' economy, in which a small number of companies dominate their respective industries. Important factors for this development are network effects or economies of scale connected with many new technologies, particularly in digital industries. These findings fit with our result that the increase in the tax base for large companies was primarily due to a rise in EBITDA, which was 63.3% larger than for the full sample. This also illustrates that the increase in profits of companies comes at a cost, potentially borne by consumers in the form of higher prices and less choice.

A second factor contributing to the overall increase in profitability in our sample is a growing share of firms with positive pre-tax profits. The share of profitable firms rises from 76.1% in 1995 to 86.3% in 2016 (Figure A.4). This is despite a considerable dip after the financial crisis. As shown in Section 4.2, excluding loss-making firms from the analysis does not change the main findings, but substantially reduces the overall increase in EBITDA. Hence, the growing share of profitable firms constitutes an important factor for the rising profitability in our sample that is not only driven by a small number of firms, but by a broader trend.

Moreover, different sectoral growth rates could have contributed to the rising corporate profitability. For the sample used in this paper, profitability measured as pre-tax profits in total assets are particularly high in the information & communication and the financial sector. The importance of the financial sector for the overall expansion of the tax base is described by Devereux *et al.* (2004) for the United Kingdom. In conjunction with the rising importance of IT companies, this may play a role for a wider range of countries.

The increase in corporate profitability also reflects in a changing distribution of income. Dao *et al.* (2017) and Autor *et al.* (2020) show a decline in the labor share for the United States, Japan, and many European economies since the 1990s. In our firm-level sample, the share of compensation of employees in added value fell between 1995 and 2007, but recovered slightly since then (Figure A.5). Figure A.6 shows the development of the labor share based on country-

level data from the OECD National Accounts with very similar results, again confirming that our firm-level sample picks up the main trends visible in macro data.[18]

Reduction in depreciation

Between 1995 and 2016, total depreciation in our main sample fell by 3.17 percentage points or almost 20%. Since our dataset is based on balance-sheet information, this reduction in depreciation does not reflect changes in depreciation rules for tax purposes. Accordingly, lower depreciation in our data suggests a reduction in investment. As Figure A.7 shows, the growth rate of total assets as one measure of firm investment indeed declined considerably over the sample period. Gutiérrez & Philippon (2016) and Alexander & Eberly (2018) similarly report reduced investment in the US business sector since the early 2000s. Gutiérrez & Philippon (2016) point towards the importance of reduced competition to explain this development while not excluding other factors such as a shift towards intangibles. This latter factor is emphasized by Alexander & Eberly (2018) and Crouzet & Eberly (2019). Since certain characteristics of intangible assets enhance industry concentration, the two factors are clearly interrelated. Figure A.8 plots the share of intangible assets in total assets from 1995-2016 for our main sample. In particular between 1995 and 2000, the share of intangibles surged and almost doubled from 3.5% to 6.9%. This is in line with the particularly strong reduction in depreciation over this period. After a temporary decline following the burst of the dotcom bubble in 2000, there again is an increasing trend in the intangibles share in our sample between 2004 and 2016.

The fact that our data only covers balance-sheet depreciation may result in an underestimation of the reduction in this variable for tax purposes. Many of the tax reforms in the last decades were of the rate-cut cum base-broadening type, where a reduction in the statutory rate was accompanied by a wider definition of the tax base (Devereux *et al.*, 2002; Devereux, 2007; Loretz, 2008; and Kawano & Slemrod, 2016). One dimension of these base-broadening efforts are stricter depreciation rules for tax purposes. Thus, the reduction in tax-depreciation may be even more pronounced than the reduction in balance-sheet depreciation we observe in our data.

Increase in financial profit/loss

The financial result of companies in our sample improved substantially, contributing to the rising tax base. One key factor for this development were declining interest payments of companies. Between 1995 and 2016, the share of interest payments in added value fell by 5.60 percentage points or 53.3%. Interest payments declined in all sub-periods, but the reduction was most pronounced in the first half of the sample period (-4.54 percentage points from 1995-2005).

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[18] Potential reasons for the decline in the labor share are discussed, for example, by Autor *et al.* (2020).

One potential reason for reduced interest payments is lower corporate debt. Many countries included caps on interest deductibility in their base broadening reforms, which makes debt financing less attractive (Blouin *et al.*, 2014). Additionally, the tax advantage of debt declines as statutory rates fall. Figure A.9 in the Appendix shows the development of the share of long-term debt in total assets and in added value for our sample. Both measures do not decline over the sample period. The share of long-term debt in added value even shows a positive trend. Therefore, lower corporate debt is unlikely to explain the observed reduction in interest payments.

The most plausible explanation for the development of interest payments is the decline in interest rates. Figure A.10 plots the Moody's Aaa corporate bond yield over our sample period. In 1995, such corporate bonds had an average yield of 8.46%. Until 2016, the yield halved to 4.06%. While declining interest rates not only lead to lower interest expenses, but may also reduce the financial income of companies, the first effect seems to clearly outweigh the latter for our full sample. For financial and real estate companies, however, the financial result deteriorated from 1995-2016. When looking at individual countries, companies from southern Europe benefited strongly from lower interest payments and improved their financial results (Figure 6). In contrast, interest payments relative to added value of German companies even increased slightly over the full sample period (+0.28 percentage points). This discrepancy may also be due to the introduction of the Euro during the sample period.

5.2 Discussion of additional factors

The analysis of this paper uses firm-level data to explain the stability of corporate tax revenues and can therefore only pick up developments within the corporate sector. Yet, there are additional factors that could add to the explanation of stable revenues.

Coming back to the decomposition of Sørensen (2007) presented in Section 2, one further factor might be an increase in the corporate share in the economy, which would not be captured by our data. Sørensen (2007), Piotrowska & Vanborren (2008), and De Mooij & Nicodème (2007) describe a trend towards incorporation as one factor contributing to the stability of corporate tax revenues. The authors attribute this to shifts in the industry composition towards sectors where incorporated firms dominate and increasing profit shifting from the personal to the corporate sphere. An increase in the share of income labeled as corporate income is likewise described by Clausing (2007). As Fuest & Weichenrieder (2002) show, one key role of corporate taxation is to act as a backstop to personal income taxation. Declining corporate tax rates could therefore trigger an increase in the reclassification of labor income as corporate income. Figure A.11 shows the development of the average share of corporates in total value added for

22 OECD countries over our sample period. This confirms the finding of an increasing corporate share in the economy. Between 1995 and 2016, the corporate share in value added rose from 60.7% to 64.8%.

In addition, reduced CIT rates might have stimulated firm investment and general economic activity leading to a further expansion of the tax base. In line with this argument, Clausing (2007) reports an inversely U-shaped relationship between CIT rates and revenues with a revenue maximizing rate of 33%. Brill & Hassett (2007) even claim that in 2005, the revenue maximizing rate was as low as 26%. In this case, corporate tax rates in the beginning of our sample period in 1995 were in the negatively sloped part of this Laffer-curve and the tax cuts constituted a move towards the revenue maximizing rate. However, this argument also implies that further rate cuts would lead to lower revenues in many countries. At the same time, international cooperation as in the OECD/G20 BEPS program started in 2013 might reduce the downward pressure on (corporate) tax rates in the longer run. The slowing of the reduction in CIT rates in the last years of our sample period might be a precursor for this.

6 Conclusions

Despite falling statutory corporate tax rates, revenues from corporate taxation remained a stable source of revenue for many countries. Our paper investigates this rate-revenue puzzle in corporate taxation based on a large firm-level dataset covering 33 OECD countries. We show that although the average statutory CIT rate in our sample fell by 16.5 percentage points between 1995 and 2016, total corporate taxes paid relative to added value remained stable. This was due to a substantial expansion of the tax base measured by pre-tax profits.

A decomposition of the corporate tax base into developments of EBITDA, depreciation, and financial profits shows that all three factors contributed to the observed stability of tax revenues: 37% of the increase in the tax base is the result of lower depreciation; another 37% is accounted for by higher financial income of firms, and 26% of the tax-base expansion can be attributed to higher EBITDA. In addition, the firm-level data allows us to look at different sub-samples based on firm size, industry, and location. This reveals substantial heterogeneity in the developments of the different components of the tax base across firm types.

While we are aware of some shortcomings of the data regarding the representativeness of our sample and book-tax differences, we are still confident that the decomposition of the tax base at the firm level offers new insights compared to previous studies based on aggregate data. This paper therefore contributes to the understanding of the trends observed in corporate tax revenues over the last decades.

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Figures and tables

Figure 1: CIT rates and revenues in OECD countries
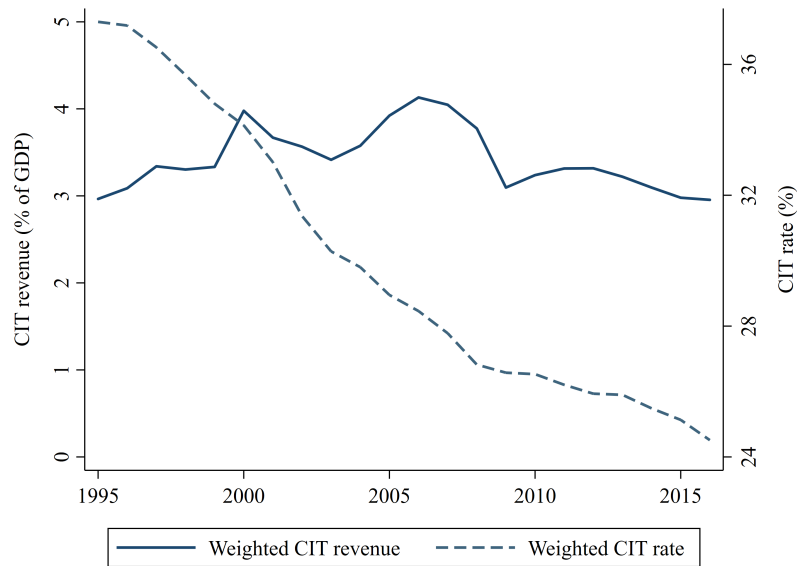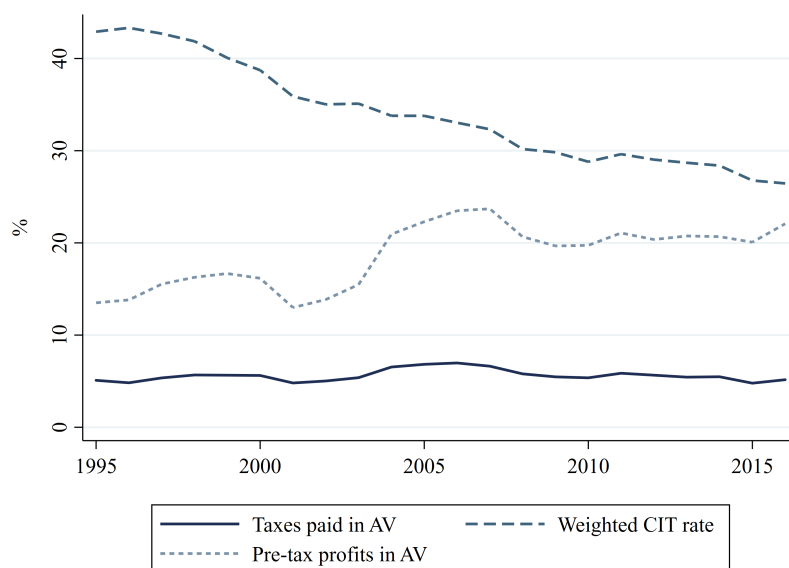

Notes: This figure shows the development of statutory CIT rates and revenues in OECD countries. Countries are weighted by their GDP. CIT rates reflect the top statutory rates on all levels of government, taken from KPMG's Corporate Tax Surveys and EY's Annual Worldwide Corporate Tax Guides. Data on tax revenues come from the OECD's Global Revenue Statistics database.

Figure 2: CIT revenues from firm- and country-level data

Notes: This figure shows the GDP-weighted mean share of revenues in GDP for the countries contained in the Orbis sample based on country-level data from the OECD's Global Revenue Statistics database as well as the added-value-weighted mean corporate tax payments in added value based on firm-level data from Orbis.

Figure 3: CIT revenues, rates, and base from firm-level data

Notes: This figure shows the development of taxes paid and pre-tax profits relative to added value based on Orbis data as well as a value-added-weighted mean CIT rate for an unbalanced sample of firms.

Figure 4: Changes in CIT rates, taxes paid, the tax base, and its components
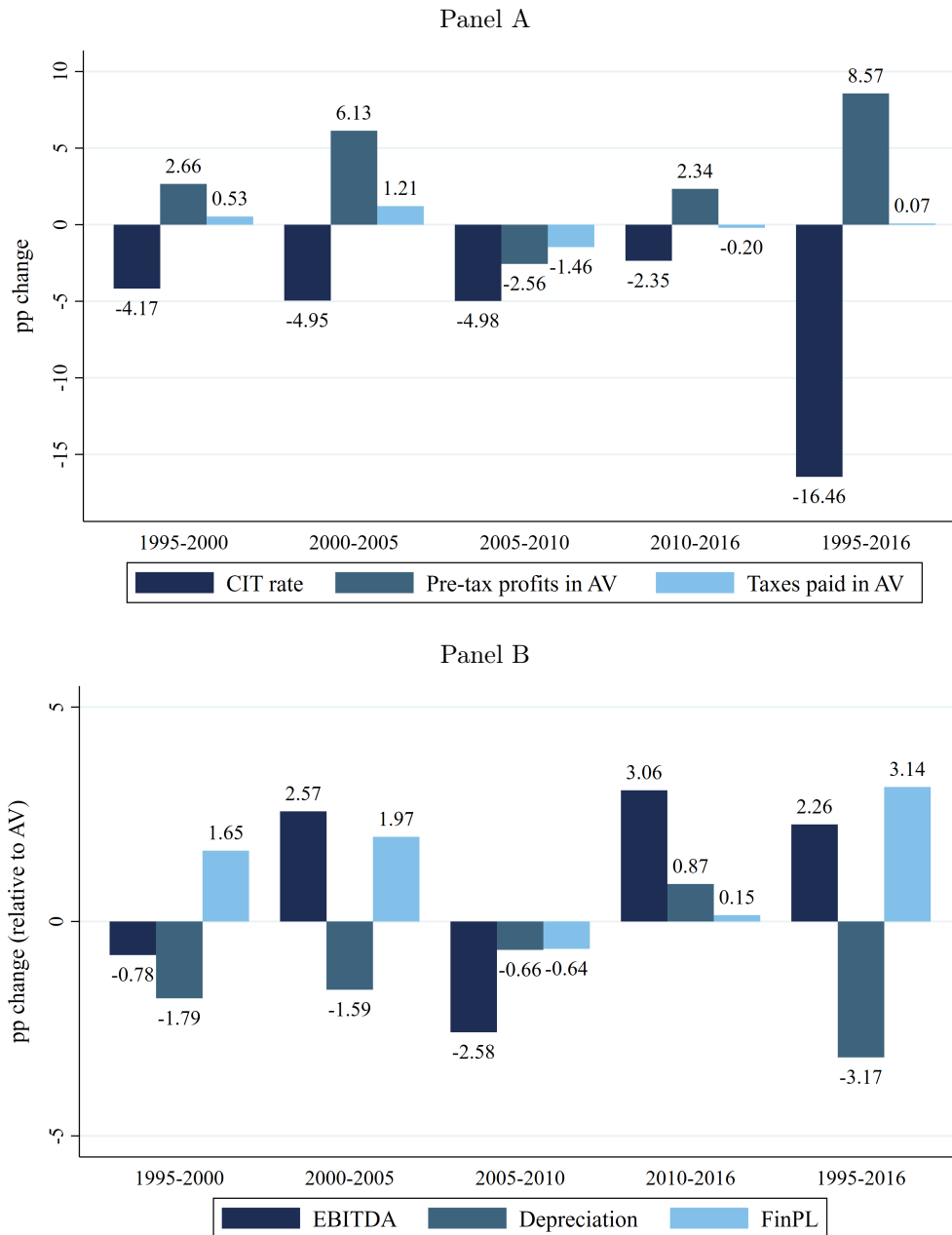
Panel A

Panel B

Notes: Panel A of this figure shows the percentage point changes for different time periods in mean statutory CIT rates, taxes paid as share in added value, and pre-tax profits as share in added value. Panel B shows the percentage point changes for different time periods in mean EBITDA, depreciation, and financial profit/loss, all measured as shares in added value. Values are calculated for an unbalanced sample of firms based on Orbis data.

Figure 5: Changes in CIT rates, taxes paid, the tax base, and its components – Large firms & high-tax countries
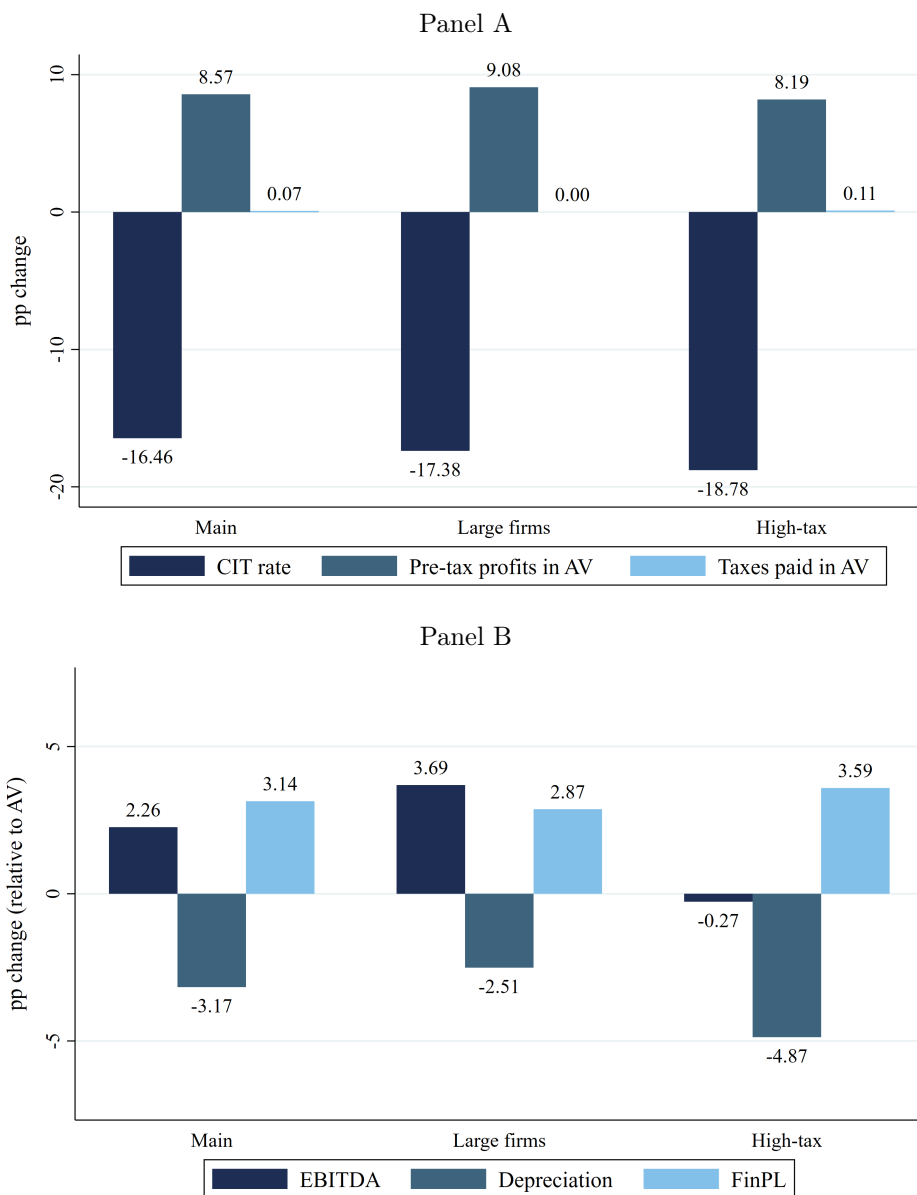
Panel A

Legend: CIT rate | Pre-tax profits in AV | Taxes paid in AV

Panel B

Legend: EBITDA | Depreciation | FinPL

Notes: Panel A of this figure shows the percentage point changes from 1995-2016 for different samples in mean statutory CIT rates, taxes paid as share in added value, and pre-tax profits as share in added value. Panel B shows the percentage point changes from 1995-2016 for different samples in mean EBITDA, depreciation, and financial profit/loss, all measured as shares in added value. Values are calculated for an unbalanced sample of firms based on Orbis data (*Main*), a sub-sample only containing companies with more than EUR 25 million in added value (*Large firms*) and a sub-sample containing companies from high-tax countries (France, Germany, and Italy; *High-tax*).

Figure 6: Changes in CIT rates, taxes paid, the tax base, and its components –
Countries
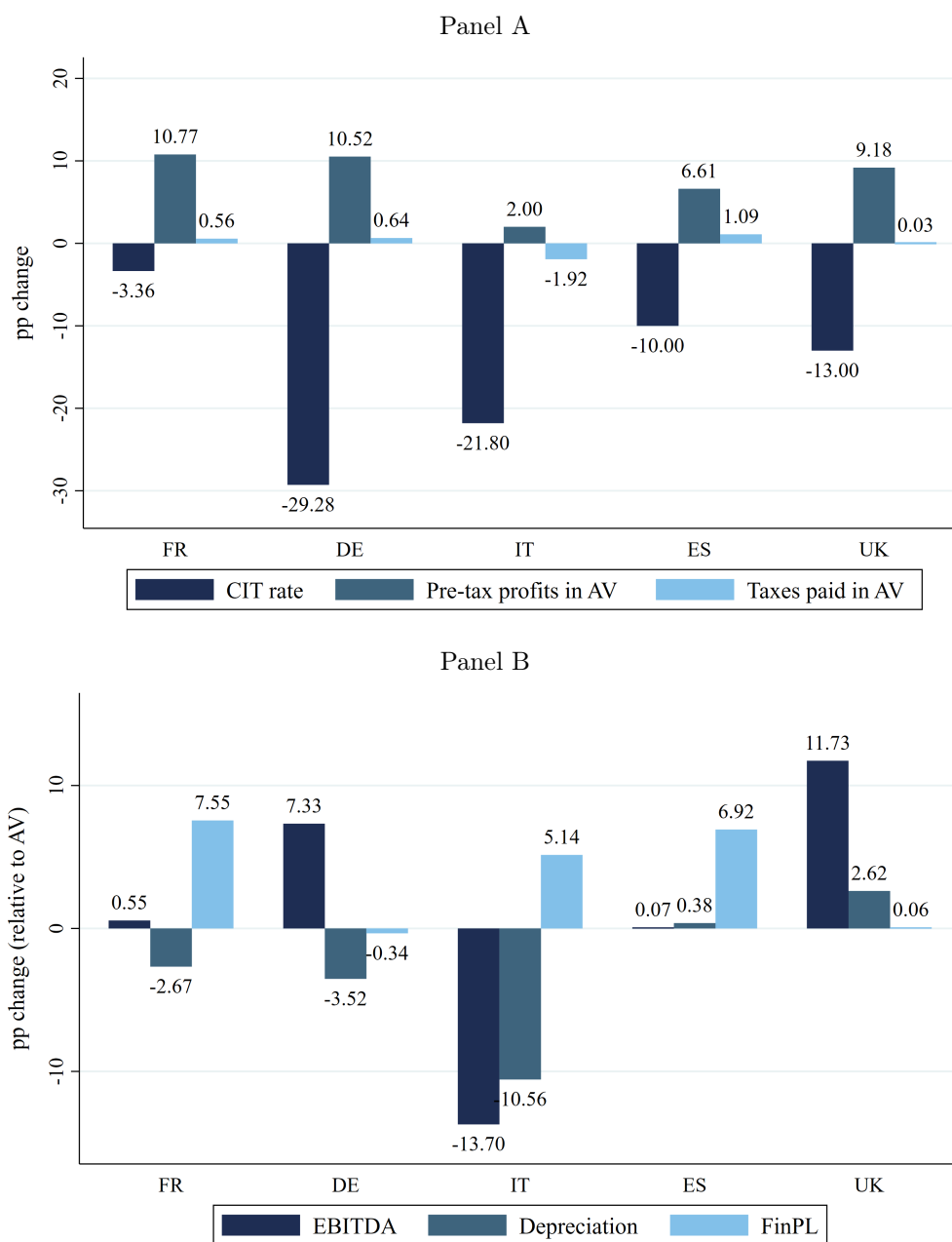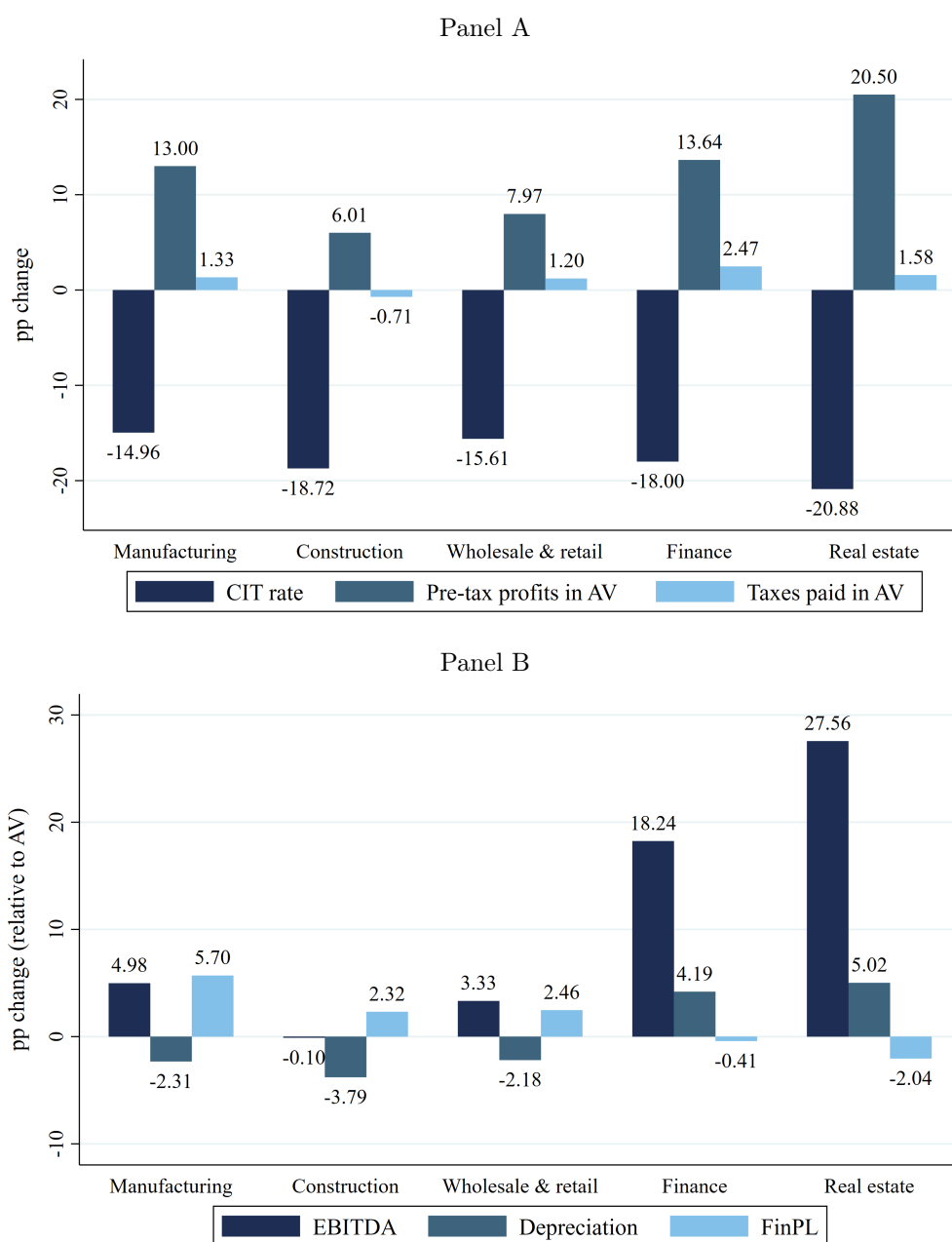
Panel A

Panel B

Notes: Panel A of this figure shows the percentage point changes from 1995-2016 for different sub-samples in mean statutory CIT rates, taxes paid as share in added value, and pre-tax profits as share in added value. Panel B shows the percentage point changes from 1995-2016 for different sub-samples in mean EBITDA, depreciation, and financial profit/loss, all measured as shares in added value. Values are calculated for unbalanced samples of firms located in different countries based on Orbis data.

Figure 7: Changes in CIT rates, taxes paid, the tax base, and its components – Sectors

Panel A

Panel B

Table 1: Summary statistics of balance-sheet variables

Variable	Obs.	Mean	Median	SD	Min	Max
A: Absolute values (firm level)						
Total assets	9,702,217	15,694.4	1,606.8	616,171.6	0.7	659,000,000
Employees	9,405,037	60.6	10.0	1,196.8	0.0	1,014,335
Added value	12,063,836	3,494.4	437.0	133,906.1	1.4	365,000,000
Pre-tax profits	12,063,836	719.0	42.2	22,963.6	-3,414,998	14,200,000
EBITDA	12,063,836	1,246.9	96.4	35,595.8	-1,384,824	17,700,000
Fin. Profit/Loss	12,063,836	-76.6	-5.0	6,654.5	-5,072,000	3,960,655
Interest	12,063,836	222.8	9.1	13,777.8	-74,855	32,800,000
Depreciation	12,063,836	451.3	26.0	13,270.6	0.0	9,003,000
Taxes paid	12,063,836	198.6	10.3	6,575.2	-495,367	3,080,000
B: Shares in added value (yearly aggregates)						
Total assets	9,702,217	379.7	415.1	65.7	244.5	447.4
Pre-tax profits	12,063,836	20.7	20.7	1.9	13.0	23.7
EBITDA	12,063,836	35.8	36.3	1.3	29.3	37.4
Fin. Profit/Loss	12,063,836	-2.2	-2.0	0.5	-5.0	-1.3
Interest	12,063,836	6.3	6.4	1.0	4.9	10.5
Depreciation	12,063,836	12.9	13.0	0.6	12.9	16.1
Taxes paid	12,063,836	5.7	5.5	0.6	4.8	7.0

Notes: Part A of this table presents summary statistics for an unbalanced panel at the firm level based on Orbis data over the full sample period (1995-2016). Employees indicates the number of employees in a firm (in persons); all other variables in Part A are measured in thousand EUR. Variables in Part B are aggregate shares in added value, measured in percent. The aggregation is executed over all firms in a given year. A detailed summary of variable definitions is contained in Table A.2 in the Appendix.

Table 2: Coverage in terms of added value

Period	Coverage (excluding US)	Coverage (including US)
1995 – 1999	6.01	4.97
2000 – 2004	10.97	5.82
2005 – 2009	26.83	15.51
2010 – 2016	36.08	20.51
Full period	**23.10**	**13.36**

Notes: This table reports the average coverage for an unbalanced panel of firms based on Orbis data in terms of added value (in percent) for different time periods, calculated as sum of added value in the sample divided by the sum of added value of the corporate sectors of all countries in the dataset as reported in the OECD's National Accounts Database.

Table 3: Percentage point changes 1995-2016 – Robustness

	Sample	Obs.	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
(I)	Excl. neg. profits & taxes	9,883,312	-16.71	+0.18	+7.56	+1.27	-3.82	+2.47
(II)	Excl. all loss-making firms	6,469,851	-16.82	-0.41	+7.80	+0.84	-4.94	+2.02
(III)	Industry weighted	11,469,886	-15.35	+0.21	+9.05	+6.46	-0.74	+1.84
(IV)	Fixed cutoffs	12,253,861	-16.50	+0.13	+11.19	+2.29	-3.12	+5.78

Notes: The values in this table represent changes in percentage points from 1995-2016 and are computed using different unbalanced panels of firms based on Orbis data.

Table 4: Percentage point changes 2005-2015 – Balanced sample

	Sample	Obs.	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
(I)	Unbalanced sample	9,727,861	-7.01	-2.04	-2.22	-1.65	-0.07	-0.64
(II)	Balanced sample	1,072,005	-5.35	-1.64	-0.85	-1.93	-0.56	+0.52

Notes: The values in this table represent changes in percentage points from 1995-2016 and are computed using different panels of firms based on Orbis data.

Table 5: Absolute changes 2005-2015 – Balanced sample

Period	Added value	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
2005 – 2008	+29.24	+0.47	+10.15	+13.46	+1.10	-2.21
2008 – 2011	+16.68	-0.95	-0.68	-0.11	+1.68	+1.09
2011 – 2015	+26.86	-2.53	+1.96	+2.07	+2.94	+2.85
Full period	**+72.79**	**-3.01**	**+11.43**	**+15.42**	**+5.73**	**+1.73**

Notes: The values in this table are computed using a balanced panel of firms based on Orbis data for the years 2005-2015 and reflect absolute changes within the periods in billion EUR. We account for inflation by using BIP-deflators taken from the World Bank's World Development Indicators database.

Appendix

Figure A.1: Average ratio of gross value added to GDP across OECD countries
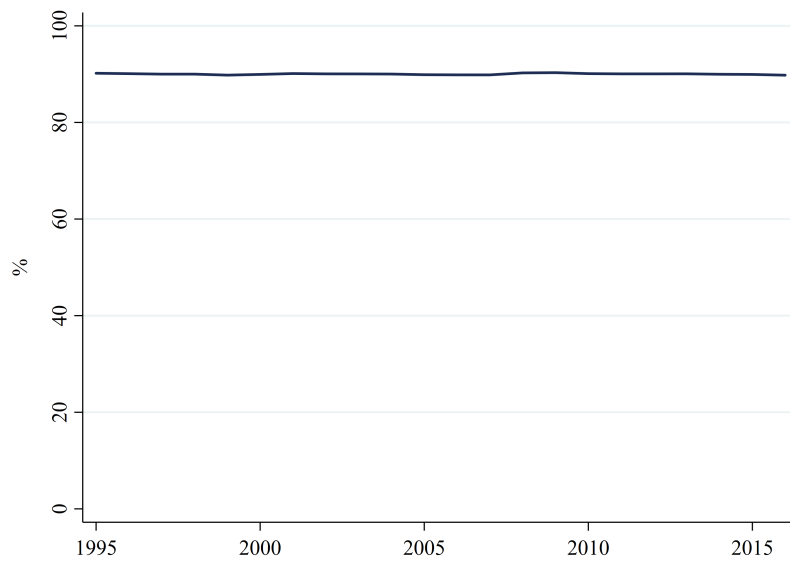
Notes: This figure shows the share of gross value added in GDP for a balanced sample of 30 OECD countries. The data is taken from the OECD's National Accounts database. At the macro level, gross value added serves as a basis for computing the GDP by adding the public sector share (taxes minus subsidies).

Figure A.2: Taxes paid and hypothetical taxes paid
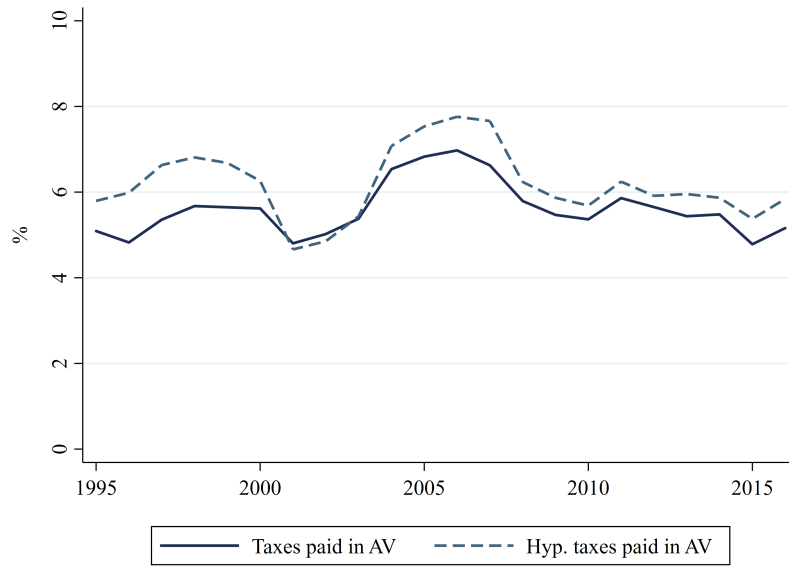
Notes: This figure shows the development of taxes paid according to Orbis and hypothetical taxes paid as shares in added value for an unbalanced sample. Hypothetical taxes paid are calculated by multiplying pre-tax profits with the statutory tax rate of a firm's location country.

Figure A.3: Components of the corporate tax base
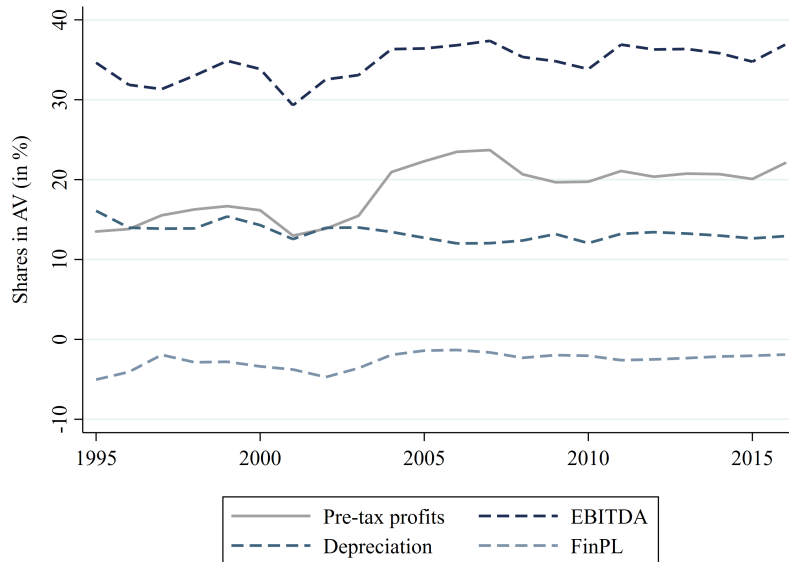
Notes: This figure shows the development of pre-tax profits, EBITDA, depreciation, and financial profit/loss, all measured relative to added value, for an unbalanced sample of firms based on Orbis data.

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Figure A.4: Share of profitable firms
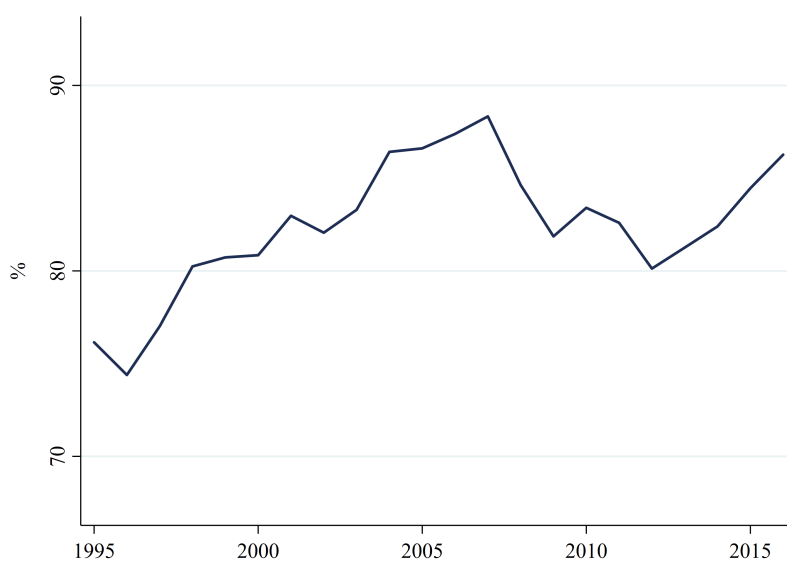
Notes: This figure shows the share of firms with positive pre-tax profits in all firms in a given year for an unbalanced sample of firms based on Orbis data.

Figure A.5: Capital and labor shares from firm-level data

Notes: This figure shows the share of EBITDA in added value (*capital share*) and compensation of employees in added value (*labor share*) for an unbalanced sample of firms based on Orbis data.

Figure A.6: Capital and labor shares from country-level data

Notes: This figure shows the share of gross operating surplus in gross value added (*capital share*) and compensation of employees in gross value added (*labor share*) for a balanced sample of 28 OECD countries. The data is taken from the OECD's National Accounts database.

Figure A.7: Growth rate of total assets
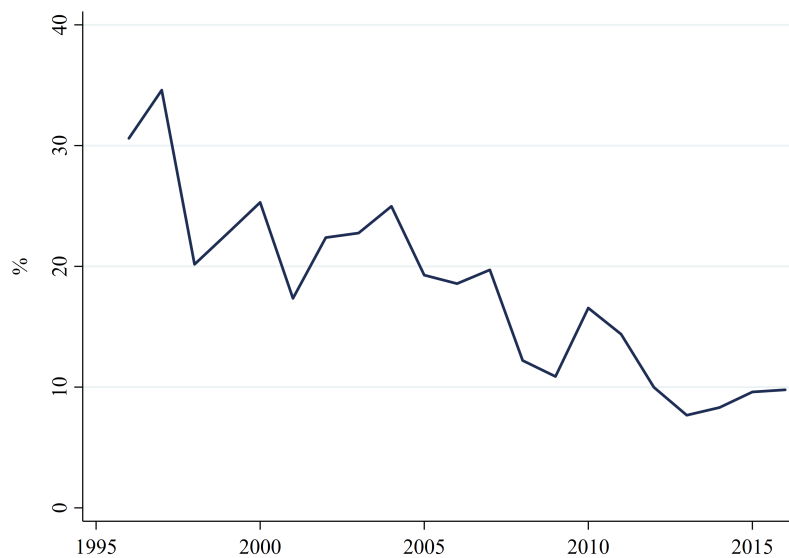
Notes: This figure shows the development of the growth rate of total assets for an unbalanced sample of firms based on Orbis data.

Figure A.8: Share of intangible assets
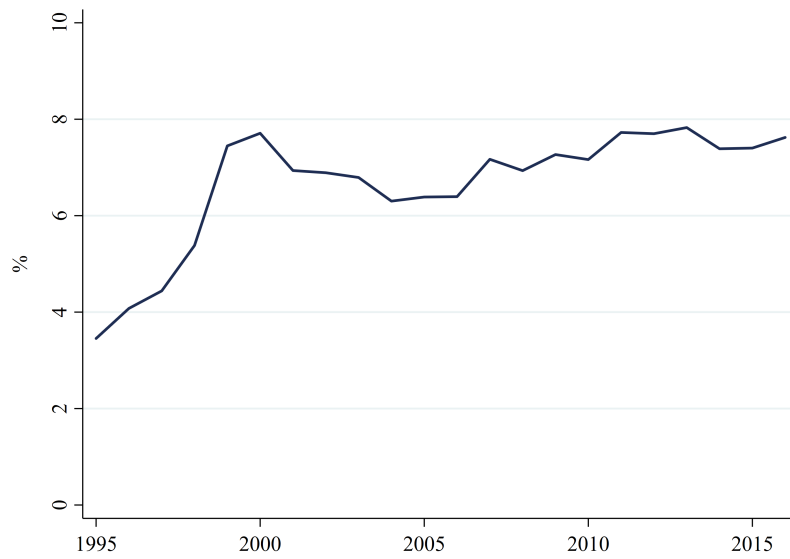
Notes: This figure shows the development of the share of intangible assets in total assets for an unbalanced sample of firms based on Orbis data.

Figure A.9: Long-term debt in total assets and added value
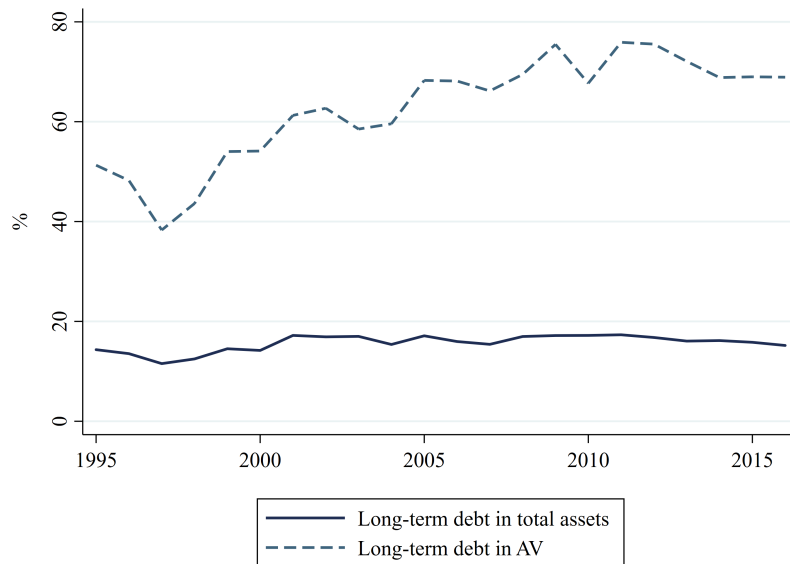
Notes: This figure shows the development of long-term debt relative to total assets and added value for an unbalanced sample of firms based on Orbis data.

Figure A.10: Moody's Aaa corporate bond yield
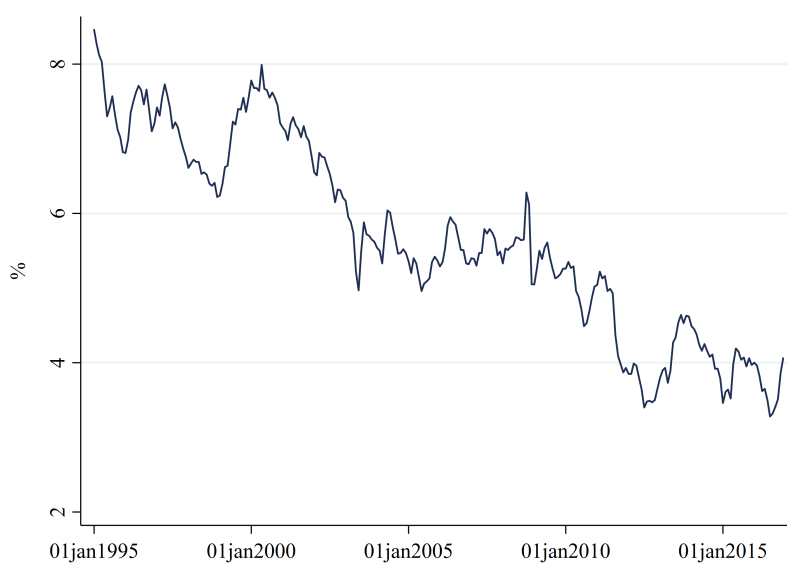
Notes: This figure shows Moody's Seasoned Aaa Corporate Bond Yield [AAA]. The data is taken from FRED, Federal Reserve Bank of St. Louis.

Figure A.11: Corporate share in total value added
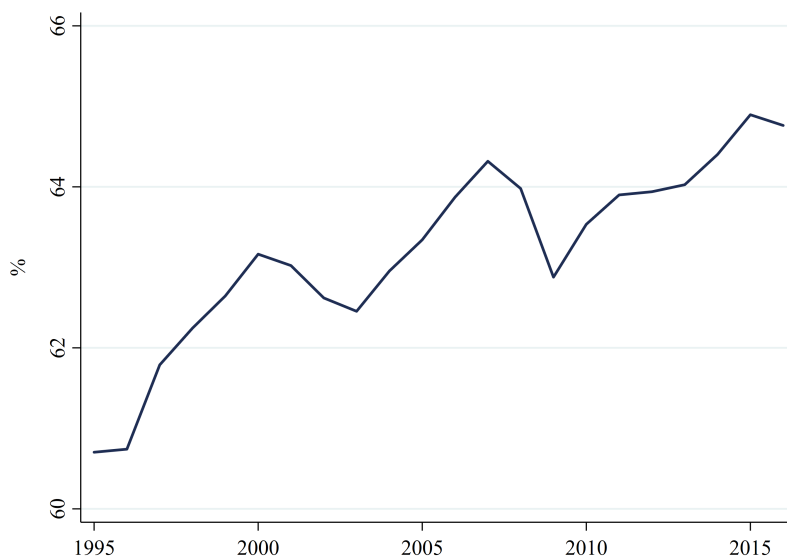
Notes: This figure shows the mean share of the corporate sector in total gross value added for a balanced sample of 22 OECD countries. The data is taken from the OECD's National Accounts database.

Table A.1: Firms and observations by country

Country	Firms	Observations	Obs. in %
AT	8,031	39,496	0.33
AU	2,761	8,475	0.07
BE	20,400	114,063	0.95
CA	444	1,045	0.01
CH	373	2,636	0.02
CL	57	139	0.00
CZ	59,383	264,096	2.19
DE	97,135	422,204	3.50
DK	46,339	92,909	0.77
ES	467,498	2,163,401	17.93
FI	57,459	243,719	2.02
FR	412,712	2,279,353	18.89
UK	61,327	269,336	2.23
GR	32	97	0.00
HU	16,443	68,772	0.57
IE	4,090	14,515	0.12
IL	53	141	0.00
IS	18	39	0.00
IT	589,643	2,998,290	24.85
JP	140,042	476,400	3.95
KR	153,787	592,625	4.91
LU	2,198	8,437	0.07
LV	266	1,008	0.01
NL	947	3,434	0.03
NO	90,379	432,045	3.58
NZ	611	1,962	0.02
PL	41,920	180,329	1.49
PT	182,467	704,867	5.84
SE	77,385	426,500	3.54
SI	24,125	80,274	0.67
SK	45,350	171,353	1.42
TR	38	139	0.00
US	559	1,737	0.01
Total	**2,608,778**	**12,063,836**	**100**

Notes: This table reports number of firms and observations in our main sample by country.

Table A.2: Description and computation of variables in Orbis

Variable name	Description	Computation
Added value	Added value	Taxes paid + Profit/Loss + Costs of employees + Depreciation + Interest
Depreciation	Total amount of depreciation and amortization of assets	
EBIT	Earnings before interest and taxes: net profit from operating activities	Pre-tax profits – Fin. P/L
EBITDA	Earnings before interest, taxes, depreciation and amortization: operating results and depreciation	EBIT + Depreciation
Employees	Total number of employees included in the company's payroll	
Interest	Total amount of interest charges paid	
Fin. P/L	Financial profit/loss: net result from financial activities of the company, defined as financial revenue minus financial expenses	Fin. revenue – Fin. expenditure
Taxes paid	All taxes related to the accounting period (paid, accrued or deferred)	
Profit/Loss	Profit/loss for the period: net income of the year	After-tax profits + Extraordinary profits
Total assets	Sum of fixed assets and current assets	Financial assets + Current assets
Pre-tax profits	Sum of operating profit and financial profit	EBIT + Fin. P/L

Notes: This table provides a summary of variable definitions based on the Bureau van Dijk Orbis User Guide version published in 2011 (available at www.wu.ac.at/fileadmin/wu/s/library/databases_info_image/ugorbisneo.pdf, last accessed 10 September 2020).

Table A.3: Percentage changes for the full sample

Period	CIT rate	Taxes paid	Hyp. revenue	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
1995 − 2000	-9.73	+10.36	+8.05	+19.69	-2.26	-11.12	-32.79
2000 − 2005	-12.79	+21.51	+20.31	+37.95	+7.59	-11.12	-58.39
2005 − 2010	-14.74	-21.44	-24.54	-11.49	-7.09	-5.21	+45.30
2010 − 2016	-8.16	-3.80	+2.72	+11.84	+9.04	+7.25	-7.23
Full period	**-38.35**	**+1.34**	**+0.76**	**+63.44**	**+6.54**	**-19.69**	**-62.30**

Notes: The values in this table represent changes in percent of the respective variables. The CIT rate is measured in percent; all other variables are measured as shares in added value (in percent) and are computed using an unbalanced panel of firms based on Orbis data.

Table A.4: Summary statistics of balance-sheet variables – Balanced sample

Variable	Obs.	Mean	Median	SD	Min	Max
A: Absolute values (firm level)						
Total assets	1,058,153	14,876.6	2,924.5	176,332.9	8.0	38,200,000
Employees	849,625	84.7	22.0	1,217.4	0.0	286,329
Added value	1,072,005	4,667.6	1,076.2	52,669.8	5.9	11,000,000
Pre-tax profits	1,072,005	1,036.5	144.8	16,404.8	-1,436,200	4,243,409
EBITDA	1,072,005	1,606.9	278.7	23,886.2	-793,800	5,914,145
Fin. Profit/Loss	1,072,005	-50.1	-14.3	2,753.7	-559,000	516,358
Interest	1,072,005	171.5	23.2	3,024.5	-31,495	789,002
Depreciation	1,072,005	520.1	75.0	8,359.8	0.0	2,064,227
Taxes paid	1,072,005	296.8	46.1	4,946.9	-431,045	1,257,334
B: Shares in added value (yearly aggregates)						
Total assets	1,058,153	313.8	314.5	11.6	298.4	333.5
Pre-tax profits	1,072,005	22.3	21.9	1.3	20.8	24.8
EBITDA	1,072,005	34.5	34.3	1.3	32.8	36.5
Fin. Profit/Loss	1,072,005	-1.1	-1.1	0.2	-1.6	-0.6
Interest	1,072,005	3.7	3.5	0.6	2.8	4.9
Depreciation	1,072,005	11.2	11.1	0.3	10.7	11.7
Taxes paid	1,072,005	6.4	6.2	0.7	5.4	7.7

Notes: Part A of this table presents summary statistics for a balanced panel at the firm level over the sample period from 2005-2015. *Employees* indicates the number of employees in a firm (in persons), all other variables in Part A are measured in thousand EUR. Variables in Part B are aggregate shares in added value, measured in percent. The aggregation is executed over all firms in a given year. A detailed summary of variable definitions is contained in Table A.2.

Table A.5: Percentage point changes – Balanced sample

Period	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
2005 − 2008	-3.34	-0.34	+0.94	+0.84	-0.50	-0.40
2008 − 2011	-0.67	-0.44	-0.98	-1.31	-0.04	+0.28
2011 − 2015	-1.34	-0.86	-0.81	-1.45	-0.02	+0.63
Full period	**-5.35**	**-1.64**	**-0.85**	**-1.93**	**-0.56**	**+0.52**

Notes: The values in this table represent changes in percentage points and are computed using a balanced panel of firms based on Orbis data.

Table A.6: Percentage point changes – Large firms

Period	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
1995 − 2000	-3.81	+0.43	+3.80	-0.69	-1.36	-1.75
2000 − 2005	-5.96	+1.61	+7.58	+3.71	-1.50	-2.37
2005 − 2010	-5.67	-1.88	-4.79	-5.17	-1.48	-1.10
2010 − 2016	-1.95	-0.15	+2.49	+4.46	+1.83	-0.15
Full period	**-17.38**	**+0.00**	**+9.08**	**+3.69**	**-2.51**	**+2.87**

Notes: The values in this table represent changes in percentage points and are computed using an unbalanced panel of firms with added value above EUR 25 million based on Orbis data. The number of observations for this sub-sample is 190,835.

Table A.7: Percentage point changes – High-tax countries

Period	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
1995 − 2000	-7.07	+0.51	+4.76	-1.29	-3.73	+2.31
2000 − 2005	-6.97	+0.43	+2.28	-1.66	-2.66	+1.28
2005 − 2010	-5.06	-0.64	+0.11	+1.79	+1.08	-0.60
2010 − 2016	0.31	-0.18	+1.04	+0.89	+0.44	+0.60
Full period	**-18.78**	**+0.11**	**+8.19**	**-0.27**	**-4.87**	**+3.59**

Notes: The values in this table represent changes in percentage points and are computed using an unbalanced panel of firms located in France, Germany, and Italy, based on Orbis data. The number of observations for this sub-sample is 5,699,847.

Table A.8: Percentage point changes – Individual countries

Country/Period	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
France						
1995 – 2000	+0.00	+1.05	+8.40	+3.59	-0.80	+4.00
2000 – 2005	-2.83	+0.78	+4.90	-2.88	-3.55	+4.23
2005 – 2010	-0.50	-0.69	-1.91	-0.90	+0.13	-0.87
2010 – 2016	-0.03	-0.59	-0.61	+0.74	+1.54	+0.19
Full period	-3.36	+0.56	+10.77	+0.55	-2.67	+7.55
Germany						
1995 – 2000	-7.37	-0.61	+4.45	+2.14	-1.91	+0.39
2000 – 2005	-13.32	+1.18	+1.91	+1.07	-2.38	-1.55
2005 – 2010	-8.90	-0.17	+3.01	+3.62	+0.46	-0.18
2010 – 2016	+0.31	+0.24	+1.15	+0.50	+0.32	+1.00
Full period	-29.28	+0.64	+10.52	+7.33	-3.52	-0.34
Italy						
1995 – 2000	-11.95	+0.95	+0.77	-12.18	-9.39	+3.56
2000 – 2005	-4.00	+0.40	+0.11	-0.88	-0.61	+0.38
2005 – 2010	-5.85	-2.52	-1.14	-0.87	+0.71	+0.43
2010 – 2016	+0.00	-0.74	+2.27	+0.23	-1.28	+0.76
Full period	-21.80	-1.92	+2.00	-13.70	-10.56	+5.14
Spain						
1995 – 2000	+0.00	+1.97	+5.10	-2.33	-1.78	+5.65
2000 – 2005	+0.00	+1.86	+5.01	+6.18	+2.25	+1.08
2005 – 2010	-5.00	-2.70	-4.88	-4.00	-0.13	-1.00
2010 – 2016	-5.00	-0.05	+1.38	+0.21	+0.03	+1.19
Full period	-10.00	+1.09	+6.61	+0.07	+0.38	+6.92
United Kingdom						
1995 – 2000	-3.00	-0.92	-5.82	+1.56	+4.40	-2.98
2000 – 2005	+0.00	+3.77	+16.39	+7.13	-2.77	+6.49
2005 – 2010	-2.00	-0.69	-0.57	+4.15	+1.03	-3.70
2010 – 2016	-8.00	-2.13	-0.82	-1.11	-0.04	+0.25
Full period	-13.00	+0.03	+9.18	+11.73	+2.62	+0.06

Notes: The values in this table represent changes in percentage points and are computed using unbalanced panels of firms in the respective countries based on Orbis data. The number of observations are 2,279,353 for France, 422,204 for Germany, 2,998,290 for Italy, 2,163,401 for Spain, and 269,336 for the United Kingdom.

Table A.9: Percentage point changes – Individual industries

Industry/Period	CIT rate	Taxes paid	Pre-tax profit	EBITDA	Depre-ciation	Fin. P/L
Manufacturing						
1995 – 2000	-3.93	+1.19	+2.69	-0.45	-0.54	+2.61
2000 – 2005	-3.97	+1.21	+6.48	+2.52	-1.13	+2.82
2005 – 2010	-7.23	-2.39	-3.94	-8.25	-3.66	+0.66
2010 – 2016	+0.16	+1.32	+7.77	+11.16	+3.01	-0.39
Full period	-14.96	+1.33	+13.00	+4.98	-2.31	+5.70
Construction						
1995 – 2000	-6.80	+2.88	+8.30	+3.26	-3.94	+1.10
2000 – 2005	-4.75	-1.80	-2.03	-5.00	-1.24	+1.73
2005 – 2010	-3.05	-1.49	-2.73	-2.05	+0.92	+0.26
2010 – 2016	-4.11	-0.30	+2.47	+3.69	+0.47	-0.77
Full period	-18.72	-0.71	+6.01	-0.10	-3.79	+2.32
Wholesale & retail						
1995 – 2000	-4.13	+1.00	+0.41	-0.96	-0.74	+0.64
2000 – 2005	-4.19	+1.18	+5.98	+2.65	-1.97	+1.36
2005 – 2010	-3.54	-0.36	+0.79	+1.44	+0.62	-0.03
2010 – 2016	-3.75	-0.61	+0.79	+0.20	-0.09	+0.50
Full period	-15.61	+1.20	+7.97	+3.33	-2.18	+2.46
Finance						
1996 – 2000	-4.91	+1.32	+10.10	+9.90	+2.43	+2.63
2000 – 2005	-7.35	+3.23	+10.18	+8.26	-1.10	+0.82
2005 – 2010	-2.36	-1.52	-8.01	-1.23	+3.37	-3.40
2010 – 2016	-3.38	-0.56	+1.37	+1.31	-0.51	-0.46
Full period	-18.00	+2.47	+13.64	+18.24	+4.19	-0.41
Real estate						
1996 – 2000	-6.99	+0.99	+8.65	+13.47	+1.06	-3.76
2000 – 2005	-5.65	+0.66	+4.08	+6.05	+3.23	+1.26
2005 – 2010	-5.08	-1.12	+1.85	+6.33	+1.61	-2.85
2010 – 2016	-3.16	+1.04	+5.91	+1.71	-0.88	+3.31
Full period	-20.88	+1.58	+20.50	+27.56	+5.02	-2.04

Notes: The values in this table represent changes in percentage points and are computed using unbalanced panels of firms in the respective industries based on Orbis data. The number of observations are 2,779,957 for manufacturing, 1,953,017 for construction, 3,604,661 for wholesale & retail, 197,818 for finance, and 474,028 for real estate.