CORPORATE COST AND PROFIT SHARES IN THE EURO AREA AND THE US: THE SAME STORY? (*)

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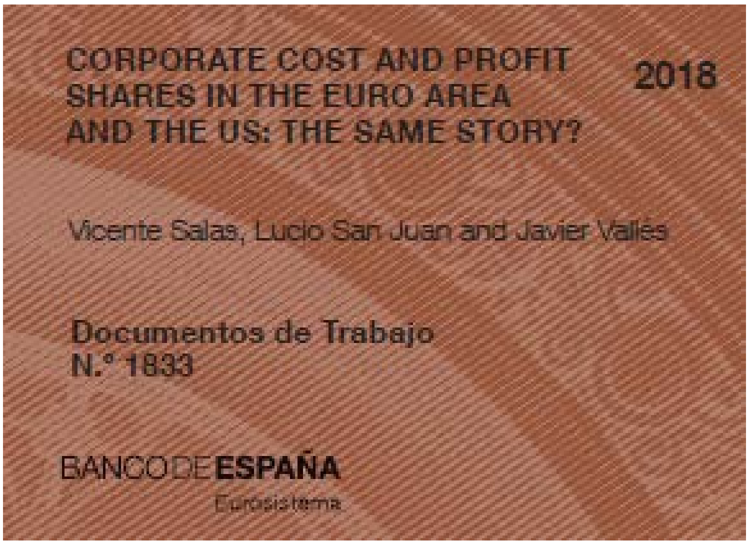

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Abstract

This paper presents evidence of how the shares of labour and capital costs and profits in the gross value added of corporate sectors of France, Germany, Italy, Spain and the US varied between 1995 and 2016, and seeks to explain the differences between countries and how they have developed over time. The descriptive evidence does not support the hypothesis of a convergence in the composition of the countries' corporate gross value added in the period, either within the euro area or between Europe and the US, nor is there evidence of a generalised downward trend in the share of labour costs over time. The parallel upward trend in the corporate profit share of the US and Germany between 2000 and 2016 stands out, with German corporate profit share consistently above that of the US. The evidence presented here supports the claim made by other studies that increasing corporate market power is the main driver of changes in the composition of gross value added over time in the case of the US. In the euro area countries, labour and capital shares are also sensitive to changes in the relative input prices of labour and capital (consistent with an inferred elasticity of substitution between labour and capital in production that is less than one, compared with the inferred value of one for the US). Finally, to explain the high and increasing German corporate profit share, it is necessary to account for the sustained comparative production cost advantage of German corporations.

Keywords: labour and capital cost shares; economic profit shares; elasticity of substitution between labour and capital; market power; euro area countries and the US.

JEL classification: E25; E22; O4.

1 Introduction

The functional distribution of income, i.e. how the value added in the economy is divided up between the market compensation for labour and capital inputs and residual economic profits, has become an important research topic among economists in recent years. This interest is well justified, as the functional distribution of income has implications for competition policy (if economic profits are evidence of unchallenged market power), for economic growth (as capital investment will depend on the relationship between the cost of capital assets and their rate of return) and for income inequality (particularly if business owners receive all non-labour income, compensation of capital services and economic profits)[1].

This paper presents evidence regarding the aggregate shares of labour and capital cost and of economic profit in the value added of non-financial corporations in four euro-area countries (France, Germany, Italy and Spain) and in the US, over the period 1995-2016. Gross value added (GVA) is equal to the difference between the annual monetary value of goods and services produced by non-financial corporations in the domestic economy, and the annual monetary value of the intermediate inputs used in production, purchased from outside the domestic non-financial corporate sector. Gross value added and labour costs are reported directly by the National Accounts. Calculating the cost of capital services requires an ad hoc estimate of the stock of capital services used in production, and of the user cost of capital services. The residual economic profit, positive or negative, aggregated across the corporate sector, is simply the difference between GVA and the sum of the costs of labour and capital services.

The paper addresses three main research questions: has the functional distribution of income in the corporate sectors of euro area countries converged since the launch of the single currency? How does the functional distribution of corporate value added in the euro area countries compare with that in the US? What factors (market power, economies of scale and elasticity of substitution of production technologies, national or global markets for goods and services) determine differences between countries' functional distribution of income and how it has developed over time? Key features of the period of study (1995-2016) include membership of the euro by the European countries in the sample since 1999, the global spread of information and communication technologies, increasing globalisation of production and trade, and the impact of the Great Recession on all five economies in the study. This paper's findings therefore offer some insights into how these factors common to all the corporate sectors considered could have interacted with distinctive national features to determine the GVA distribution observed. The inclusion of US corporate data for comparative purposes gives a more global dimension to the evidence reported here.

The paper follows the approach recently taken in Barkai (2016), separating the non-labour income of the gross value added of the corporate sector into cost of capital services and economic profits. The main focus of Barkai's paper (2016) is to link developments in profit shares with changing corporate market power in the US. Our paper presents similar evidence on the progress of corporate profits in the largest euro area countries, and considers factors other than market power to be the drivers of the cross-country differences and time course of profit shares.

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1 See for example Zingales (2017) on the policy implications of evidence of firms' increasing market power, especially in the US; Gutierrez and Philippon (2017) on the relative slowdown of capital investment in the recent economic recovery; and Piketty (2014) on the functional distribution of income and individual income inequality.

This paper therefore first outlines the properties of production technology under which developments in factor costs and profit shares can be unequivocally attributed to the progression of market power over time. And second, the paper examines the determinants of costs and profit shares in the context of a closed economy, where the relevant market for each corporate sector is domestic, and in the context of a global economy, where the national corporate sectors compete in a single relevant global market. In the latter case, differences in countries' corporate profit shares will necessarily depend on differences in corporate production costs.

Overall, the paper contributes to the literature in two ways. Firstly, with new empirical evidence on the aggregate composition of gross value added of corporate sectors in the main euro area economies and the US, with the specific new feature of the separation of non-labour income in capital costs and economic profit shares. And second, with a comprehensive conceptual framework that integrates properties of the production technology and of the definition of the relevant market, in explaining cross-country and trend differences in factor costs and profit shares. In particular, the paper clarifies the conditions under which changes in labour cost shares can be attributed solely to changes in firms' market power, and highlights the relevance of comparative unit production costs in explaining the differences in corporate profit shares across countries in a single global market.

The remainder of the paper is organised as follows. Section 2 reviews the most relevant literature on the changes over time in labour cost shares and the more recent literature on profit shares. In Section 3 we develop a conceptual accounting framework for the measurement of the underlying variables involved in the calculations of costs and profit shares. In Section 4 we describe the data sources for the different variables and Section 5 shows the results of the calculations of costs and profit shares. Section 6 presents a summary of the theoretical framework, expanded in Appendix 1, under which the empirical evidence is analysed. This analysis is reported in Section 7. Section 8 presents some robustness exercises using industry level data. Finally, Section 9 sets out the main conclusions.

2 Related literature

The research contained in this paper is related to a relatively long list of research into the way in which labour cost shares have evolved in different countries over time, as well as to a few recent papers on trends in profit shares, and to the growing list of papers that use the evidence on changing cost and profit shares to assess worldwide trends in corporate market power.

2.1 Labour cost share

The early work of Keynes (1939), Kaldor (1957) and Solow (1958) documented the stability over time of the labour cost share in value added, particularly in the US, to the point that such stability became one of the universal laws in the explanation of the income distribution. However, more recent evidence has modified this view. Elsby et al. (2013) have examined the magnitude of the movements in the labour share in the US economy's value added since 1948 and found a decline of around 6 percentage points (pp) starting in the late 1980s and accelerating since the early 2000s. The drop in the overall labour share is due mostly to declines in the shares within particular industries, rather than to shifts in activity from higher to lower labour-intensive sectors. Karabarbounis and Neiman (2013) report a 5 pp average decline in the labour share of global corporate gross value added over the last 35 years, using data from 59 countries. This decline also occurred in each of the world's eight largest economies, with the United Kingdom being the only exception, and, once again, it was explained by a decline in the share in particular industries across countries.

Research into the stability (or not) of labour compensation in the functional distribution of income has continued with papers by Bridgman (2014), Rognlie (2015), Lawrence (2015), Koh et al. (2016), Barkai (2016), Kehrig and Vincent (2017) and Grossman et al. (2017), among others. The generally accepted conclusion of this body of research is that the change in the functional distribution of income has been a worldwide phenomenon and that it may have begun around the year 2000. However, a closer look at the results from the different papers reveals that their results are not always comparable, with divergences possibly arising out of methodological differences. For example, conclusions about the decline in labour cost shares over time depend on whether labour income is calculated for the whole economy or for the market economy (Estrada and Valdeolivas, 2012), or on whether labour costs include only compensation of employees, or also include self-employed individuals' income (Elsby et al., 2013)[2].

Among those papers that conclude that the labour cost share has been declining over time, the most widespread explanation is the rising capital to labour ratio in the production of goods and services. One reason for this rise is the fall in the relative unit cost of capital, which Karabarbounis and Neiman (2013) attribute to the decrease over time in the purchase price of one unit of ICT capital, the kind of production equipment in which firms have invested most in recent years, and which Piketty (2014) attributes to the rise in aggregate savings around the world that depresses the expected rate of return on capital. However, if the quantities of labour and capital used in production are decided by profit maximising firms, for a lower relative cost of capital to translate into a smaller labour cost share the elasticity of substitution between capital and labour needs to be greater than one, which is not broadly supported by the empirical evidence. Oberfield and Raval (2015) explain the increase in capital intensity by the widespread adoption and use of production technologies biased towards capital. More recently

2 The conclusions are also sensitive to the use of gross or net value added, i.e. on whether the depreciation of productive capital is included in, or excluded from, value added (Bridgman, 2014, Rognlie, 2015). Including the income attributed to the owner occupied housing in the value added (or not) (Rognlie, 2015). And to the inclusion or not of the value of produced intangible assets in the estimated value of output produced in the economy (Koh et al., 2016).

Grossman et al. (2017) attribute the fall in the labour cost share to the slowdown in productivity growth that causes a deceleration of human capital accumulation in economies with production technologies that incorporate capital-skill complementarity (compatible with an elasticity of substitution between capital and labour lower than one).[3]

2.2 Capital cost share and profits

Within gross value added, non-labour income has tended to be considered, more or less explicitly, as capital income, without further distinction between capital cost and economic profits. Barkai (2016) is the exception, with a study estimating the US corporate sector's capital cost and the profit shares from 1985 to 2014. The capital cost share is calculated as the stock of corporate operating assets –measured as the non-residential fixed assets valued at current prices- per dollar of corporate gross value added, multiplied by the per unit user cost of capital (ex-ante nominal gross rate of return to compensate for the opportunity cost of the investment). He documents a decline of 7 pp in the capital share and a practically identical decline in the labour share (6.7 pp). This implies an increase of 13 p.p. in the economic profit share of US corporations over the last 30 years.

Dobbs et al. (2015) report a significant increase in the accounting profits of firms relative to GDP worldwide from 1980 to 2013. Corporate earnings before interest and taxes rose from 7.6 per cent of world GDP in 1980 to almost 10 per cent in 2013. Over the same period, worldwide net accounting profits, i.e. after interest on debt and taxes, as a proportion of GDP, increased even more. However, accounting profits are not the same as economic profits, as while accounting profits do not account for the opportunity cost of equity financing, economic profits account for the cost of both debt and equity.

We are unaware of any studies estimating capital cost shares and profit shares for corporate sectors in countries other than the US. This paper is then the first to provide estimates of these shares for the euro area countries of France, Germany, Italy and Spain. One difficulty in the calculation of the capital cost share is that no official statistics exist on capital stock or on the per unit user cost of capital, so they have to be calculated ad hoc. To ensure the comparisons are uniform, we have replicated the calculation of capital stock and unit user cost for the US corporate sector using the same methodology.

2.3 Market power

Firms have market power if they can set the price at which their products sell on the market at above their marginal costs. Hall (1988) shows that the ratio of price over marginal cost (mark-up ratio) can be empirically estimated as the ratio between the elasticity of output to the variable input, and the share of the cost of the variable input over the total sales of the firm. Recently De Loecker and Eeckhout (2017) estimate the Hall measure of market power with data from individual firms in the US over the period 1950-2014, with capital excluded from the variable inputs, and conclude that market power has been steadily increasing over time. Diez et al. (2018) and De Loecker and Eeckhout (2018) replicate the study with firm level data from

3 Other explanations, unrelated with our analysis, include: the increase in cheaper imported intermediate goods and offshoring activities (Elsby et al., 2013); the automation of tasks that were previously done by humans (Acemoglu and Restrepo, 2016); and the growing importance of "super star firms" (Author et al., 2017; Khering and Vincent, 2017).

numerous countries around the world over the period 1980-2016. The results of the two studies confirm the rise of market power worldwide but more clearly in developed countries.[4]

Alternatively, Barkai (2016) measures market power in the US corporate sector directly from the economic profit share, therefore including capital among the variable production inputs and assuming constant returns to scale (marginal and average unit production costs coincide). Since the profit share increases over time so does market power. At the industry level, Barkai reports a strong positive correlation between market power and market concentration.

Summing up, from the theoretical framework set out in Appendix A, an economy with labour as the only variable input and with a constant elasticity of output to the labour input, under Hall's framework, the decline in the labour cost share would have to be attributed to increasing market power. Capital deepening could not be an explanation of the decrease in the labour cost share because the capital input is fixed, as is the cost attributed to the fixed input. With two or more variable inputs, for example intermediate products and labour, the condition for a constant elasticity of output to the labour input is true only if the production function is of the Cobb-Douglas type (elasticity of substitution between labour and intermediate inputs equal to one). With capital as a variable input together with labour and gross value added as the output variable, the falling labour and capital cost shares would necessarily be the consequence of increasing market power if the elasticity of substitution between the two inputs in the production function is equal to one. Also with labour and capital as variable inputs, Barkai's economic profit share can be taken as a direct estimate of market power if the production function has constant returns to scale.

4 Several papers (Gutiérrez and Philippon, 2017; Karabarbounis and Neiman, 2018; Traina, 2018; Hall, 2018) question the results of De Loecker and Eeckhout (2017) for the US, particularly their choice of variable costs used as proxy of the marginal production cost.

3 Accounting

Corporations are legal entities that own non-human capital assets, which they combine with labour and intermediate goods to produce goods and services to be sold on the market. In an earlier paper we were interested in measuring the contribution of the corporate sector to national income through the production of goods and services within national boundaries.[5] Here we are interested in how the aggregate value added produced by the corporate sector is divided into the cost of labour, the cost of capital and economic profits. Corporations with headquarters in one country can have subsidiaries producing goods or services abroad and therefore creating wealth in the host country. Our analysis excludes any wealth created abroad as our interest is in the allocation of the wealth created by the corporate sector within the national boundaries of a particular country. The activities of corporations not directly related to the production and sales of goods and services, such as investment in pure financial assets, are also excluded.

Sectoral National Accounts publish the aggregate data on value added and the compensation of the labour input but do not report official information on the cost of capital. This is because corporations largely use capital input services from the assets they own (generally reported on their balance sheets), for which no reference market price is ready available, in the production of goods and services. In this situation it is common practice to divide corporations' value added into labour and non-labour income. This practice, while avoiding questionable estimates of opportunity cost for the capital services from the capital assets owned by the firm, has the significant limitation that it does not separate non-labour income into capital costs and economic profits and, therefore, relevant information on corporate profits is not available.

In this paper, we estimate the unit user cost of capital and the stock of operating capital for the five countries' corporate sectors at replacement cost values. We then use these two variables to calculate the total opportunity cost of the capital services used in production. With the estimated cost of capital it is possible to separate the aggregate non-labour income into aggregate cost of capital and economic profits. In this section we explain the basics of the accounting for corporate economic profits applied in the paper.

3.1 Income Accounting

Excluding corporate subsidies and production taxes to simplify the notation, on an ex post basis, the aggregate gross value added (GVA) generated by the corporate sector during a time period t (generally one year) can be broken down into three terms: compensation for labour inputs, opportunity cost of capital and residual profits (positive or negative):

$$p_t Y_t = w_t L_t + R_t p_{Kt} K_t + \Pi_t \tag{1}$$

The value of output produced, Y_t, at the unit price, p_t, is the notation we use to represent the gross value added with the primary inputs, $GVA \equiv p_t Y_t$; where w_t is the cost per employee; L_t is the number of employees; $R_t p_{Kt}$ is the opportunity cost per unit of capital

5 Salas et al. (2017) calculate that the contribution of NFCs' GVA to national income (measured as GDP) in France, Germany, Italy, Spain and US in the period 1999-2015 ranged from 45% to 56%. The main cross-country differences arise from: i) the relative significance of self-employed business, classified within the household sector; and ii) for the case of the US, by not taking into account the non-corporate firms in the NFCs. Likewise, considering a broader measure of gross income with the inclusion of financial income, it is found that the weight of financial rents in NFCs total income is also heterogeneous across these countries.

services (equal to the user cost per monetary unit invested, R_t times the current purchase price per unit of capital services, p_{Kt}), and K_t is the stock of units of capital services from past investments; the profit, Π_t, is a residual that can be positive or negative.[6]

From equation (1) we obtain the labour cost share, $S_t^L = \frac{w_t L_t}{p_t Y_t}$, the capital cost share, $S_t^K = \frac{R_t p_{Kt} K_t}{p_t Y_t}$, and the ex-post share of economic profits, $S_t^{\Pi} = \frac{\Pi_t}{p_t Y_t}$.

Sectoral National Accounts provide information on GVA and labor compensation, but not on the stock of capital and on the unit user cost of this capital. Hence for the calculation of capital costs and profit shares it will be necessary to estimate the unit user cost of capital, R_t, and the capital stock, $p_{Kt}K_t$.

3.2 The unit user cost of capital

Incorporated firms report their activity via accounting statements such as their income statement (the flows of revenues and explicit costs of goods or services produced) and balance sheet (stock of assets and liabilities at a given moment of time). Generally accepted accounting practices for NFCs establish that only explicit costs can be used when calculating accounting profits. Opportunity costs are excluded and this particularly affects the opportunity cost of equity. Conversely, depreciation of capital assets and interest on debt are included among the costs of the business activity. One way to reconcile the accounting profits from conventional accounting statements with economic profits is to estimate an opportunity cost of equity and subtract it from the accounting profits. The limitation of this approach for the purposes of this paper is that it does not differentiate between the cost of operating capital assets, those consumed in the production of the gross value added, and the costs of all the NFCs' operating and financial assets.

In this paper we will depart from the corporate accounting practices and instead estimate values of the unit user cost of capital and of the stock of operating capital at replacement cost, for the corporate sectors of the five countries, France, Germany, Italy, Spain and the US. The per unit user cost of capital is an estimate of the ex-ante rate of return of capital invested demanded by investors to compensate for the return they would obtain investing in other alternatives with similar economic and financial risks. The unit user cost of capital is calculated as follows.

At time t, the price of one unit of capital services is p_{Kt} and the expected rate of return on investing in another asset of equal risk is i_t. One unit of capital service used in production will turn into $(1 - \delta_t)$ units at the end of the period (depreciation rate δ_t). At time t, the expectation of the price of capital services at the end of the period is $E(p_{Kt+1})$. The ex-ante user cost of capital is the rate of return, R_t, which solves the following difference condition:[7]

$$p_{Kt}R_t + (1 - \delta_t)Ep_{Kt+1} = p_{Kt}(1 + i_t)$$

Writing $E(p_{Kt+1}) = p_{Kt}\big(1 + E(\pi_{t+1})\big)$, where $\mathrm{E}(\pi_{t+1})$ is the expectation in moment t of the rate of change in the price of capital services during that period up to t+1.

6 Including subsidies, SUt, and production taxes, PTt, the left-hand side of equation (1) would be modified to ptYt + SUt - PTt. In the empirical calculation subsidies and production taxes are properly accounted for.

7 See Hall and Jorgenson (1967).

Solving for R_t, we obtain the expression for the ex-ante user cost of capital per monetary unit of capital invested,

$$R_t = i_t - E(\pi_{t+1}) + \delta_t \left(1 + E(\pi_{t+1})\right)$$

The ex-ante user cost of capital per euro of current value of the capital asset is equal to the risk-adjusted nominal opportunity cost of each euro invested in the asset, at time t, i_t, minus the expected the rate of change in the price of the capital assets up to time t+1, $E(\pi_{t+1})$, plus the expected replacement cost of the assets depreciated in the period, $\delta_t\left(1 + E(\pi_{t+1})\right) \approx \delta_t$.

Corporations finance their assets with debt and equity. These two sources of finance have different effective costs because debt-holders and shareholders are exposed to different financial risks (debt-holders earn a pre-determined interest rate and shareholders a residual dividend) and interest on debt is tax-deductible, as are depreciation costs, whereas the cost of equity is not. Taking these differences into account the pre-tax user cost of capital (R_t^τ) per monetary unit invested in productive capital, financed with proportions of debt and equity *b* and $(1-b)$, is equal to:[8]

$$R_t^\tau = \left(b_t i_t^b (1-\tau_t) + (1-b_t)\alpha_t + \delta_t - E(\pi_{t+1})\right) \frac{1-\tau_t z_t}{1-\tau_t} \qquad (2)$$

Where i_t^b is the rate of interest on debt; α_t is the rate of return expected by the shareholders, i.e. the financial opportunity cost of equity; τ_t is the legal tax rate on corporate profits; and z_t is the net present value of tax-deductible capital depreciation allowances per unit of capital.[9] The details of the sources of data used in the calculation of the unit user cost of capital are presented in Appendix B.

3.3 Capital stock and total user cost

Firms invest in new capital assets over time. The new investment replaces the capital assets consumed or depreciated in each period and may contribute to expanding production capacity. If market purchase prices of capital assets fluctuate over time and/or the technological progress incorporated into the new capital goods accelerates the economic depreciation of past invested assets, the monetary value of the stock of capital assets at a given moment in time will, unless properly adjusted, be an aggregation of assets valued at different acquisition prices and with different technological characteristics. Calculating the opportunity cost of capital requires that all operating assets be valued at current replacement cost, which in general will be different from the acquisition cost of capital assets on the balance sheets.

Assuming that the technological obsolescence of any existing capital assets is included in δ, to save on notation, the stock of units of capital services at the end of period t for a firm that invests I_t units of new capital during that period is given by:

8 As discussed below, we consider the time varying funding structure of NFCs, according to the breakdown of liabilities into debt and equity over time as reported in the Financial Accounts of this institutional sector. This enables us to better capture the changing nature of the funding structure of the NFCs, their average funding cost and, therefore, the implications for the user cost of capital.

9 In the calculation of the net present value of capital depreciation allowances we take into account the breakdown of nominal gross-fixed capital formation into three types of investment (non-residential buildings, equipment and intangibles) with different allowance schedules.

$$K_t = K_{t-1}(1-\delta_t) + I_t$$

The stock of capital services and the investment in new assets are reported in monetary values. If p_{kt-1}, p_{Kt} are, respectively, the prices per unit of capital services in period t-1 and in period t, the current replacement cost of capital services can be expressed as,

$$p_{Kt}K_t = p_{kt-1}K_{t-1}(1-\delta_t)\frac{p_{Kt}}{p_{Kt-1}} + p_{Kt}I_t \tag{3}$$

The replacement cost of capital services at the end of a given period is equal to the stock of capital services at the end of the previous period, net of depreciation, valued at current replacement prices, plus the new gross investment in capital services during the period at current prices.

The pre-tax total cost of capital services in period t is equal to the pre-tax user cost of capital in (2), multiplied the stock of capital at current replacement cost in (3), i.e. $R_t^{\tau} p_{Kt} K_t$.

4 Variables and data sources

For the organisation and collection of the data used in the calculation of cost and profit shares we have considered a simplified income statement and balance sheet for the consolidated corporate sector of each country as follows:

Income statement (the variables actually measured are in bold type)

Revenues from products and services sold

+Subsidies

-Production taxes

-Cost of the intermediate production inputs purchased outside the corporate sector

=**Gross value added**

-Cost of labour input

-Cost of capital input

=Economic profits

Balance Sheet:

Operating capital assets	**Interest-bearing debt**
	Equity

The measurement of the variables on the income statement and balance sheet will involve data from several sources: the Sectoral National Accounts for the Non-Financial Corporate Sector, NFCs (flow variables); NFCs' Financial Accounts (stock data); the KLEMS database (initial depreciation rate and investment price-deflators); Central Bank statistics on prices and returns on financial assets; and OECD data on corporate income tax rates and on the net present value of depreciation allowances for each type of capital good (non-residential buildings and structures, equipment goods and intangible assets). For the four euro-area countries the Sectoral and Financial Accounts data are taken from the harmonised Eurostat statistics database, while for the US corporate sector the data source is the BEA statistics database. The definition of non-financial corporations is different in the BEA than in the Eurostat statistics (see note 5).

The Sectoral National Accounts provide data on flow variables: value of production, cost of intermediate inputs, labour compensation, production and import taxes and corporate subsidies, consumption of fixed capital (depreciation) and capital investment flows. From this data source we can therefore directly obtain information on gross value added, and on the cost of labour inputs on the income statement. The cost of capital income is not readily available and has to be estimated. For this purpose we need an estimate of the stock of operating capital valued at replacement cost, $p_{Kt}K_t$ and an estimate of the user cost of capital per euro/dollar invested, R_t.

4.1 The estimated capital stock

The stock of capital assets for the corporate sector of each of the five countries at the end of year t, over the period from 1995 to 2016, has been calculated using the perpetual inventory method (simplified version of equation (3)):

$$p_{Kt}K_t = p_{kt-1}K_{t-1} - Dep_t + p_{Kt}I_t$$

The term Dep_t is the nominal depreciation flow reported in the National Accounts, aggregated for the NFCs of the respective country in year t (calculated from assets at current replacement cost and assumed to be a good estimate of economic depreciation), and $p_{Kt}I_t$ is the flow of nominal expenditures in gross capital formation of the NFCs in year t.[10]

The capital stock of year 0 (1994) is not available so has to be estimated. The observed depreciation flow in year 1995 will be given by $Dep_{1995} = \delta_{1995}p_{K1995}K_{1994}$. Thus, from this expression,

$$p_{k1995}K_{1994} = \frac{Dep_{1995}}{\delta_{1995}}$$

We still need the initial depreciation rate for the year 1995 (δ_{1995}). To calculate this depreciation rate we used data from the KLEMS database on the composition of capital stocks (machinery, equipment, non-residential buildings and structures, and intellectual property products), and on the depreciation rates of each asset class, across 2-digit economic sectors of the respective country. The estimated depreciation rate for each corporate sector will therefore be the sum of depreciation rates of individual assets weighted by the share of the asset class in the country's total assets. The resulting depreciation rates for 1995 are: 8.6% for France, 8% for Germany, 6.8% for Italy, 6.5% for Spain and 8% for the US.

For illustrative purposes, Figure 1 shows the estimated ratios of capital stock to gross value added.[11] The ratios increase over time for the corporate sectors of Spain and Italy (until 2013), stay relatively stable in the corporate sectors of US and France and decrease in the German corporate sector. The differences across corporate sectors in capital to output ratios are considerable. For example, in 2016 the ratios were 2.5 in Italy, 2.8 in Spain, close to 2 in France and Germany and 1.7 in the US.[12]

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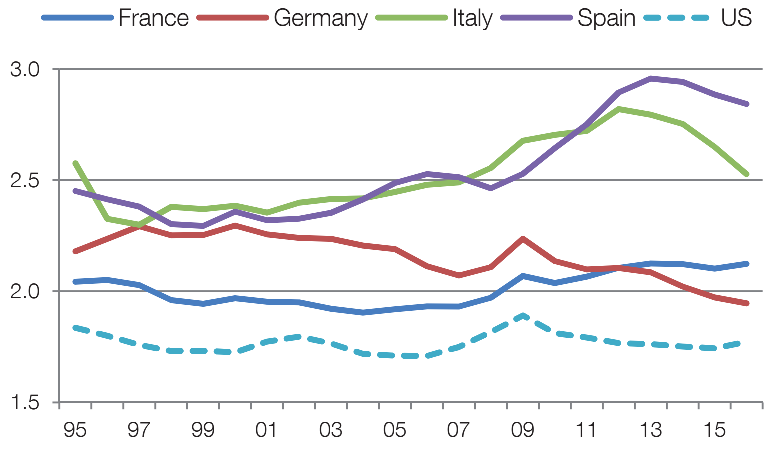
10 Gross capital formation is the sum of gross fixed capital formation, changes in inventories and net acquisitions of non-financial non-produced assets. The KLEMS database provides estimates of the stock of capital in the economies represented in this paper but we prefer to calculate our own estimates because this way we can use investment and depreciation data that National Accounts attribute specifically to the NFC sector.

11 Annual data on these two variables as well as on labour costs, gross investment, depreciation and the investment deflator for the corporate sectors of the five countries is included in Data Appendix.

12 We compared with alternative measures of capital stock, which are not represented here. For example, our measure of capital stock of the NFC sectors in our countries of interest shares generally similar trends to those obtained aggregating data by activity branch and type of asset from KLEMS. In terms of levels, our measure of capital stock is, on average over the period 1995-2016, higher than that estimated with KLEMS data in the cases of France, Spain (both around 15%) and Germany (10%), while it is lower in the US (almost 20%) and Italy (about 5%). It should be noted that our selected measure of capital stock for the US nonfinancial corporations is very close to non-residential fixed assets data from BEA, which was used by Barkai (2016) and, in the case of Germany, it does not have the sizeable underestimation problem that other statistics like Financial Accounts do (taking the difference between its liabilities and financial assets as a measure of capital stock for the NFC sector).

Figure 1. Capital Stock over GVA, $\frac{p_{Kt}K_t}{p_tY_t}$



4.2 The unit user cost of capital

In what follows, we report the results of the calculation of the pre-tax and per unit user cost of capital as given in equation (2) above. A more detailed explanation of the data sources and values of individual variables can be found in Appendix B.

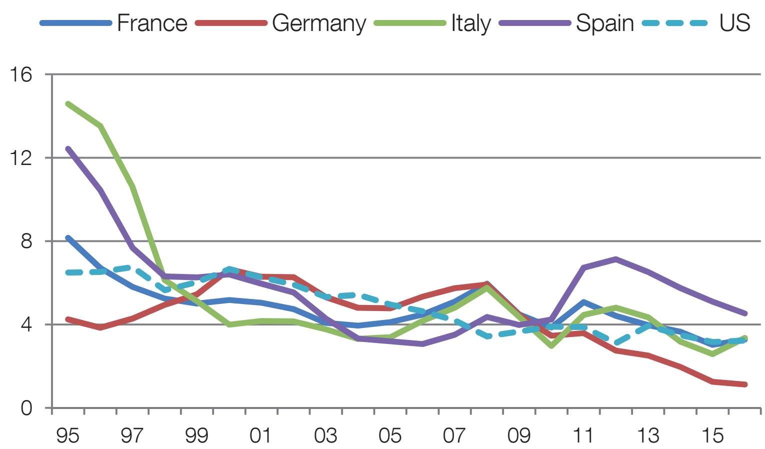
The real financial opportunity cost component of the user cost of capital is equal to the weighted average of the opportunity cost of debt and the opportunity cost of equity, where the weights are the respective proportions of debt and equity on the balance sheet of the corporate sector, minus the expected inflation rate for the prices of capital goods:

$$R_{ft} = b_t i_t^D + (1 - b_t)\alpha_t - E(\pi_{t+1})$$

Figure 2 shows the estimated real financial opportunity costs for the corporate sectors of the five countries.[13]

13 The country level data on the cost of debt i_t^D, the debt-to-total capital stock ratio, b_t, the cost of equity α_t, the expected inflation rate in the prices of capital goods $E(\pi_{t+1})$ as well as on the depreciation rate $\delta_t$is available in Data Appendix.

Figure 2. Real Financial Cost of Capital, R_{ft} (%)

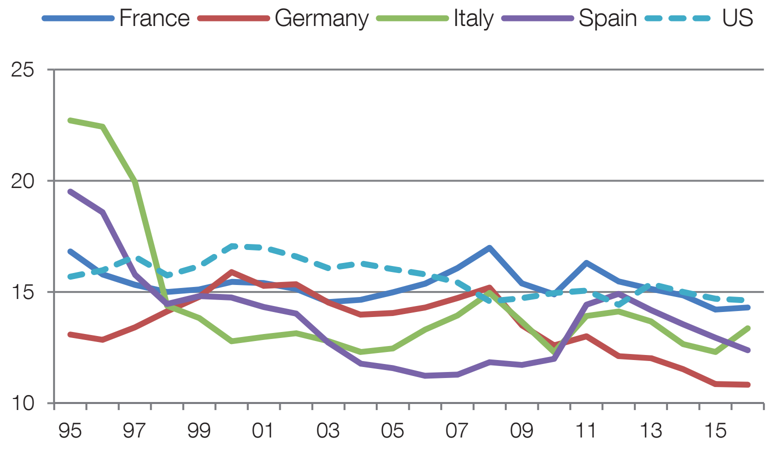


In 1999, the year of the creation of the euro, the real financial cost of capital was around 6% for the four euro-area countries and the US. The higher price inflation of capital goods in Italy, France and Spain than in Germany and the US, explains why during the period 2000-2008 the real financial cost of capital in the European countries was lower than in the US. In the final years of the sample period, 2010-2016, the real financial cost of capital steadily decreased in Germany, to a low of 1.1% in 2016. French corporations' financial cost of capital has been relatively stable since the creation of the euro and the same is true for the Italian and US corporate sectors (an average of 4%). The financial cost of capital of Spanish corporations fell to a low of 3% in 2006 and rose during the crisis to a peak of 7.1% in 2012. Since 2013, coinciding with the years of monetary expansion by the ECB, borrowing costs have been decreasing but in 2016 are still higher than in other corporate sectors.

The *pre-tax user cost of capital* is defined in equation (2). The calculation involves the real financial cost of capital shown in Figure 2, the depreciation rate, and the tax adjustment due to the fact that capital depreciation and interest on debt are tax-deductible in the calculation of taxable corporate profits. The estimated pre-tax user costs of capital of the corporate sectors of the five countries are shown in Figure 3.[14]

14 In general, the most significant factors explaining the fall of the unit user cost of capital during the sample period across countries were the funding costs (both, equity and debt). By contrast, corporate tax variables and expected inflation made a marginal contribution. See Appendix B and Data Appendix.

Figure 3. Pre-tax User Cost of Capital, R_t^τ (%)



The user cost of capital differs across countries because of differences in the financial cost (Figure 2) depreciation rates, and tax variables. Average depreciation rates over the sample period were 9.6% for France, 8.2% for Germany, 8.1% for Italy, 7.0% for Spain, and 9.0% for the US. The difference between pre-tax and after-tax user cost of capital ranges from 1.7 pp in the US corporate sector –the highest– to 0.9 pp in France –the lowest. In the cases of Germany, Italy and Spain the differences are all close to 1.1 pp. Therefore, the main reason why the pre-tax user cost of capital of Spanish corporations was lower than that of their German counterparts between 2000 and 2010 was the lower depreciation rate for corporate assets in Spain than in Germany. The differences in depreciation rates also explain why the pre-tax user cost of capital of French and US corporations, around 15.5% in the sample period, is, on average, almost 2 pp higher than the pre-tax user cost of capital of German and Spanish corporations, and 1.5 pp higher than that of Italian firms.

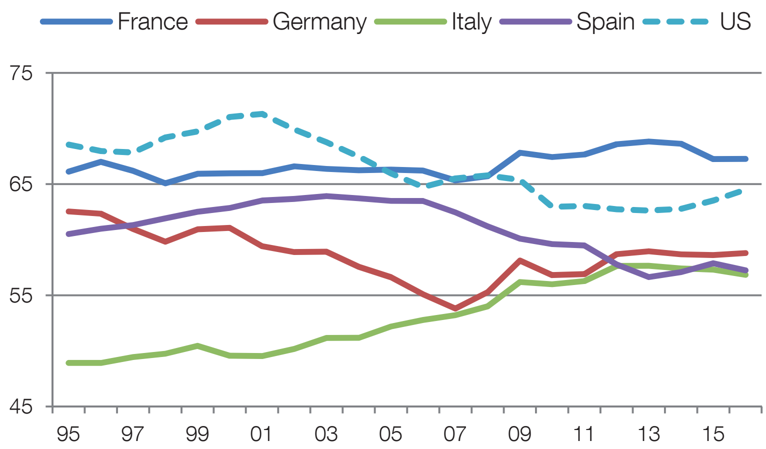
The downward trend in the unit user cost of capital for the Spanish and Italian corporate sectors in the first ten years of the euro reflects the downward trend in borrowing costs after joining the single currency area. From 2010 onwards, Germany had by far the lowest user cost of capital, again explained by German corporations' lower borrowing costs in this period.

5 The shares of input costs and profits: trends and convergence

This section presents the results of the calculations of the input cost shares and the residual profit share for the corporate sectors of the five countries over the period 1995-2016.[15]

The *labour cost shares* values, i.e. the ratio of labour costs to gross value added are shown in Figure 4. In the mid-nineties, the labour cost shares of non-financial corporations clustered around 65% in four of the five countries; in the fifth country, Italy, the share was less than 50%. Since then, corporate cost shares diverged among the countries in the sample in the pre-crisis and crisis periods. In particular, over the period 1995-2007 the labour cost share in the German corporate sector fell by 10 pp, from 63% to 53%; it then rose again to stabilise around 59% in the final years of the sample period. In the Spanish corporate sector, the labour cost share went in exactly the opposite direction, first increasing in the pre-crisis period and later decreasing. The labour cost share in the French corporate sector held stable over time with values around 67%, while in the Italian corporate sector the labour cost share increased up until 2009 and stabilised thereafter at values closer to those of Germany and Spain (around 57%). Finally, in the US corporate sector the labour share first rose to a maximum of 71% in 2001 and then declined to stabilise around 65% from 2010 onwards.

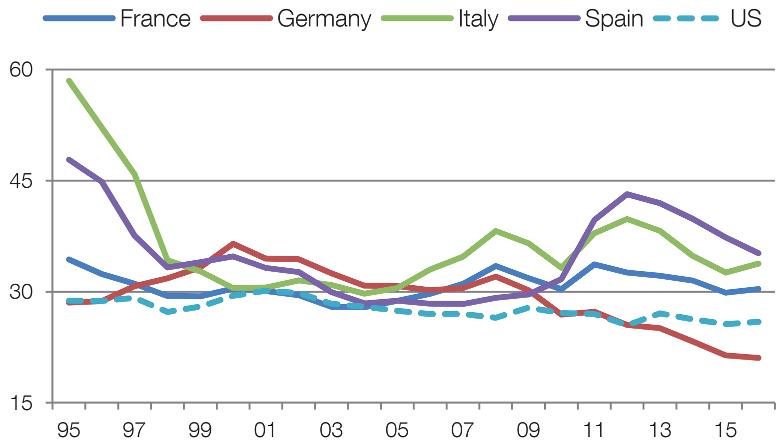
Figure 4. Labour Cost Share relative to GVA, $\frac{w_t L_t}{p_t Y_t}$ (%)



The next piece of evidence is on *the capital cost share*, i.e. the ratio of the imputed total user cost of capital to the GVA of the respective corporate sector (Figure 5).

15 The annual country level values of the cost and profit shares variables is available in the Data Appendix.

Figure 5. Capital Cost Share relative to GVA, $\frac{R_t p_{Kt} K_t}{p_t Y_t}$ (%)

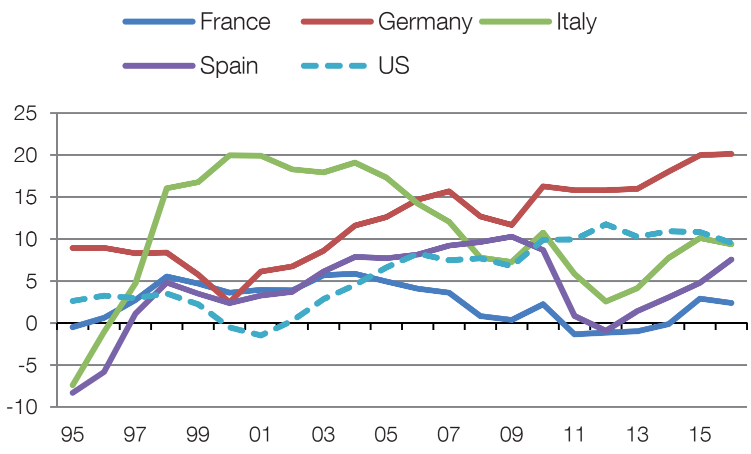


From 1995 until 1999, when the countries joined the euro, the capital cost shares of NFCs in Italy and Spain were on a downward trend starting from divergent values of around 50% to reach values around 30%, close to the capital costs shares of corporations in France, Germany and the US. In the years 1999-2009 the capital shares held fairly stable across countries, with modest declines in Germany, Spain and the US and moderate increases in France and Italy (ranging between 1 pp and 3 pp in absolute values). With the crisis the per unit user cost of capital and the ratio of capital to gross value added diverged across countries, as did the capital cost shares.

Of particular note is the stability of the capital cost share of the French corporate sector throughout the sample period. This contrasts with the steady decline in the capital cost share of the German corporate sector since the introduction of the euro, from a high of 37% in 2000 to a low close to 21% in 2016. Over the same period, the capital share of US corporations only decreased by less than 4 pp. In 2016, the capital cost share of Spanish corporations was still 14 pp higher than that of German corporations.

The *profit share* is equal to economic profits divided by gross value added. It is also equal to the difference from one of the sum of the labour and capital cost shares. The results of the calculations are shown in Figure 6.

Figure 6. Economic Profit Share relative to GVA, $\frac{\Pi_t}{p_t Y_t}$ (%)



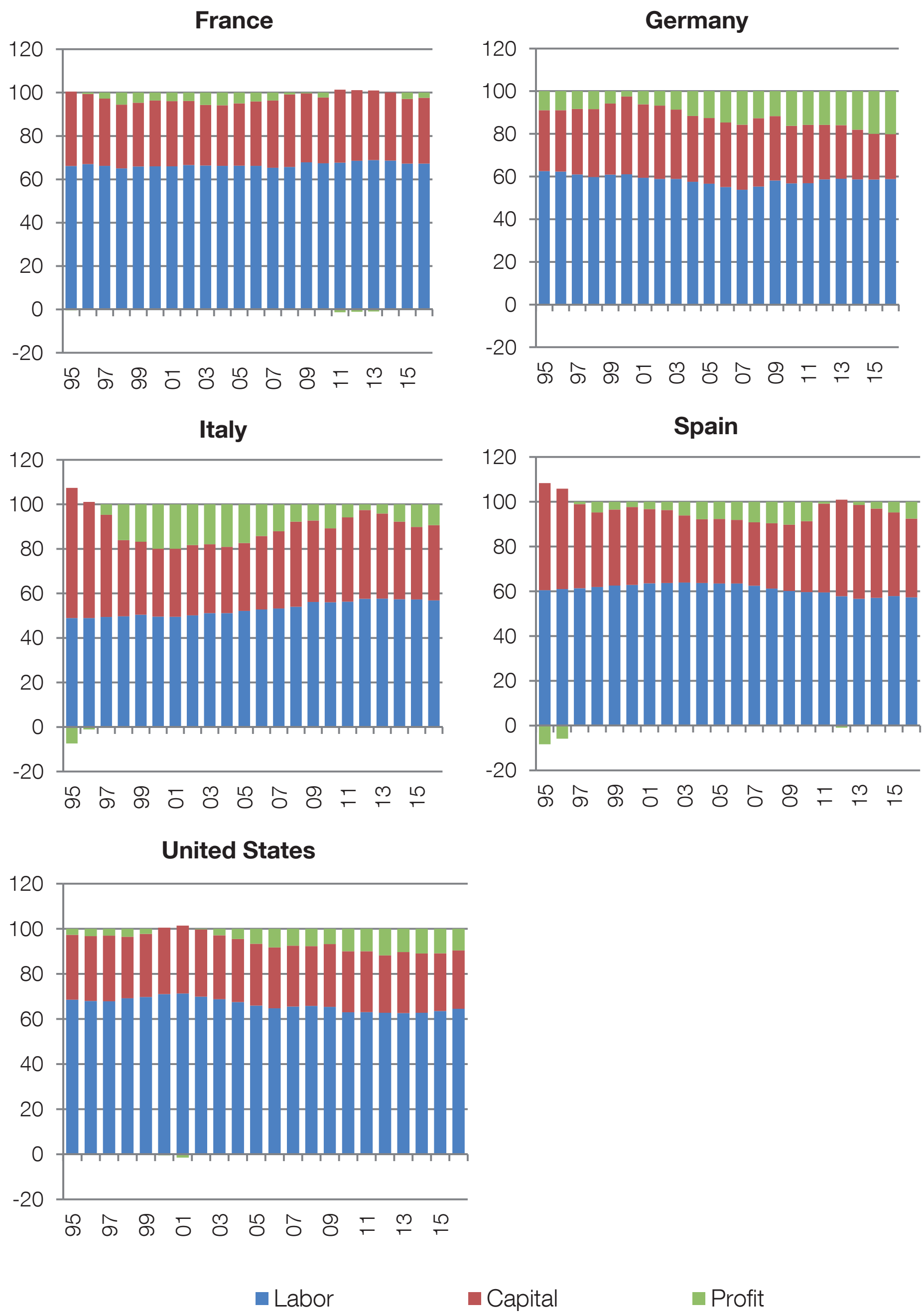
Since 2000, the profit shares have been on an upward trend in the German and US NFCs, although values in Germany have been consistently higher than those in the US: in 2016, German corporations' profit share was 20%, more than twice that of US corporations. In the pre-euro years, Italian corporations increased their profit share from negative values at the beginning of the sample period to almost 20% in 2000. In the years from 2000 to 2012, the profit share of Italian corporations decreased steadily to a low of 2%; from 2013, the profit shares increased again, reaching a value of 9% in 2016.

The trends in Spanish and Italian corporations' profit shares initially paralleled one another, but in the period 2000-2009 the two diverged and the Spanish profit share reached a maximum of 10% in 2009 (the main adjustment of the real sector of the economy to the crisis took place in the years 2010-2013). The sharp increase in the user cost of capital in 2009-2012, together with the inertia in the capital intensity ratio, resulted in Spanish corporations having a slightly negative profit share in 2012. Since then, the profit share of Spanish corporations has trended positively, rising to 7.5% of GVA in 2016. On average for the sample period as a whole, the NFCs' profit shares were 2.4% in France, 12.2% in Germany, 10.3% in Italy, 4.1% in Spain and 5.4% in the US. The difference in German and US corporations' profit shares has been relatively stable over time, except in the final years when the profit share of German corporations increased sharply to 20%, while the profit share of US corporations remained stable at around 10%.

Figure 7 summarises the five countries' distribution of corporate sectors' GVA into labour and capital cost inputs, and profit shares. France is the country where NFCs have normally had the lowest profit share, while profit shares of German NFCs have been traditionally the highest. In general, the profit share tended to move in the opposite direction to that of the capital cost share, with the exception of Italy where the labour share also shrank over time. Italy and Spain are the countries whose corporate sectors seemed to benefit the most in terms of higher profits from the reduction in the financing costs of capital thanks to the euro, particularly during the years 2000-2007.

The descriptive information presented so far indicates substantial differences in the composition of corporate sector GVA across countries. These differences persist over time, although how one corporate sector compares with the rest depends on whether the comparison is made in the pre-crisis or crisis years.

Figure 7. Cost and Profit Shares relative to GVA (%)



As regards the question of the convergence of the labour cost shares of the corporate sectors in the euro area, the empirical evidence in Figure 4 shows permanent divergences in at least one country. In the first few years of the sample period, the labour cost share clustered around 65% of gross value added in all corporate sectors except Italy's, where the labour cost share is less than 50%. In the early years of the euro, up until 2007, the labour cost share decreased in the German corporate sector by almost 9 pp, remained stable in the French and Spanish corporate sectors and increased in the Italian corporate sector. During the crisis the share decreased in the Spanish corporate sector and increased in Germany's, such that in 2016 the labour cost shares of the corporate sectors of Germany, Italy and Spain clustered around the value of 58%, while in the French corporate sector the labour cost share was 67%. The labour cost share of the US corporate sector is higher than the corporate sector's share in any of the euro area countries in the sample, except France's. During the crisis the difference in the labour cost shares of corporations in the US and Germany stabilised around 5-6 pp.

Figure 4 shows no evidence of a decreasing trend in the labour shares of the euro area countries. In the US corporate sector the share has been stable since 2010. Hence, the evidence does not support the generally accepted view of a decreasing time trend in labour cost shares across developed countries. However, when comparing our results with others in the literature a number of points should be borne in mind: the evidence reported here includes only four countries; it refers to the aggregate corporate sector, not to the whole economy; the labour share is calculated relative to gross value added and excludes the value of produced intangible assets; and the study covers a shorter period of time than other studies.

In the years prior to the euro, the capital cost shares converge between countries to a value around 30% of gross value added (Figure 5). This convergence continued until the onset of the crisis in 2008 and since then the situation has been one of clear divergence. The German corporate sector, where the capital cost share decreased steadily from 2008 until 2016 (11 pp), accounts for a large portion of this divergence. The capital cost share of the US corporate sector remained close to 30% until 2001 and subsequently declined (4 pp lower cost share in 2016 than in 2001) although not so markedly as the decline in capital cost share of German corporations.

The cross-country divergence in profit shares (Figure 6) is more evident than that in cost shares, although the differences between corporate sectors vary depending on the point in time. Of particular relevance is the upward trend in the profit shares of the German and the US corporate sectors since the year 2000, with Germany's share approximately 7 pp higher than the US's.

6 Theoretical background

A more detailed explanation of the theory framework from which we examine and interpret the empirical evidence is presented in the Appendix A. This section summarises the main theoretical predictions that guide the analysis of the empirical evidence given in the following section.

For a profit-maximising firm with two variable inputs, labour and capital, and one output sold on a market with price inelastic demand, the costs and profit shares, with variables evaluated at optimum values, are determined as follows:

$$\frac{w_t L_t}{p_t Y_t} = E_{Y_t/L_t}\eta_t \tag{4}$$

$$\frac{R_t p_{Kt} K_t}{p_t Y_t} = E_{Y_t/K_t}\eta_t \tag{5}$$

$$\frac{\Pi_t}{p_t Y_t} = (1 - \gamma\eta_t) \tag{6}$$

$E_{Y_t/L_t}, E_{Y_t/K_t}$ are the elasticity of output Y to the labour L and capital K inputs, respectively. They satisfy the condition $\gamma = E_{Y_t/L_t} + E_{Y_t/K_t}$ where γ is a parameter that measures the returns to scale in the production function, constant $(\gamma = 1)$, increasing $(\gamma > 1)$ or decreasing $(\gamma < 1)$ returns. For the CES production function, (see (A4)-(A6) in the appendix) the elasticity of output to the labour input is given by:

$$E_{Y_t/L_t} = \frac{\gamma}{1+\left(\frac{1-a}{a}\right)^{\frac{1}{1+\rho}}\left(\frac{R_t p_{Kt}}{w_t}\right)^{\frac{\rho}{1+\rho}}} \tag{7}$$

Where a is a positive parameter of the relative technological labour intensity in the production function, and $\rho>-1$, is a parameter related to the elasticity of substitution $\sigma = \frac{1}{1+\rho}$.

The variable $0 < \eta_t \leq 1$ is an inverse measure of market power, $\frac{1}{\eta_t} = \frac{p_t}{mc_t}$, the ratio of price p_t to marginal cost mc_t. Equations (4) to (6) may refer to an individual firm, to a market with more than one firm or to the whole economy with many different markets. Market and economy levels of costs and profit shares are the weighted averages of costs, and profit shares of individual firms, where the weights are the share of the value added of the particular firm in the total value added of the respective market or the total economy. The value of the ratio of price to marginal cost will vary across countries or within countries over time depending on market structure variables and competition conditions. For example, for a single firm j facing a residual demand for its products with constant price elasticity $\epsilon_j > 1$ in absolute value, in the profit maximising output $\eta_j = \frac{\epsilon_j - 1}{\epsilon_j}$.

If the firm behaves as a price taker then the price elasticity is equal to infinity and the market power parameter is equal to 1 (price equal to marginal cost). If the economy is a single market with a homogeneous product and firms compete à la Nash-Cournot, at equilibrium $\eta = \frac{\epsilon - H}{\epsilon}$, where ϵ is the price elasticity of market demand for the homogeneous product in absolute value, and H is the Herfindahl concentration measure. In this case, market power $\frac{1}{\eta}$ decreases with the price elasticity of demand and increases with market concentration.

Papers such as that by Karabarbounis and Neiman (2013) focusing on the labour cost share implicitly assume absence of market power, η_t=1, and the labor cost share is determined only by the elasticity of output to the labour input in the production function. From (7) when the elasticity of substitution is equal to 1, i.e., ρ=0, then the elasticity E_{Y_t/L_t} is constant and equal to γa ("iron law" of income distribution). When ρ is non-zero the value of the elasticity of substitution, greater than or less than one, determines the sign of the variation in the labour cost share relative to changes in relative input prices.

On the other hand, papers inspired by Hall (1988) that estimate market power as $\frac{1}{\eta_t} = E_{Y_t/L_t} \frac{p_t Y_t}{w_t L_t}$ (when the labour input is the only variable input) assume that the elasticity of output to labour is constant and market power evolves in a way totally determined by changes in the ratio of sales to variable costs (labour costs in this case). This will be true only if the elasticity of substitution between labour and other variable inputs is equal to one.

From (6), with the implicit assumption that capital is also a variable input, the measure of market power as a function of the profit share, is given by

$$\frac{1}{\eta_t} = \frac{\gamma}{1 - \frac{\Pi_t}{p_t Y_t}} \qquad (8)$$

Barkai (2016) assumes $\gamma = 1$ and estimates the evolution of market power in the US corporate sector as a function of the profit share alone.

So far, the corporate sectors of the national economies have been assumed to operate in a closed economy. The elasticity of demand and the market concentration that structurally determine simultaneously the market power and the profit shares, refer to the respective national economy. If the national economies are open and the national corporate sectors compete in a single global market, then, at market equilibrium, homogeneous products from different corporate sectors will all sell at the same price (p_t). Therefore, differences in profit shares of the corporate sectors between countries will be determined by differences in unit costs. For country i,

$$\frac{\Pi_{it}}{p_t Y_{it}} = \frac{p_t - ac_{it}}{p_t} \qquad (9)$$

Where the average unit cost ac_{it} is given by: $ac_{it} = \frac{w_{it} L_{it} + R_{it} p_{Kit} K_{it}}{Y_{it}}$

7 Analysis of the empirical evidence

The theory suggests that if firms are profit maximisers, differences in cost and profit shares between countries and trends within countries over time, will be determined by differences and changes in the characteristics of the production technology (elasticity of substitution among labour inputs, degree of economies of scale, intrinsic capital intensity), of the product market (price elasticity of demand, concentration, geographic scope, i.e. domestic or global market). This section aims to interpret the empirical results from the calculations of costs and profit shares under these theoretical predictions. To do so, it will be necessary to make some inferences from the data as to the plausible values of the elasticity of substitution between labour and capital, and of the economies of scale in production, because the values of these parameters will determine the validity of one explanation of the results or another.

7.1 Evidence regarding the elasticity of substitution between labour and capital

Combining equations (4), (5) and (7) above the ratio of labour to capital costs is given by:

$$\frac{w_t L_t}{R_t p_{Kt} K_t} = \left(\frac{a}{1-a}\right)^{\frac{1}{1+\rho}} \left(\frac{w_t}{R_t p_{Kt}}\right)^{\frac{\rho}{1+\rho}} \tag{10}$$

The ratio between labour costs and capital costs is independent of the returns to scale, γ, and of market power η. Changes in relative input unit prices will affect the ratio of inputs' total costs depending on the value of the parameter ρ. If the empirical evidence indicates that the ratio of inputs' costs is uncorrelated with relative input prices then it can be reasonably accepted that $\rho = 0$, i.e. elasticity of substitution between labor and capital equal to one, $\sigma = 1$ (Cobb-Douglas production function). Positive (negative) and significant correlation between cost shares and relative input prices will indicate that ρ is positive (negative) and that the elasticity of substitution between labor and capital is less (greater) than one.

Figure 8 shows the ratios of labour over capital costs for the NFCs of the five countries compared. The US corporate sector has the highest labour to capital costs ratio throughout the sample period, remaining practically constant over time at around 2.5. The corporate sector with the lowest ratio is Italy's, with a value around 1.5, which has been stable since 1998. The cost ratio of the French corporate sector remained close to the cost ratio of the US corporate sector, although somewhat lower and more volatile. In the case of Germany, the cost ratio first decreased, in the pre-euro years, then stayed stable around a value of 1.7 in the period 2000-2008, after which it again rose, up to a value of 2.8 in 2016, which was higher than that in the US. In the Spanish corporate sector the ratio of labour to capital costs increased from 1.3 in 1995 to 2.2 in 2007 after which it experienced a significant decline until it stabilised at around 1.5 at the end of the sample period, close to the values observed for the Italian corporate sector's ratio.[16]

16 The higher volatility in Spain's ratio may be related to the particular characteristics of its labour market with significant employment and unit labour cost changes over the business cycles.

Figure 8. The Ratios of Labour over Capital Costs, $\frac{w_t L_t}{R_t p_{Kt} K_t}$

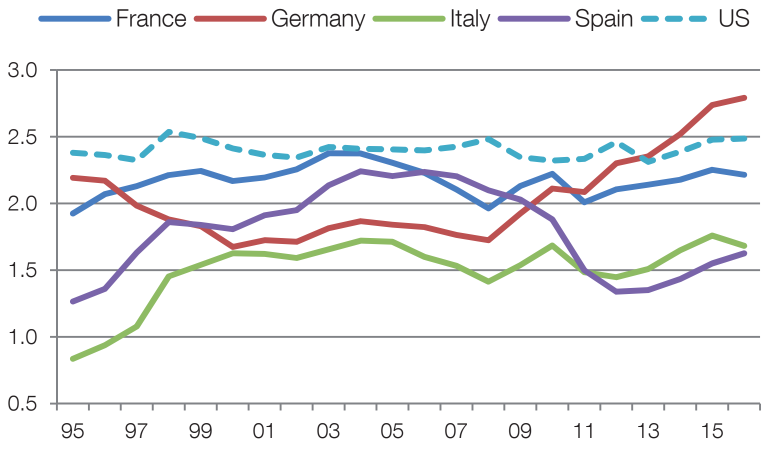
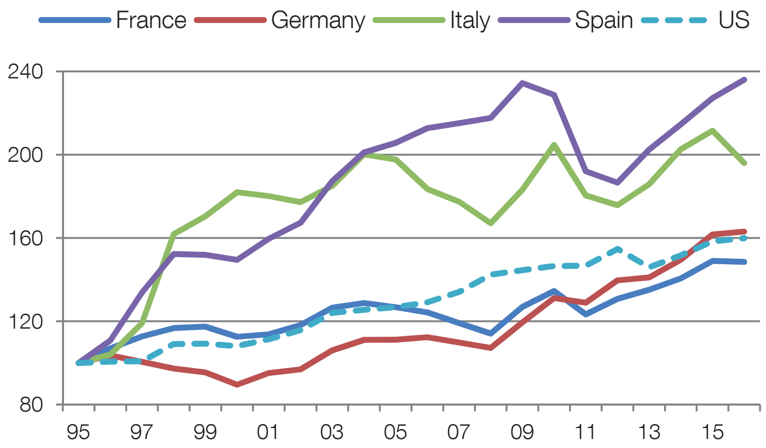


Figure 9. Relative Input Prices, $\frac{w_t}{R_t p_{Kt}}$ (1995=100)



The relative unit input unit prices for each corporate sector are shown in Figure 9.[17] In Germany, the ratio of input prices remained relatively stable with practically no time trend from the first year of the sample period to the year 2008. From 2009 onwards the price per unit of labour relative to that of capital followed an upward trend and in 2016 it was 50% higher than in 2008. In France, the upward trend in the ratio of input prices seen in the previous years accelerated during the crisis. Even so, in 2016 the cost ratio of the French corporate sector was 15 units lower than that of the German corporate sector. In the US the ratio of unit labour to capital prices rose steadily throughout the sample period and in 2016 was 1.6 times the ratio in 1995, close to the ratio of the German corporate sector.

Spain and Italy are the countries where the ratio of unit input prices increased most during the sample period, although the pattern of growth differed in each case. In Italy, the ratio

17 For each country, wages are measured as compensation of employees of the NFC sector as a whole reported in National Accounts divided by full-time equivalent (FTE) employees constructed specifically for this sector aggregating FTE employees from activity branches typical of NFCs. The number of FTE employees for the European countries is constructed from the EU Labour Force Survey data available on Eurostat. Data for the US are available on BEA (NIPA Tables, Section 6 – Income and employment by industry). For each activity branch and year, the number of FTE employees is equal to the number of total employees multiplied by the average number of actual weekly hours for total employees and divided by the average number of actual weekly hours for full-time employees. Total employees include full- and part-time employees.

of input prices rose by around 80% between 1995 and 1999, since when it has remained relatively stable. In Spain, the ratio followed an upward trend from 1995 until 2009 when it reached its maximum value of 2.3 times the value of the ratio in 1995. After 2009, the ratio first declined and then rose again in the final years of the sample period up to a value close to that in 2009. This pattern can be viewed as a reflection of the greater volatility of the business cycle of the Spanish economy, in comparison with the volatility of the other economies in the sample.

Figure 9 shows that the ratio of input prices increases over time in the US, while Figure 8 shows how the ratio of labour and capital costs there remained stable. This suggests that the value of ρ implicit in the US corporate sector data will be close to zero, i.e. the inferred elasticity of substitution σ will be close to one. In Germany and Italy, on the other hand, the visual comparison of the time course of cost ratios (Figure 8) and unit price ratios (Figure 9) suggests a high correlation between the two variables. France and Spain are in between.

Figure 10. The Relationship between Relative Cost Shares (y axis, logs and differences from sample means) and Relative Input Prices (x axis, logs and differences from sample means)

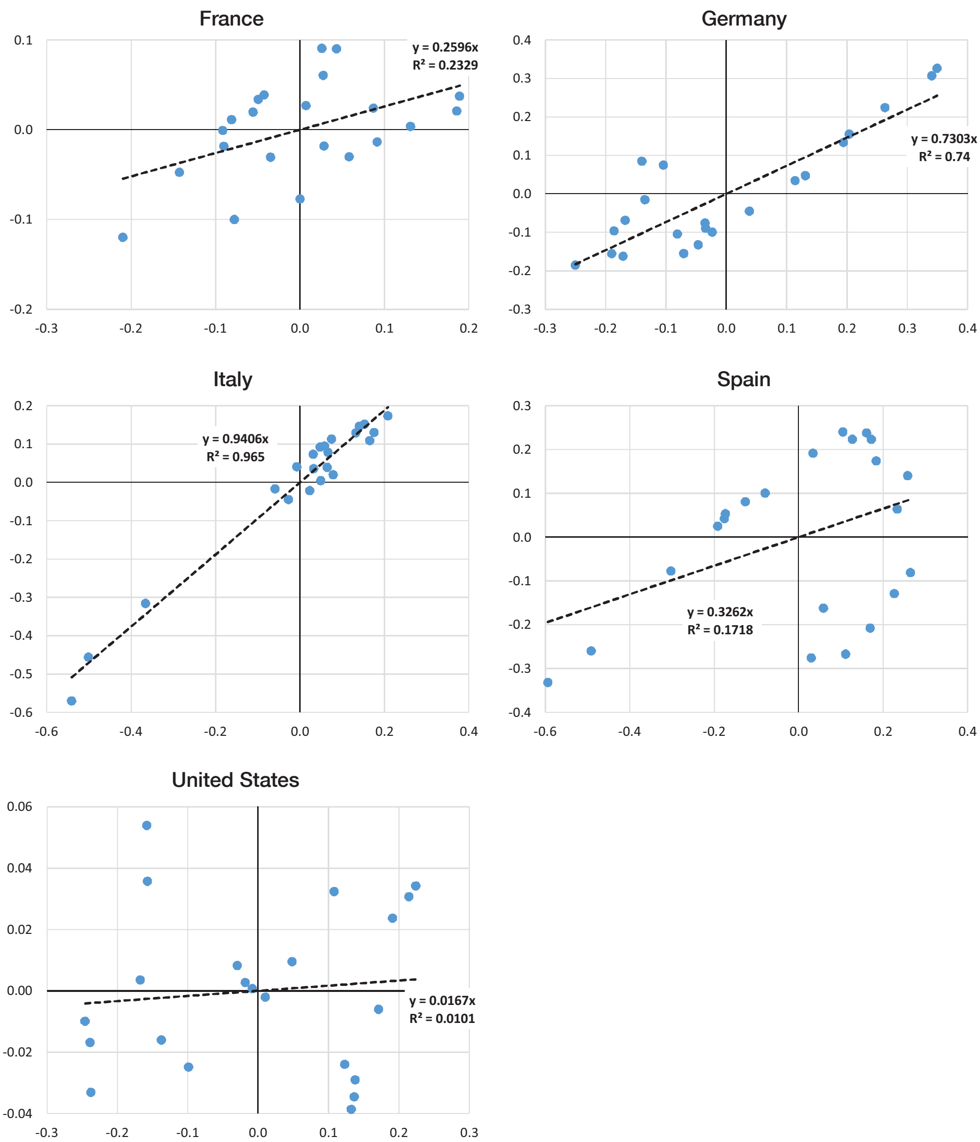


Figure 10 shows estimates of the coefficient of a linear regression model resulting from taking logs of both sides of equation (10). The dependent variable is the logarithm of the cost shares (in terms of differences from the sample mean), and the explanatory variable is the log of the ratio of unit prices of labour to capital (also in differences with respect to the sample mean). The regression coefficient of the explanatory variable is equal to $\frac{\rho}{(1+\rho)}$. According to the results shown in the Figure, the estimated coefficient is practically zero for the US corporate sector, and close to one, (0.94) for the Italian corporate sector. Between these extremes, the estimated coefficients are 0.26 for France, 0.33 for Spain and 0.73 for Germany.[18]

From the estimated coefficient β of the explanatory variable in Figure 10 we calculate the implicit value of ρ, i.e. $\rho=\beta/(1-\beta)$ and the elasticity of substitution inferred from the aggregate data, $\sigma=1/(1+\rho)=1-\beta$. The resulting estimated elasticity of substitution values are reported in the first row of Table 1. The values of the second row are obtained by repeating the estimation with data limited to the years since the launch of the euro, i.e. 1999-2016. The inferred elasticity of substitution is close to one for the US corporate sector and zero for Italy's. For the other countries' corporate sectors the inferred values of the elasticity of substitution are 0.74 for France, 0.67 for Spain and much lower, 0.27, for Germany.

Table 1: Estimates of the elasticity of substitution between labour and capital $\left(\sigma = \frac{1}{1+\rho}\right)$

	France	Germany	Italy	Spain	US
1995-2016	0.740***	0.270***	0.059	0.674***	0.983***
1999-2016	0.834***	0.166**	0.128	0.887***	0.991***

*** Indicates significant at 1%, and ** at 5%.

An estimated elasticity of substitution equal to one for the US corporate sector means that relative quantities of labour and capital inputs adjust in similar proportions – but with the opposite sign – to changes in relative prices such that the ratio of cost shares remains unchanged. On the other hand, an estimated elasticity of substitution of zero for Italy means that in this economy relative input quantities remain unchanged in response to changes in the relative prices of inputs; therefore, in the Italian corporate sector the ratio of cost shares closely tracks changes in the ratio of unit prices to labour and capital inputs.[19]

7.2 Economies of scale and market power

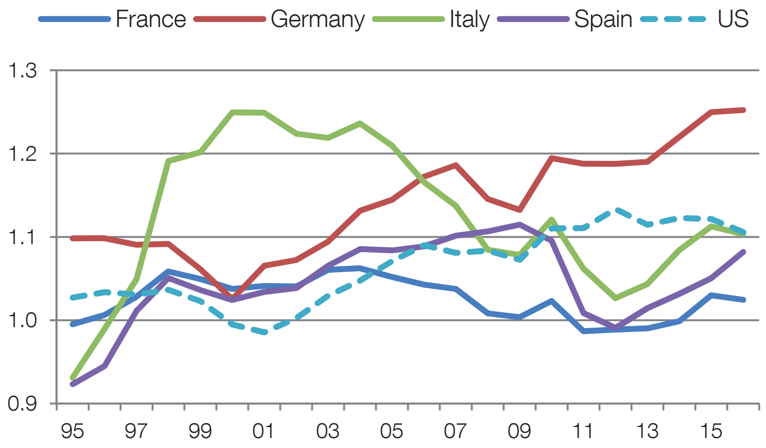
According to equation (8) the estimated mark-up depends on the economies of scale in production γ and on the profit share. Barkai (2016) directly assumes constant returns to scale $\gamma=1$ for the US corporate sector so market power is uniquely determined by profit shares. We estimate the market power on the same assumption of constant returns to scale as Barkai to facilitate the comparisons, although in the robustness section we test the hypothesis of constant returns to scale with sector level data from the four Euro area countries and the hypothesis is not rejected in any of them.

18 This estimation could be biased as it does not consider capital-augmenting technological progress in the production function. However we find no correlation between the estimated residual of the fitted regression, a proxy for capital-augmenting technological progress, and the ratio of relative input prices. Alternatively, we checked that the estimation of the results did not change significantly when introducing a time trend capturing a Hicks-neutral technological progress.

19 Karabarbounis and Neiman (2013) estimate values for the elasticity of substitution between labour and capital greater than one (1.25) although the estimation methodology is different from that used here.

Substituting the observed profit shares in equation (8) with γ=1 we obtain the implicit corporate market power 1/η for each country and year. The results appear in Figure 11. The inferred mark-ups on prices of corporate sectors of Germany and the US increased steadily from 2000 onwards, which points to evidence for increasing market power of corporations in the two countries over time. The estimate of market power for German corporations was consistently above that for US corporations; the absolute difference between the estimated mark-ups for the two countries remains quite stable over time, except in the final years of the sample period when it goes up. In 2000, the mark-up is close to 1 in the two countries (no market power) and in 2016 is 1.25 for German corporations and 1.1 for the US corporations. In other words, the German corporations sell their products on average at a price 25% above their unit cost, while US corporations sell their products at a price on average 10% above their unit cost.

Figure 11. Market Power Estimates, Mark-ups, $1/\eta_t$, with Constant Returns to Scale, γ=1



The market power of corporate sectors in Italy and Spain remained at minimum values from the launch of the euro until 2012, and then increased in the later years of the sample period, getting close to the US's mark-up value.[20] The mark-up of French corporations has been close to one in all years since 2008.

The market power estimated for US corporations in this paper is lower than that estimated by Barkai (2016), although it follows a similar pattern over time. We attribute this difference in levels to the fact that our measure of capital stock calculated for the corporate sector of the US is higher than the capital stock in Barkai (2016).[21] With a lower capital stock the estimated market power of US corporations would resemble our estimates of market power for German corporations more closely.

7.3 Cost competitive advantage

We will now discuss the scenario of open economies and national corporate sectors competing in a single global market. National corporate sectors' profit shares are no longer

20 Using individual firm data Montero and Urtasun (2014) find a similar cyclical behaviour for the Spanish corporations' mark-ups, although in their estimation the mark-ups increase from 2007 until 2011. In the early years of the sample (1995-2000) the price of capital services in Italy shows very erratic dynamics affecting the values of the mark-ups.

21 Our estimated measure of capital stock, relative to GVA minus net production taxes, is approximately 20% higher than the series employed by Barkai (2016) for the US over the period 1995-2014. Using Barkai's capital stock measure, the difference between our mark-up estimates and those of Barkai are reduced from 11% to 5% in the average period 1995-2014.

determined by the market structure variables at the national level but by differences in production unit costs, according to (9). We therefore focus on the unit production cost of the respective corporate sector over time calculated as,

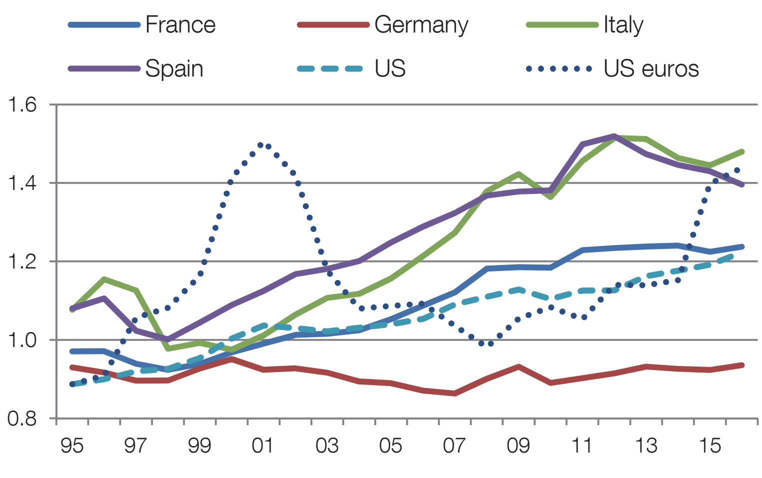
$$Unit\ average\ cost\ ac_{it} = \frac{w_{it}L_{it}+R_{it}p_{kit}K_{it}}{Y_{it}} \tag{11}$$

Where the measure of total output Y is equal to the GVA of the corresponding country deflated by the GDP deflator.

The estimated unit production costs are shown in Figure 12. The German corporate sector has the lowest unit production cost throughout practically the whole sample period. Moreover, since the unit cost of the German corporate sector stayed stable over the sample period while the unit cost of the corporate sectors in the other countries increased, the competitive cost advantage of German corporations relative to those in the other countries in the sample also increased over time. For example, the unit production cost of corporations in the US was similar to that of German corporations at the beginning of the period but was 30% higher in 2016. Figure 12 shows the unit cost of US corporations adjusted for the exchange rate of the dollar against the euro (US production costs in euros). The appreciation of the dollar in 2000-2001 and in 2015-2016 increased the competitive advantage of German corporations over their US counterparts more than the cost advantage assuming the exchange rate had remained unchanged from the 1995 level.

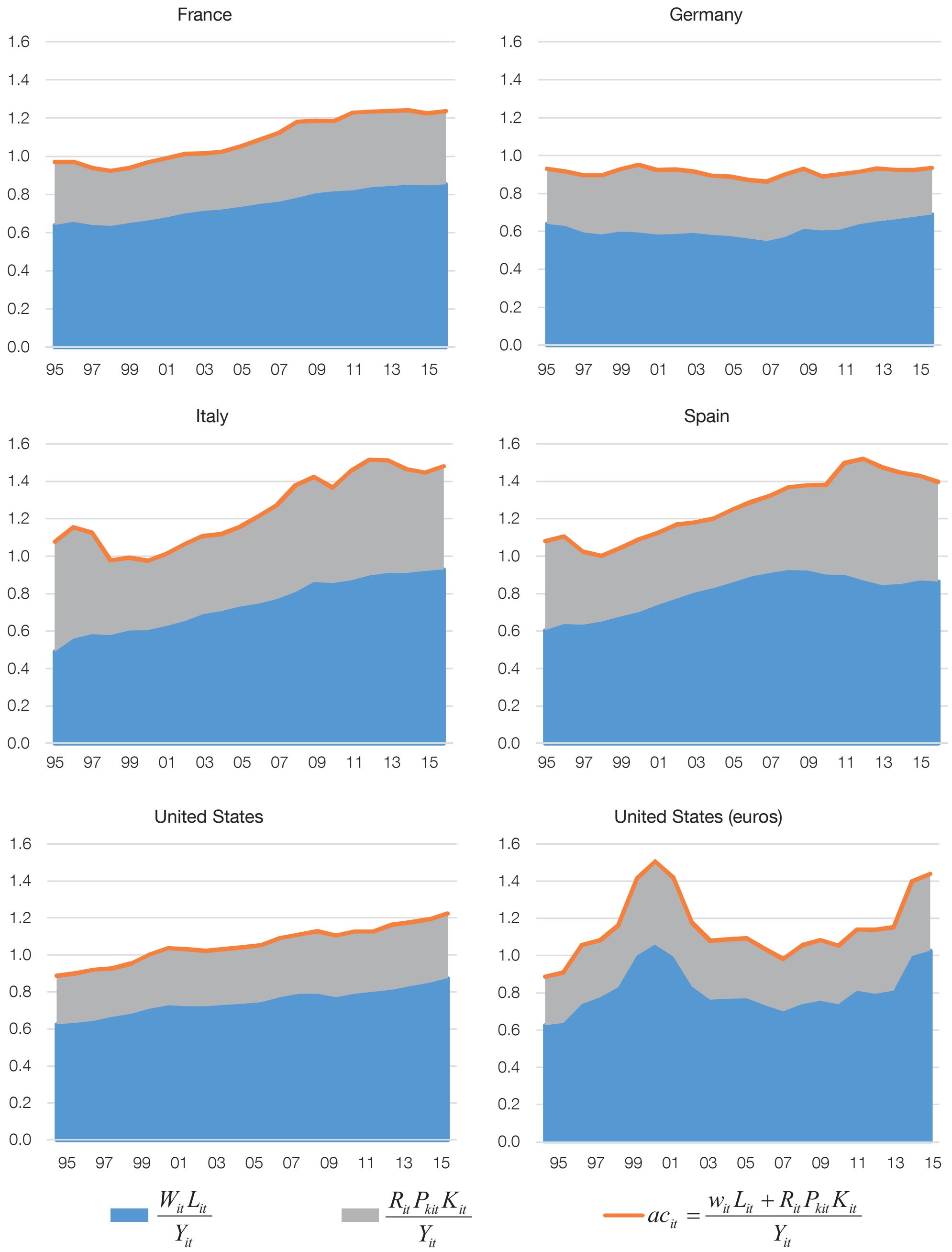
For the remainder of the euro area countries, unit costs decreased in the pre-euro years while from 2000 onwards they all showed an upward trend lasting until 2012. Over this period, unit costs increased by around 30% in France, 40% in Spain and 50% in Italy. Between 2012 and 2016, the unit cost of the corporate sectors of France and Italy remained relatively stable, while Spanish corporations reduced their cost disadvantage with respect to their German peers from 66% in 2012 to less than 50% in 2016.

Figure 12. Average Unit Production Costs, $ac_{it} = \frac{w_{it}L_{it}+R_{it}p_{Kit}K_{it}}{Y_{it}}$



The unit production cost *ac* is equal to the sum of the unit labour cost, $\frac{wL}{Y}$, and the unit capital cost, $\frac{Rp_K K}{Y}$. Figure 13 shows the evolution of each component of the unit production cost for the five countries. The unit labour cost has been steadily increasing over time in the corporate sectors of France, Italy and the US. In the Spanish corporate sector, unit labour costs increased between 1995 and 2008 and decreased moderately in the years of the crisis, stabilising during the recovery. This was the opposite of the trend in German corporations' unit labour costs, which decreased moderately in the pre-crisis years of expansion and increased moderately from 2008 to 2016.

Figure 13. Unit Labour and Capital Costs and Total Unit Costs



In Spain, the years of decreasing unit labour costs coincided with a period of increasing unit capital costs such that total unit costs continued to rise until 2012. In the German corporate sector the moderate increase in unit labour costs between 2008 and 2016 coincided with a period of decreasing unit capital costs, such that the total unit cost remained unchanged. The unit capital cost of the corporate sectors in Spain and Italy increased over the period 2007-2012, reaching values similar to those at the start of the period. The capital unit cost of corporations in US and in France remained stable throughout the period.

The summary of the inferences from the aggregate empirical evidence is then as follows: For the US, the inferred elasticity of substitution between labour and capital equal to one suggests that the fall in the labour and capital cost shares over time and the increase in the profit share can be reasonably attributed to increasing market power. For EU countries with inferred elasticity of substitution less than one, the differences in cost shares across countries and their changes over time can be explained by both differences between countries and changes in relative input prices and, possibly, by differences in market power in the scenario of closed economies, and by differences in production unit costs, in the scenario of a single open global market. To examine these explanations more closely, the following section complements the evidence from aggregate data with evidence from sector level data in the subsample of Euro countries.

8 Robustness: industry level evidence

The data source of the industry level data is CompNet, a database of inputs and outputs covering around 60 2-digit NACE sectors, available for France, Germany, Italy and Spain, although not for the US. For this reason the robustness analysis is limited to euro area corporate sectors. The industry level robustness analysis has two main aims, to test the hypothesis of constant returns to scale in production used in the calculation of market power from profit shares (Figure 11) and to assess the potential link between profit shares and market power through differences and trends in market concentration (Barkai's findings for the US case).[22]

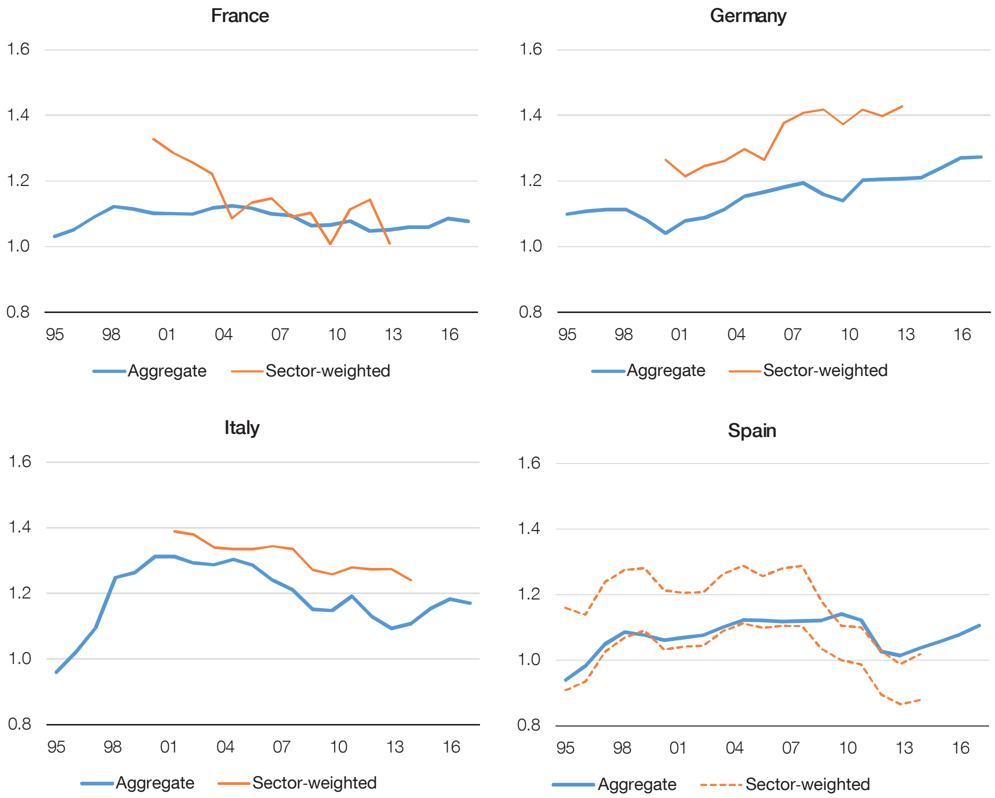
The details of the econometric test of the null hypothesis of constant returns to scale with the industry level data and under different estimation methods are presented in Appendix C. We find that estimates of the parameter of the returns to scale are consistently around values close to one in several estimation methodologies that take into account the unobserved variable of technological progress. Therefore, the constant returns to scale assumption appears a plausible one for the corporate sectors of the four countries. Then, according to the theory, differences in profit share can be attributed to differences in market power.

Next, we calculated the profit share for each of the 2-digit sectors in the CompNet database, $\frac{\Pi_{st}}{p_{st}Y_{st}}$. The calculation assumes the same financial cost of capital for all the 2-digit sectors of the respective country. The measure of market power for each 2-digit industry is calculated from equation (8), with γ=1. Finally, the aggregate corporate sector market power measure is equal to the sum of industry market powers weighted by the GVA of each sector and country.

Figure 14 shows the estimated mark-ups with profit shares calculated using aggregate corporate data (Figure 11) and the estimated corporate market power with profit shares calculated at the 2-digit industry level and subsequently aggregated. Although the absolute values of estimated market power differs depending on the calculation, their trends over time are fairly similar in all countries. Therefore, the estimates of corporate market power in Figure 11 appear robust to the estimation of market power using industry level data on profit shares.

22 The estimated elasticity of substitution between labour and capital using sectoral data confirms a value less than one in the euro area countries.

Figure 14. Aggregate Nonfinancial Corporate Sector Mark-ups vs. Industry-Weighted Mark-ups



Source and notes: mark-up estimates based on National Accounts data (aggregate non-financial corporate sector data) are shown as blue lines (excluding net subsidies on production and tax treatment effects). Mark-up estimates based on sector-level data from CompNet (weighted across around sixty 2-digit NACE sectors), are shown by red lines. In France, the pharmaceuticals sector has been excluded from the sector-weighted mark-up calculation due to its high volatility. In Germany, the sector-weighted mark-up takes into account a correction for the capital stock underestimation problem presented in balance-sheet data of the country's corporate sector (see Salas *et al.* (2017)). For Spain, there are no data for the period up to 2007 in CompNet on the nominal capital stock and the proxy for the user cost of capital, so we have made two approximations to estimate the capital shares and, therefore, the mark-ups, across sectors, namely: i) we take our aggregate capital share estimates (principally, from NA data) as given (lower band), and ii) we reproduce the ratio between the nominal capital stock and the nominal GVA with CompNet data with some assumptions about their deflators and apply our aggregate measure of the user cost of capital shown in Appendix B. Capital share estimates are available in CompNet for the period 2008-2013. These are not shown here, but are within the range shown in the figure.

Barkai (2016) finds a positive association between industry level estimates of market power and industry level concentration in the US corporate sector. We now examine if the positive association between market power and market concentration also holds for the corporate sectors of the euro area countries. For each 1-digit industry we obtain the mark-up by aggregating the mark-ups calculated for each of the 2-digit sectors that share the same 1-digit number. The concentration ratio is calculated by aggregating the share of the sales of the 10 largest companies over the total sales of firms in the 2-digit sectors with the same 1-digit number. Figure 15A shows the estimated sector mark-ups for the four corporate sectors, and Figure 15B shows the concentration ratios for the same sectors and countries over the period 2000-2013, for which information is available.

Figure 15A. Aggregate mark-ups: breakdown by sector

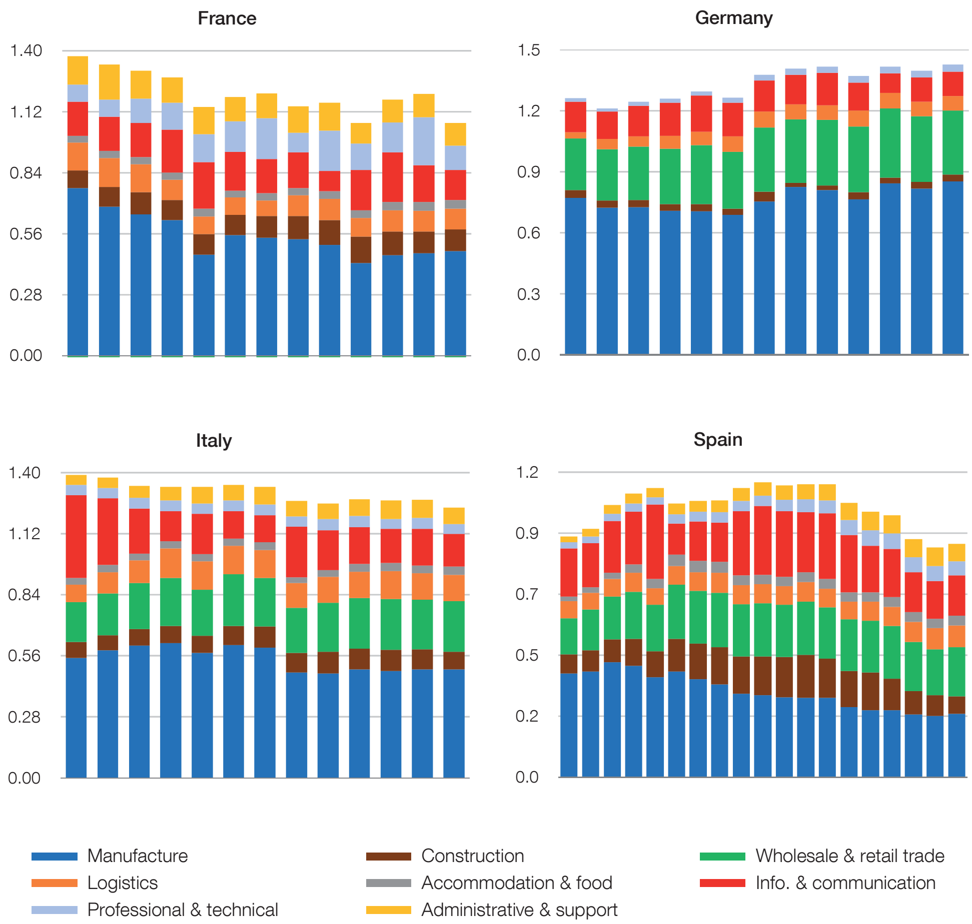
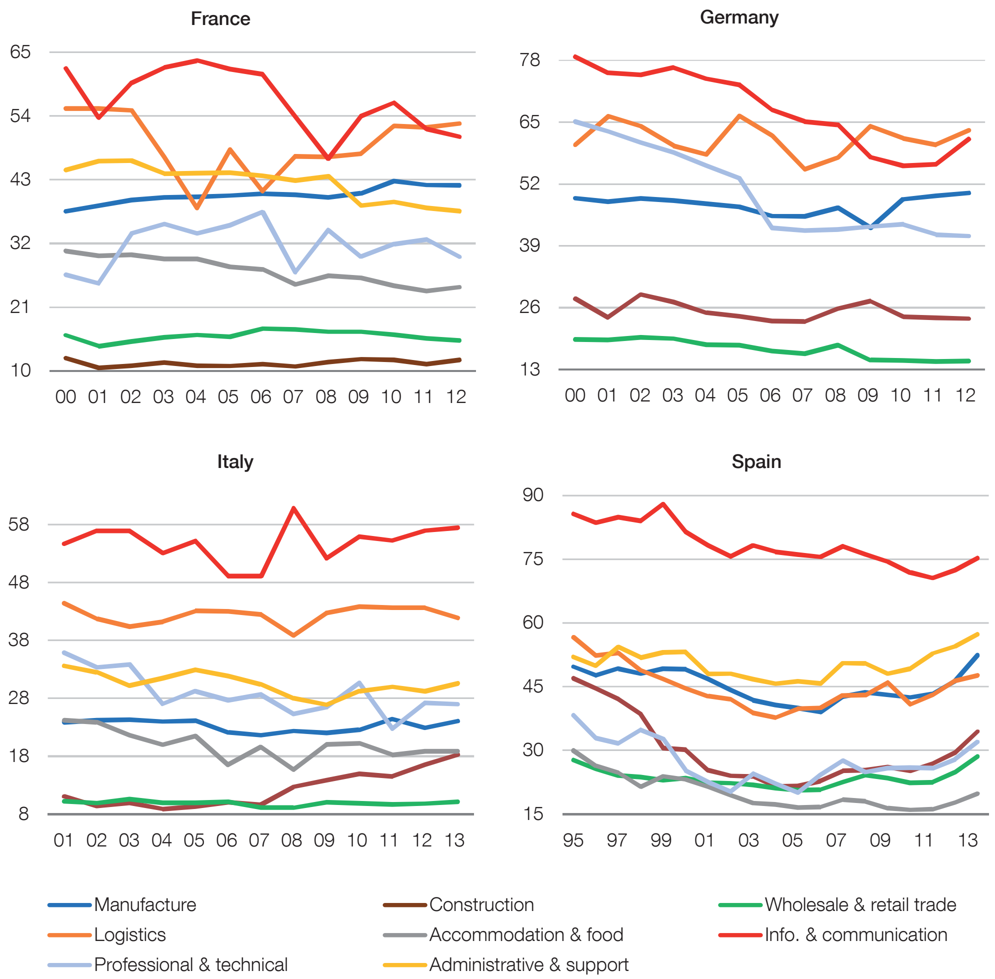


Figure 15B. Sector concentration



In Germany, the increase over time in mark-ups (until 2012) seems to be occurring in manufacturing and some service sectors (wholesale and retail trade, transportation and storage, and professional & technical). This trend is not observed in the other countries in the sample, except in the case of a few service activities. In fact, in the manufacturing sectors of France, Italy and Spain the trend observed in mark-ups is the opposite of that observed in the German manufacturing sector.

The visual inspection of Figures 14 and 15B suggests that, in aggregate terms, mark-ups are apparently uncorrelated or only slightly correlated with industry concentration. However, heterogeneity across sectors could mask a significant relationship between both magnitudes. To account for differences across sectors in this relationship, we consider the following fixed effect regression:

$$\log\left(\frac{1}{\eta_{s,t}}\right) = \alpha_t + \beta_{FE} C_{s,t} + \mu_s + \epsilon_{s,t} \tag{12}$$

where $\log\left(\frac{1}{\eta_{s,t}}\right)$ is the mark-up in logs of the sector s at time t, that is, the inverse of the complement of the profit share for each sector at period t, $C_{s,t}$ is the concentration ratio – in percentage points- of the sector s at time t, calculated as the total sales of the ten largest firms in each sector divided by the total sales in that sector at period t, μ_s is the term associated with the fixed idiosyncratic characteristics of each sector and $\epsilon_{s,t}$ is the error term.

We also added time dummies (α_t) to capture any contemporaneous correlation across sectors or common business cycle effects. We assume that $C_{s,t}$ is a predetermined exogenous variable, i.e. it is not correlated with present and future error terms $(E(\epsilon_{s,j} \mid C_{s,t}) = 0 \; \forall j \geq t, \forall s$).a

As an alternative to determine the significance in the relationship between industry concentration and mark-ups, we also perform a second regression based on equation (12), but in first differences:

$$\Delta \log(\frac{1}{\eta_{s,t}}) = \alpha_0 + \beta_{FD} \Delta C_{s,t} + \varepsilon_{s,t} \tag{13}$$

As the error term in (9) is defined as $\varepsilon_{s,t} = \epsilon_{s,t} - \epsilon_{s,t-1}$, our predetermined regressor assumption in (8) does not warrant the absence of endogeneity of $\Delta C_{s,t}$ as $C_{s,t}$ can be correlated with $\varepsilon_{s,t}$ via $\epsilon_{s,t-1}$. To mitigate the correlation between the regressor in first differences and the new error term resulting from first-differencing, we estimated (13) using the two-step feasible Generalised Method of Moments (GMM). For the instrumental variable, $\Delta C_{s,t}$, we use the concentration ratio lagged one period as the instrument[23] $(C_{s,t-1})$ given our assumption that $E(\epsilon_{s,j} \mid C_{s,t}) = 0 \; \forall j \geq t, \forall s$:

$$E(C_{s,t-1} \Delta C_{s,t} \varepsilon_{s,t}) = E[C_{s,t-1}(C_{s,t} - C_{s,t-1})(\epsilon_{s,t} - \epsilon_{s,t-1})] = 0$$

In the estimation of both equations, (12) and (13), we allowed for heteroskedasticity and serial autocorrelation in the error terms. In particular, we clustered them by 2-digit NACE sector. Finally, a test of the endogeneity of the regressor in equation (13) was performed. Under the null hypothesis of this test the specified endogenous regressor (concentration ratio in first differences, $\Delta C_{s,t}$) can be treated as exogenous.

23 We have also considered as instruments other lags in the level of the concentration ratio but the results are very similar to those obtained with the first lag.

Table 2. The Relationship between Mark-ups and Industry Concentration: 2-digit NACE.

Dependent variable:	log markup $_{s,t}$										
	OLS	GLS (random effects)	Fixed effects	First differences	First differences	2012-2001	2012-2001	2012-2007 and 2007-2001	2012-2007 and 2007-2001	2012-2007 and 2007-2001	Five-year differences in 2001-2012
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
						France					
Concentration ratio $_{s,t}$ (%)	-0.002	0.002	0.007	-	0.021	-	0.007	-0.001	0.000	-0.001	-0.001
	(0.266)	(0.523)	(0.264)	-	(0.251)	-	(0.309)	(0.795)	(0.982)	(0.875)	(0.896)
Constant	**0.513*** **	**0.328*** **	0.132	-0.004	-0.006	**-0.134*** **	**-0.133*** **	-	-	-0.060	-0.074
	(0.000)	(0.010)	(0.597)	(0.699)	(0.451)	(0.001)	(0.002)	-	-	(0.190)	(0.424)
Time dummies	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes
Number of observations	626	631	631	577	529	48	48	97	97	97	337
Endogeneity test (p-value)	-	-	-	-	0.684	-	-	-	-	-	-
						Germany					
Concentration ratio $_{s,t}$ (%)	**-0.005*** **	-0.001	0.002	-	0.045	-	-0.001	0.001	0.000	0.005	0.002
	(0.000)	(0.508)	(0.503)	-	(0.817)	-	(0.794)	(0.714)	(0.896)	(0.126)	(0.349)
Constant	**0.479*** **	**0.484*** **	**0.208***	0.001	0.010	**0.077*** **	**0.075** **	-	-	**0.080*** **	**0.083*** **
	(0.000)	(0.000)	(0.081)	(0.872)	(0.800)	(0.007)	(0.011)	-	-	(0.001)	(0.002)
Time dummies	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes
Number of observations	577	577	577	531	485	44	44	88	88	88	309
Endogeneity test (p-value)	-	-	-	-	0.717	-	-	-	-	-	-
						Italy					
Concentration ratio $_{s,t}$ (%)	0.004	**0.009***	0.011	-	0.012	-	0.008	0.001	0.003	0.003	0.002
	(0.272)	(0.052)	(0.190)	-	(0.286)	-	(0.301)	(0.865)	(0.670)	(0.726)	(0.697)
Constant	**0.269*** **	0.119	0.045	0.001	**-0.012** **	**-0.097*** **	**-0.098*** **	-	-	-0.022	-0.018
	(0.000)	(0.274)	(0.857)	(0.959)	(0.026)	(0.000)	(0.000)	-	-	(0.117)	(0.313)
Time dummies	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes
Number of observations	720	720	720	662	605	55	55	110	110	110	384
Endogeneity test (p-value)	-	-	-	-	0.440	-	-	-	-	-	-
						Spain					
Concentration ratio $_{s,t}$ (%)	0.003	0.000	0.000	-	0.067	-	-0.002	0.000	-0.001	-0.001	-0.001
	(0.160)	(0.579)	(0.896)	-	(0.758)	-	(0.514)	(0.765)	(0.676)	(0.757)	(0.473)
Constant	**-0.328*** **	**-0.230*** **	**-0.215*** **	**0.012*** **	0.019	**0.060** **	**0.063** **	-	-	**0.061** **	**0.053** **
	(0.001)	(0.000)	(0.000)	(0.000)	(0.529)	(0.046)	(0.040)	-	-	(0.015)	(0.021)
Time dummies	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes
Number of observations	1,064	1,064	1,064	1,008	952	56	56	112	112	112	392
Endogeneity test (p-value)	-	-	-	-	**0.054**	-	-	-	-	-	-

Sources and notes: CompNet. The results of several regressions are reported either of sectoral mark-ups in logs of sectoral concentration ratios in percentage points (Ordinary Least Squares, Feasible Generalised Least Squares-random effects-, and fixed effects), or the previous variables in differences (first differences -annual -, differences in the whole common sample period 2001-2012, differences in periods 2001-2007 and 2007-2012, and five-year differences during 2001-2012). The observations of cross-section and of cumulative differences of several years' regressions are weighted by sectors' shares in GVA (in each year and in the last year of each difference, respectively). First difference regressions are performed with 2-step feasible Generalised Method of Moments (GMM) where the instrumental variable is the concentration ratio in first differences and the instrument is the concentration ratio lagged one period in order to mitigate the correlation between the regressor in first differences and the new error term arose when first-differencing the equation in levels. *** Indicates significant at 1%; ** at 5%, and * at 10%. P-values for regression coefficients are reported in parenthesis. Standard errors, not reported, are clustered by 2-digit NACE sector (around 60 sectors), and are robust to heteroskedasticity and serial autocorrelation. A test for endogenous regressors was implemented in the case of the first difference estimation, and the p-values are reported. Under the null hypothesis for this test the specified endogenous regressor (concentration ratio in first differences) can actually be treated as exogenous. Data from Germany, Italy and Spain come from the full sample of firms, meaning all firm sizes. For France, only data on companies with more than 20 employees are available. The sample periods are the following: 2000-2012 for France, 2000-2012 for Germany, 2001-2013 for Italy, and 1995-2013 for Spain. In the case of France, we excluded the pharmaceutical manufacturing sector due to the strong volatility of some of the variables underlying the calculation of its mark-up. In the case of Germany, we adjusted the mark-ups by the same proportion across sectors to take into account the capital stock underestimation problem presented in balance-sheet data of the corporate sector of this country (see Salas et al. (2017)). In Spain, data up to 2007 in CompNet on the nominal capital stock and the proxy for the user cost of capital across sectors are missing, so we have taken our capital share estimates for the corporate sector as a whole (principally, from National Accounts data) as a proxy to estimate the capital shares and, therefore, the mark-ups across sectors. The sectoral mark-up is defined as the inverse of the complement of the profit share for each sector. The sectoral concentration ratio is defined as the total sales of the ten largest firms in each sector divided by the total sales in that sector.

Table 2 shows the panel data results of the fixed effects estimation of (12), the GMM estimation of (13) as well as OLS and GLS estimations for comparison purposes (columns 1-5). P-values for the regressions' coefficients are reported in parenthesis. For all countries analysed, France, Germany, Italy and Spain there is no significant relationship between mark-ups and industry concentration once we control for heterogeneity across sectors. Given the slow changes in concentration over time, the second part of Table 2 (columns 6-10) shows different cross section regressions for alternative sample periods, as well as a five-year rolling regression (column 11). We find similar results as under the panel data regressions: those sectors with higher concentration ratios do not necessarily have higher mark-ups, even when taking into account variations in the economic cycle.[24] Interestingly, in these last two regressions (columns 10 and 11) the estimated intercept coefficient is statistically non-zero in the case of German industry, indicating an average increase in the market power across sectors during the sample period after controlling for changes in concentration.[25]

Thus, the increasing mark-ups in Germany cannot be attributed to increasing market concentration and, rather, the alternative explanation that increasing profits of German corporations respond to German corporations' increasing competitive advantage in terms of costs over time, appears as a plausible one. These results are in clear contrast with those obtained for the United States, as reported in the most recent literature paying renewed attention to the relationship between mark-ups and firm concentration (Barkai, 2016; Grullon *et al.*, 2017; Eggertsson et al, 2018), where it is shown that this relation has been positive for US corporations over the last two decades.

24 The same econometric evidence holds when the sectoral concentration ratio is substituted by the Herfindahl index. We also considered a regression with the labour share instead of the market power as the dependent variable with identical results.

25 This intercept is also significant and positive in the Spanish case but this may be influenced by the fact that before 2007 sectoral data on the user cost of capital and the price of capital had to be proxied by total NFC aggregate data.

9 Conclusions

Conventional macroeconomic accounting divides the value added generated by economic activity over a period of time into labour and non-labour income. However, this practice masks information on business profits that is relevant for the assessment of market competition, investment incentives, and income inequality. In this paper we first provide evidence on the composition of aggregate gross value added, including the labour and capital cost shares and the profit share, of the corporate sectors in France, Germany, Italy and Spain, and compare it with the composition of corporate gross value added in the US. We then examine the evidence as if profit maximising firms decided the quantities of capital and labour used in production by the corporate sectors of the different countries. On this assumption, the composition of gross value added is determined by exogenous parameters of the production technology, market structure variables and the relative unit prices of labour and capital.

We find no clear evidence of convergence in costs and profit shares among euro area corporate sectors, although the trends towards convergence vary in the pre-crisis and crisis years. The atypical trend in the German corporate sector played a big part in this lack of convergence, as its financial costs declined from 2009 onwards, while in the other corporate sectors, particularly Spain's and Italy's, financial costs rose during the crisis. Compared with the evidence from other studies, the aggregate labour cost shares of the four euro area corporate sectors reported in this paper are not consistent with the hypothesis of a widespread decreasing time trend in the aggregate labour cost shares in the value added of developed countries. However, the profit share of the German corporate sector developed remarkably over time above and in parallel with the profit share of the US corporate sector, both increasing over time.

When looking at the evidence from the standpoint of theoretical predictions, the results suggest that the explanation for trends in labour cost shares in euro area corporate sectors has to take into account changes in relative input prices. This is not the case for the US corporate sector where the trend in labour cost shares is more likely to be driven by developments in market power. The justifications of these results have to do with the evidence found in the paper on an elasticity of substitution between labour and capital lower than that in the corporate sectors of the euro area countries, and equal to one in the US corporate sector. In the explanation of the time course of profit shares, the evidence from corporate profits in the US may be consistent with increasing corporate market power. However, in the case of Germany, the upward trend in corporate profit shares is consistent with the comparative production cost advantage of their corporations relative to the costs of corporations from other countries.

From a policy point of view, this paper highlights the relevance of distinguishing between costs and economic profits in the composition of corporate value added, in the assessment of production efficiency and when expressing income distribution concerns. The euro was launched with the aim of creating a single financial market to complement the single market for goods and services, including labour services. The evidence reported here shows ups and downs in the convergence of user cost of capital among euro area corporate sectors during the period of study. But what is clear from the evidence is that the competitive cost advantage of German corporations with respect to corporations in other euro area countries increased during the sample period, mainly because their financial cost, in terms of both debt and equity, remains substantially lower than the financial cost paid by corporations in other euro area countries. The cost advantage of German corporations appears again in the comparison with US corporations, but in this case the final competitive advantage can vary with exchange rate movements of the euro/dollar. It seems clear then that the creation of the euro area was not sufficient for effective financial integration, and further steps are needed.

The implications of the reported evidence for the distribution of income are of two kinds. First, increasing profit shares will contribute to income inequality if all economic profits are distributed to shareholders in the form of dividends or capital gains (ownership of capital is even more concentrated than is income). Second, with values of the elasticity of substitution of labour by capital different from one, the share of value added as compensation for labour inputs will be sensitive to changes in relative input prices. In particular, if salaries increase more than the user cost of capital the labour cost share will increase (decrease) if the elasticity of substitution is lower (greater) than one. Our results indicate values of the elasticity of substitution less than or equal to one, but they must be taken as very preliminary given the characteristics of the data available.

The empirical analysis of cost and profit shares has been done under the assumption of competitive input markets, labour and capital. We have not considered the effect of changes in labour market regulations, among other factors, in reducing employees' negotiating power, as an additional explanation of decreasing labour shares and increasing profits. In the theoretical appendix there is a discussion of how to extend the analysis to account for non-competitive labour markets where employers and employees negotiate just wages or wages and employment at the same time. Other lines of research (Naidu et al., 2018) argue that increasing concentration in many economic sectors increases the market power of employers in already "monopsonised" labour markets. Future research should extend the analysis reported here to examine the influence of changing labour markets in the evolution of cost and profit shares.

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Appendix A. Theoretical framework

This appendix presents the determinants of cost and profits shares when the quantities of inputs and outputs used in the calculations come from decisions made by profit-maximising firms. Although the analysis will consider a representative profit-maximising firm, the analytical results can be extrapolated to the whole corporate sector if the sector values of cost and profit shares are obtained by aggregating individual corporations' inputs and their output decisions.

Consider the production function $Y = F(L, K)$ where output Y is increasing and concave on labor, *L*, and capital, *K*, inputs. If the function is homogeneous of degree $\gamma > 0$ the following holds,

$$\frac{\partial Y}{\partial L}L + \frac{\partial Y}{\partial K}K = \gamma Y$$

Dividing both sides of the equation by *Y*

$$\frac{\partial Y}{\partial L}\frac{L}{Y} + \frac{\partial Y}{\partial K}\frac{K}{Y} = \gamma$$

and

$$E_{Y/L} + E_{Y/K} = \gamma$$

where $E_{Y/j} = \frac{\partial Y}{\partial J}\frac{J}{Y}$ is the elasticity of output to changes in input *j*, J=L, J=K.

The economy's representative firm sells its output on the market with a price elasticity of demand that is constant and equal to $\epsilon > 1$ (in absolute values). The competitive market prices are *w*, wages per employee, and *R*, user cost of capital per euro of the stock of capital services at current purchase prices. In the profit-maximising solution for labour and capital resource inputs**,** the cost share of labour and capital and the economic profit share are equal to (with all variables evaluated at their optimal values):

$$\frac{wL}{pY} = E_{Y/L}\eta \qquad \text{(A1)}$$

$$\frac{Rp_K K}{pY} = E_{Y/K}\eta \qquad \text{(A2)}$$

$$\frac{pY - wL - Rp_K K}{pY} = \frac{\Pi}{pY} = 1 - \gamma\eta \qquad \text{(A3)}$$

where *p* is the profit maximising output price and $\eta = \frac{\epsilon - 1}{\epsilon}$. The inverse of η is also the mark-up over marginal cost that determines the profit-maximizing output price. Therefore $\frac{1}{\eta} = \frac{\epsilon - 1}{\epsilon}$ is a measure of market power of the firm, inversely related to the price elasticity of demand (when the price elasticity of demand tends to infinity (the firm is a price taker) the mark-up is one, meaning that price is equal to marginal cost.

Under constant returns to scale, $\gamma = 1,$ and no market power $(\epsilon = \infty, \eta = 1)$, the share of the labour cost (capital cost) in the value of production is equal to the labour (capital) elasticity of output in the production function and the economic profit share will be equal to zero. In other words, under constant returns to scale and no market power (the firm is a price taker) the share of the capital input cost in value added is just one minus the share of the labour cost. Moreover, if the elasticity of output to the labour inputs is a constant, as in the Cobb Douglas production function, the share of labour costs and the share of capital costs in the total revenues of the firm will also be constant.

From (A1) and (A2) the shares of labour and capital input costs in the value of production will increase with η and will be equal to the respective elasticity of output to the quantity of input if η=1 (perfect competition). On the other hand, greater market power in the product market, i.e. lower ϵ, and lower η, will decrease the shares of labour input costs in the value of production and consequently will increase the profit share.

If we examine the determinants of the profit share (A3) directly we have:

$$\frac{\Pi}{pY} = 1 - \gamma\eta = \frac{\gamma + \epsilon(1-\gamma)}{\epsilon}$$

The optimal profit margin decreases with the returns to scale γ and decreases also with the price elasticity of demand, ϵ. The profit margin in (A3) depends on the parameter of returns to scale γ because the profit margin in (A3) is calculated using average cost while in the profit maximising condition marginal revenue is equal to marginal cost. Under constant returns to scale, $\gamma = 1$, the marginal production cost (of labour and capital) will be equal to average unit production cost and the profit share will be equal to the inverse of the price elasticity of demand in absolute value (Lerner index of market power):

$$\frac{\Pi}{pY} = \frac{1}{\varepsilon}$$

Under decreasing (increasing) returns to scale, γ < (>) 1, the marginal unit cost is higher (lower) than the average unit cost and the firm will earn a positive (negative) profit margin even if the market is competitive. If returns to scale are increasing, the market will evolve into a structure of natural monopoly. Under decreasing returns to scale positive economic profits will attract new entrants into the market until price equals average cost.

In purely accounting terms, the share of labour costs in the value added may coincide with an increase in the capital cost share, an increase in the profit share and an increase in both capital and profit shares. When both labour and capital shares decrease then the profit share will necessarily increase. What the profit maximising results above suggest is that costs and profit shares can change as a result of changes in the values of the parameters of the production and demand functions and/or changes in the relative input prices. For example, from (A1) differences across countries in the labour cost shares will indicate differences in the production technology (elasticity of output to labour) and/or differences in the demand function (price elasticity).

Oligopolistic market

So far we have assumed that the representative firm in the economy is a monopoly with price-inelastic demand for the final product. We now complete the exposition with the Nash equilibrium results in a market with N>2 firms competing in quantities and homogeneous product. In the Nash-Cournot equilibrium the following results holds for firm j in the market:

$$\frac{p - mc_i}{p} = \frac{s_j}{\epsilon}$$

Where *p* is the market price (the same for all firms since the product is homogeneous) c_i is the marginal unit production cost of firm j, s_j is the market share of firm j and ϵ is the price elasticity of demand as an absolute value, as above. Multiplying both sides by the market share s_j and adding the terms we have:

$$\frac{p - \overline{mc}}{p} = \frac{H}{\epsilon}$$

Where $\overline{mc}$ is the weighted average marginal unit production cost of firms in the market, $\overline{mc} = \sum s_j \, mc_j$, and H is the Herfindahl index of market concentration calculated as, $H = \sum s_j^2$. Therefore, the market price as a function of the industry weighted marginal cost is given by,

$$p = \frac{\epsilon}{\epsilon - H}\overline{mc}$$

The mark-up over marginal cost is then equal to $\frac{\epsilon}{\epsilon - H}$, increasing with market concentration H and decreasing with the price elasticity of demand, ϵ.[26] If we view a country's corporate sector as a market with N firms and a concentration H, then equations (A1) to (A3) above would have to be changed by substituting $1/\eta = \frac{\epsilon}{\epsilon - 1}$ with only one firm, by $1/\eta' = \frac{\epsilon}{\epsilon - H}$ with N firms and Cournot competition

In most cases the marginal cost will not be observable and it will have to be substituted for by the industry average cost ac,

$$ac = \frac{wL + cK}{Y}$$

Since the average and marginal unit costs are related by the scale economies parameter, $ac = mc\gamma$, the mark-up over average cost is equal to $\frac{p}{ac} = \frac{\epsilon}{(\epsilon - H)\gamma}$.

If firms have the same unit costs then, at equilibrium, *H=1/N* (all firms will have the same market share). However if firms have different unit costs more efficient firms will have a larger market share and a higher profit margin in the equilibrium. The profit share in this case will be,

$$\frac{\Pi_j}{pY_j} = \frac{p - ac_j}{p}$$

Differences in profit share among firms and the evolution of profit share of the firm over time will be explained by differences and changes in the respective unit production cost.

For the application of these results to the analysis of the cost and profit shares of the corporate sectors of the different countries, the analysis above can be extended to consider each corporate sector as a representative firm that competes with the representative firms of the other countries in the same (global) market. In this case concentration and price elasticity of

26 Higher concentration also facilitates tacit collusion around the monopoly solution (Tirole, 1988).

demand will be defined at the global market level and each national corporate sector could be viewed as a competitor in that market.

Employees with bargaining power

So far we have assumed that labour and capital input markets are competitive, so input unit prices reflect true opportunity costs. When this happens, the residual profit Π can be considered to be equal to the firm's economic profit. This assumption may not always hold, particularly in the case of labour markets where trade unions negotiate wages and/or employment levels with employers. Negotiations between employers and employees can take two forms: one where the employees negotiate the salary, w, and the number of employees L is decided by the firm, and another where employees negotiate the total labour income, wL.

If the outcome of the negotiations is the Nash bargaining equilibrium in both cases, in the first case, where unions negotiate the highest wages w, the agreed wages are the marginal cost of labour, and will generally exceed the opportunity cost. The profit-maximising firm will set its prices equal to marginal cost where this factors in the agreed price of labour. In the bargain equilibrium, profit and labour compensation are given by:

$$\widehat{\Pi} = \hat{p}\hat{Y} - \widehat{w}\hat{L} - Rp_K\widehat{K}$$

$$\widehat{w}\hat{L} = \widehat{w} + (\widehat{w} - w)\hat{L}$$

Where the ^ symbol means that the price of labour has been negotiated with the unions and the bargained price affects the demand of labour and the demand for capital in the profit maximising solution. In terms of profit and labour cost shares,

$$\frac{\widehat{\Pi}}{\hat{p}\hat{Y}} = (1 - \gamma\eta)$$

$$\frac{\widehat{w}\hat{L}}{\hat{p}\hat{Y}} = E_{Y/L}\eta$$

On the other hand, if the unions' goal in the bargaining process is to maximise total compensation for labour, wL, the residual profit and labour compensation in the Nash bargain equilibrium solution will be given by:

$$(1 - \lambda)\Pi = (1 - \lambda)(pY - wL - Rp_K K)$$

$$Labor\ compensation = wL + \lambda\Pi$$

Where λ is a parameter between 0 and 1 that measures the bargaining power of employees, and the rest of variables are defined as above, i.e. w is the market wage or unit opportunity cost of labour. Again, in terms of profit and labour cost shares,

$$\frac{(1 - \lambda)\Pi}{pY} = (1 - \gamma\eta)(1 - \lambda)$$

$$\frac{Labor\ compensation}{pY} = E_{Y/L}\eta + \lambda(1 - \gamma\eta)$$

The total output produced, the demand for labour and total wealth created in the optimal solution when employees negotiate wages and employment at the same time are higher than the values of output, employment and wealth when they only negotiate higher wages and firms decide the number of employees given the bargained salary. Therefore, from a social efficiency point of view the bargaining over total labour compensation is preferred to negotiating wages alone.

When the unions negotiate total labour compensation, i.e. wages times the number of employees, then the marginal optimal conditions are not distorted in the sense that the number of employees hired by the firm is the same as would be hired in the absence of negotiations; the reason is that in both cases the perceived marginal cost of labour is the market price *w* (opportunity cost). What the bargaining between employers and employees does is simply allocate the economic profits between the employees and the business owners (residual claimants). When employees bargain for the salary only then the bargained salary is the marginal cost of labour for firms when deciding the profit maximising number of employees that they want to hire. Since this will be higher than the market price *w* then firms reduce the demand of labour compared with the demand at the market opportunity cost.

In practice, National Accounts data reports total compensation of labour without distinguishing how this compensation is generated, i.e. with the employees sharing the economic profit in addition to earning the market wage, or just earning wages above the opportunity cost. Nothing has been said so far about the destination of the residual profit. The role of the entrepreneur/manager is different from that of employees and the compatibility of incentives recommends that for efficient decisions they should receive the residual profit as compensation for their work. Again, in practice, it is not possible to know if all or part of the compensation of entrepreneurs/managers for their services is included in the reported labour compensation or not. Moreover, if the entrepreneur managing the business were also the financier paying for the firm's productive capital, then the user cost of capital would be capital income for the entrepreneur. When the financiers are external investors then their compensation will come from the financial cost of capital (user cost minus depreciation). In the case of workers' cooperatives, the economic profits would all be income for the cooperative's partners (who are also its workers).

Long-term profits

Firms' market power can also be reflected in the ratio of their market value to the replacement cost of their assets, or Tobin's q. This measure of market power takes into account the expectation about the future course of profit margins. With the notation and results from above, if V is the market value of the capital stock, equal to the present value of cash flow discounted at the cost of capital *R*, the ratio *q* for a profit-maximising firm with constant returns to scale can be written as follows:

$$q = \frac{V}{p_K K} = \frac{\frac{Rp_K K + \Pi}{R}}{p_K K} = 1 + \frac{1}{R}\frac{\Pi}{p_K K} = 1 + \frac{1}{R}\frac{\Pi}{pY}\frac{pY}{p_K K} = 1 + \frac{1}{R}\frac{1}{\epsilon}\frac{R}{E_{Y/K}\eta}$$
$$= 1 + \frac{1}{E_{Y/K}(\epsilon - 1)}$$

The ratio converges to the value of 1 if the firm has no market power, infinity price elasticity. For a given positive market power, Tobin's q decreases with higher elasticity of output to the capital input.

Example: CES production.

Consider the CES production function:

$$Y = A[aL^{-\rho} + (1-a)K^{-\rho}]^{\frac{-\gamma}{\rho}}$$

Where A represents the level of technological development, $0 < a < 1$ is a parameter indicating the relative intensity of labour in the production technology, and ρ is related to the elasticity of substitution σ, $\sigma = \frac{1}{1+\rho}, \rho > -1.$ When $\rho = 0$ the CES transforms into a Cobb-Douglas production function with elasticity of substitution $\sigma = 1,$ and elasticity of output to labour $E_{Y/L} = a\gamma.$ In general, the elasticity of output to labour in the CES production function is given by,

$$E_{Y/L} = \frac{\gamma}{1+\frac{1-a}{a}\left(\frac{L}{K}\right)^{\rho}}$$

If the ratio of labour to capital is evaluated at the profit maximising values,

$$\frac{L}{K} = \left(\frac{Rp_K a}{w(1-a)}\right)^{\frac{1}{1+\rho}}$$

And the labour share is equal to:

$$\frac{wL}{pY} = E_{Y/L}\eta = \frac{\gamma\eta}{1+\left(\frac{1-a}{a}\right)^{\frac{1}{1+\rho}}\left(\frac{Rp_K}{w}\right)^{\frac{\rho}{1+\rho}}}$$

Changes in relative prices of inputs, wages and user cost of capital can result in shifts in the cost shares between labour and capital inputs, although the direction will depend on the value of the elasticity of substitution. For example, higher wages *w* relative to the user cost Rp_K will increase the elasticity of output to the labor input, and therefore the labor cost share, if $\rho > 0$, that is if the elasticity of substitution is less than one. But it will decrease the labour share if $\rho < 0$, i.e. the elasticity of substitution is greater than one. With these formulas we can complete the rest of expression for profit and capital shares.

Appendix B. Elements of the calculation of the per unit user cost of capital

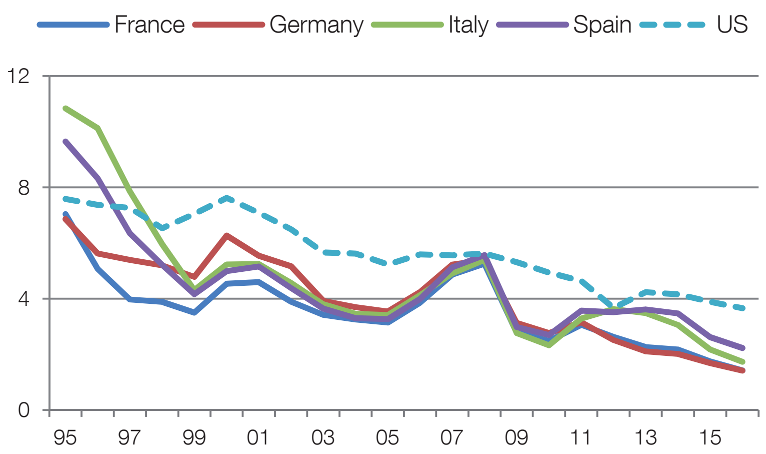
From equation (2) in the main text, the calculation of the unit user cost of capital requires the estimation of: the financial costs of debt and equity; the proportion of debt and equity in the total assets financed; the price inflation rate; the depreciation rate; and corporate tax variables[27].

Financial cost of capital

The financial opportunity cost of capital is equal to the weighted average of the opportunity cost of debt and the opportunity cost of equity, where the weights are the respective proportions of debt and equity in the corporate sector balance sheet.[28]

Given the importance of financing from the banking sector has for European companies, the **cost of debt** i_t^b for the NFCs of each of the euro area countries is set equal to the interest rate on new long-term lending operations in year t, as reported country by country in the ECB dataset. On the other hand, US corporations rely more on marketable debt securities issued and for this reason, the interest rate on debt is set equal to the yield on Moody's Aaa bond portfolio for each year. Figure B1 shows the evolution of the estimated cost of debt for the NFCs of each country in the sample period[29].

Figure B1. Cost of Corporate Debt, i_t^b (%)



Since 1999, the corporate cost of debt has been higher for the US than for the euro area corporations, with the exception of 2008, the year of the financial crisis when the two coincide. On average, US corporations pay 2 pp more for their debt than their German counterparts. There is a similar difference between the US and the euro area when analysing the average cost of debt calculated from the NFC sectors' income statement and the balance sheet data (Salas et al. 2017)

In all the countries, the nominal cost of debt was on a downward trend throughout the sample period, interrupted by the tightening of monetary policy by the ECB in the pre-crisis

27 Data of these variables are available in Data Appendix.

28 We consider the time-varying liability composition of the NFCs. Thus, in expression (2), bt-1 and (1-bt-1) are the weights for debt and equity finance, respectively.

29 The data on the interest rates applied to corporate loans for European countries are monthly and on the US corporate bonds yields are daily. We take annual averages of these data for each country.

years, 2006-2008. In the case of Spain, for example, the cost fell from almost 10% in 1995 to 2.2% in 2016. With the euro, the cost of debt for corporations in the euro area countries converged towards the low values of France and Germany, but diverged again, particularly for Spanish and Italian corporations in the wake of the European sovereign debt crisis in 2011-2012, which had some lagged effects on bank financing costs, as illustrated in Figure 3.

Formally, the opportunity **cost of equity** (α) is the discount factor for which the present value of current and future dividends that shareholders expect to receive from holding shares of the company equals to the current market value of the shares. Expressed in price and dividends per share, the discount factor we are interested in is the value of α that solves the equation,

$$P^{share} = \frac{d^{share}}{\alpha - E(g^d)}$$

or,

$$\alpha = \frac{d^{share}}{P^{share}} + E\left(g^d\right)$$

where d^{share} is the current dividend per share, P^{share} is the current share price, and $E(g^d)$ is the expected constant future growth rate of dividends per share. The financial cost of equity is then equal to the current dividend returns per share (known as the "dividend yield") plus the expected future growth rate in dividends. Firms with stable production capacity will distribute all their profits as dividends (the investment to replace depreciated capacity will be financed with depreciation allowances). In this case, $E(g^d)$=0 and dividend per share is simply equal to profit per share.

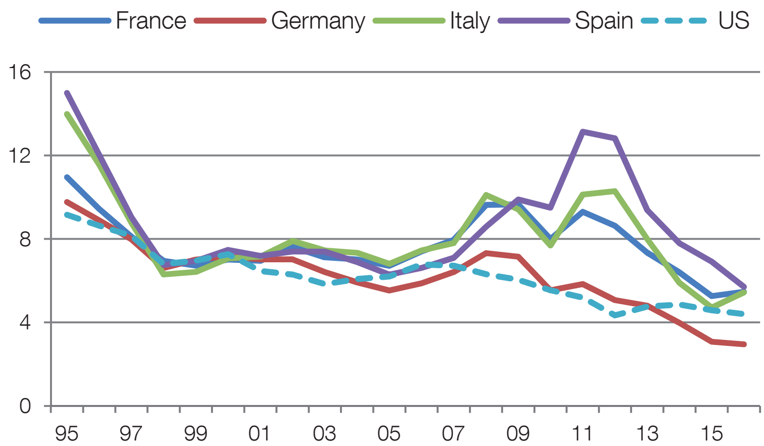
For stock market-listed firms, the current and past values of the share price and the dividends per share (the inverse of the Price-Earnings Ratio or PER) are public information but the expected growth rate of future dividends is not an observable value. The calculation of the cost of equity thus requires a subjective assessment of the expected growth rate of dividends. At the firm level, the future growth of dividends is often estimated by extrapolation of past values. At the macro level, the evolution of corporate dividends is assumed to be parallel to that of macroeconomic variables. Hence, estimates of the future growth rates of dividends used in practice include the forecasts of the nominal GDP growth rates or expectations about risk-free interest rates.[30]

In this paper, the cost of equity is calculated as the sum of the dividend price ratio, based on dividend and price per share data from the companies listed on the main stock exchanges of the various countries, and the 10-year sovereign bond yield of the corresponding country. Therefore, the interest rate on the 10-year sovereign bond is our estimate of the long-term expected nominal growth rate of the economy. As a robustness check, we have also estimated the opportunity cost of equity using the long-term expected annual growth of the nominal GDP of the economy as an estimate of the expected annual growth rate of dividends

30 See Fama and French (1988) and Barkai (2016).

per share of its NFCs; the results are very similar to those obtained using the 10-year sovereign bond yield.[31] The estimated costs of equity are shown in Figure B2.

Figure B2. Cost of Corporate Equity, α (%)

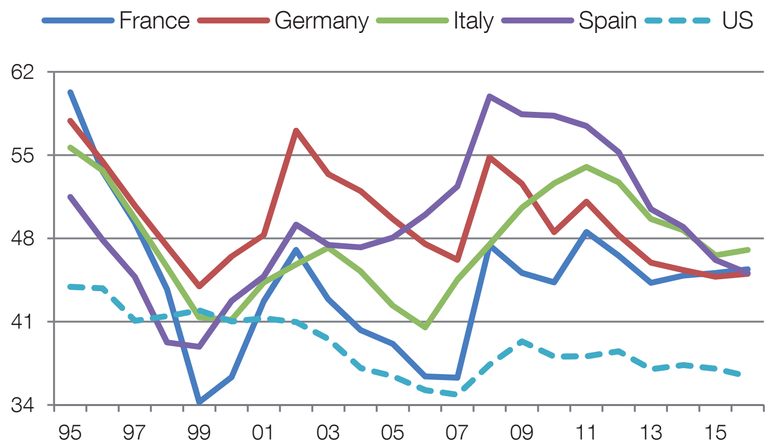


US corporations pay a cost for their equity similar to that paid by German firms. Moreover, the cost of equity for US corporations is similar to their cost of debt (average differential rate of 0.7 pp in the sample period), while for the corporations in the euro area equity is more expensive than debt, with an average differential rate of 4.1 pp in France, 2.2 pp in Germany, 3.5 pp in Italy and 4.2 pp in Spain. The fragmentation of financial markets with the sovereign debt crisis also affected the equity markets. In 2011 and 2012, the cost of equity peaked at close to 13% in Spain and to 10% in Italy, compared with less than 6% in Germany. At the end of the sample period the cost of equity among corporate sectors of the different euro area countries was significantly higher than the cost of debt and tended to converge again among the corporate sectors of the different countries, although for the German corporations the cost of equity was still around 2.5 pp lower than the cost of equity for Spanish, Italian and French corporations.

The third element in the calculation of the financial cost of capital is the weighting applied to each source of finance. As stated earlier these weights will be the respective proportions of debt (b_t) and equity $(1\text{-}b_t)$ in the liabilities of the corresponding country corporations, as published in the Financial Accounts. Figure B3 shows the time evolution over time of the debt ratio of the NFCs in each of the countries.

31 As forecasts of nominal GDP growth rates we used expectations of both the long-term real GDP growth and the long-term Consumer Price Index inflation according to the Consensus Economics Forecasts.

Figure B3. Corporate Debt / Total Liabilities, b_t (%)



US corporations finance their assets with a smaller proportion of debt and larger proportion of equity than corporations in the euro area. In the average sample period, German, Spanish and Italian corporations financed their assets practically with the same proportion of debt as equity. The average debt ratio of the French corporations was 44% and that of the US corporations 39%. The leverage ratios showed ups and downs throughout the period, including the 20 pp increase in the debt ratio of Spanish corporations from 1999 to 2008, and the 15 pp deleveraging of these corporations from 2008 to 2016.

Depreciation rates and tax adjustment factors

The annual depreciation rates δ_t are calculated as the ratio of the fixed capital consumption reported in Sector National Accounts for the non-financial corporate sector of the respective country in year t to the stock of capital at the end of year t, $P_t K_t$. Depreciation rates, on average for the sample period, are 9.6% for France, 8.2% for Germany, 8.1% for Italy, 7.0% for Spain and 9.0% for the US.

The adjusted-tax user cost of capital accounts for the taxation on corporate profits, as interest payments on debt finance and amortisation of invested capital are considered as expenses totally and partially deducted from the corporate tax base, respectively. For each country and over time, data on corporate income taxes are from the OECD and calculations on the net present values (NPV) of depreciation allowances are obtained directly from the US Tax Foundation.[32] The NPV of depreciation allowances represents the percent of one dollar of a capital investment that can be recovered through the tax code. We aggregate the information available for the NPV of depreciation allowances for three kinds of assets (non-

32 Data on corporate income taxes have been obtained from the OECD Tax Database available at http://www.oecd.org/tax/tax-policy/tax-database.htm. We take as the corporate income tax for each country the basic combined central and sub-central (statutory) corporate income tax rate given by the adjusted central government rate plus the sub-central rate. The adjusted central government rate takes into account surtaxes (if any) and interactions between central and sub-central taxation where tax at one level is deductible from the tax base of the other. Calculations of the NPV of depreciation allowances for each country over time are available at https://taxfoundation.org. These data are generally available from 1979 up to 2012 and are in turn calculations based on parameters from the CBT Tax Database collected by the Oxford University Centre for Business Taxation, assuming additionally an interest rate of 5% and an inflation rate of 2.5% across all countries and years. According to the CBT Tax Database, the parameters for the calculation of capital allowances do no change after 2012 for our countries of interest (Spain is the only exception but changes tend to revert over time to their previous values).

residential buildings, equipment and intangibles) using as weights the time-varying composition of nominal GFCF.

The most relevant factors explaining the fall of the unit user cost of capital during the sample period were the funding costs (both, equity and debt) and the depreciation rate. By contrast, corporate tax variables and expected inflation had a marginal contribution.

Appendix C. Industry level analysis

This appendix complements the robustness check presented in Section 7 of the main text. In particular we present the detailed results of the test of constant returns to scale with 2-digit sector level data taken from the CompNet database. This is a database of output and inputs for around 60 2-digit NACE sectors, available for France, Germany, Italy and Spain.[33] We postulate a standard Cobb-Douglas production function (with variables in logs) where output is the gross value added of the NACE sector s in year t, $y_{s,t}$, and the two inputs are labour, $l_{s,t}$, and estimated stock of capital, $k_{s,t}$:

$$y_{s,t} = \beta_0 + \beta_l l_{s,t} + \beta_k k_{s,t} + \omega_{s,t} + \epsilon_{s,t} \tag{C1}$$

where $y_{s,t}$, $l_{s,t}$ and $k_{s,t}$ are all observed. β_l and β_k are, respectively, the elasticity of output to labour and capital inputs. By contrast, there are two unobserved components, $\epsilon_{s,t}$ and $\omega_{s,t}$. The first represents shocks to production or productivity that corporations are unable to predict before making their input decisions at t, so $E[\epsilon_{s,t} \mid I_{s,t}] = 0$, where $I_{s,t}$ is the information set at t of the representative firm of the sector s. However, the term $\omega_{s,t}$ can be potentially predictable by firms, as long as it represents factors such as experience and skills of the firm's managers and of their business conditions.

The identification or bias problem arises here when we estimate β_l and β_k by ordinary least squares, as it is likely that a representative firm decides on its labour input $l_{s,t}$ after or during the period in which it is unobservable $\omega_{s,t}$ is becoming partially observed. This case is unlikely to occur when the representative company of the sector s decides on its stock of capital $k_{s,t}$ since this is a time-to-build process (i.e. the level of capital stock in period t is decided at period $t-1$, because new capital needs more time to be installed and operational). Therefore, there could potentially be a correlation between $l_{s,t}$ and $\omega_{s,t}$ that affects the estimation of β_l and β_k.

The parameters of the production function were estimated adopting the approach of several methodologies proposed to correct for this simultaneity bias: Olley and Pakes (OP, 1996), Levinsohn and Petrin (LP, 2003), Ackerberg, Caves and Frazer correction to OP and LP (ACF, 2015), Robinson (R, 1988), Wooldridge (W, 2009), and Mollisi and Rovigatti (MR, 2017). According to these methodologies a proxy variable is used to recover the productivity shock $\omega_{s,t}$ (unobserved technical efficiency parameter), either the levels of investment (OP, 1996) or, in order to address the issue of zero values in investment data, the levels of intermediate consumption (LP, 2003). We also use as a proxy variable the ratio of investment over capital stock. Ensuring this invertibility of the proxy variable to be used in the technical efficiency shock $\omega_{s,t}$ requires imposing the condition that the proxy variable be strictly monotone in $\omega_{s,t}$. So, assuming the decision by a firm representative of a given sector s about its proxy $p_{s,t} \in (i_{s,t}, m_{s,t})$ is given by $p_{s,t} = f_t(k_{s,t}, \omega_{s,t})$, we can invert the investment policy function $i_{s,t}$ or the intermediate consumption demand $m_{s,t}$ such that we get

33 Data from CompNet for Germany, Italy and Spain come from the full sample of firms meaning all firm sizes. For France, only data on companies with more than 20 employees are available. The sample periods are the following: 2001-2012 for France, 2000-2012 for Germany, 2001-2013 for Italy, and 1995-2013 for Spain. The information used is data about three descriptive statistics –mean, (output) weighted-mean, and median- across firms for each sector on turnover (total sales), gross value added, intermediate inputs (materials), labour (number of full-time equivalent employees), stock of capital, gross investment and investment ratio over capital, (all variables in real terms). To save space, in Table C1 we only show estimates coming from the information on weighted-mean statistics, although it should be mentioned that estimates based on the mean and median yield similar results for the returns to scale parameter and that the null hypothesis of constant returns to scale continues not to be rejected in most cases.

$$\omega_{s,t} = f_t^{-1}(k_{s,t}, p_{s,t}) \quad \text{(C2)}$$

and this way we can express the productivity shock as a partially identified function of observables.

If we substitute expression (C2) into the production function (C1) and, to simplify this complex and dynamic optimisation problem,[34] treat it as a non-parametric function together with β_0 and $\beta_k k_{s,t}$, such that

$$\psi_t(k_{s,t}, p_{s,t}) = \beta_0 + \beta_k k_{s,t} + f_t^{-1}(k_{s,t}, p_{s,t}) \quad \text{(C3)}$$

we obtain

$$y_{s,t} = \beta_0 + \beta_l l_{s,t} + \beta_k k_{s,t} + f_t^{-1}(k_{s,t}, p_{s,t}) + \epsilon_{s,t} = \beta_l l_{s,t} + \psi_t(k_{s,t}, p_{s,t}) + \epsilon_{s,t} \quad \text{(C4)}$$

Production function estimations à la OP (1996) and à la LP (2003) proceed in two stages. First, they use equation (C4) to form the first stage moment condition given by:

$$E[\epsilon_{s,t} \mid I_{s,t}] = E\left[y_{s,t} - \beta_l l_{s,t} - \psi_t\left(k_{s,t}, p_{s,t}\right) \mid I_{s,t}\right] = 0 \quad \text{(C5)}$$

Generalised Method of Moments (GMM) estimates of $\widehat{\beta_l}$ and $\widehat{\psi_t}(k_{s,t}, p_{s,t})$ can be derived from equation (C5). As mentioned, a polynomial approximation to the last term can be used.

Equally important in these estimation approaches is the assumption that the unobserved productivity shock $\omega_{s,t}$ follows a first-order Markov process in order to exploit the second moment condition, i.e. the capital stock $k_{s,t}$ and the lagged labour input $l_{s,t-j}$ $(j > 1)$ are uncorrelated with $\omega_{s,t}$, which will allow us to estimate the output elasticity to labour and capital, β_l and β_k. That is, we can decompose $\omega_{s,t}$ into its conditional expectation at period *t-1*, and an innovation term:

$$\omega_{s,t} = E[\omega_{s,t} \mid I_{s,t-1}] + \xi_{s,t} = E[\omega_{s,t} \mid \omega_{s,t-1}] + \xi_{s,t} = g(\omega_{s,t-1}) + \xi_{s,t} \quad \text{(C6)}$$

where $E[\xi_{s,t} \mid I_{s,t-1}] = 0$. Substituting equation (C6) into (C1) renders

$$y_{s,t} = \beta_0 + \beta_l l_{s,t} + \beta_k k_{s,t} + g(\omega_{s,t-1}) + \xi_{s,t} + \epsilon_{s,t} \quad \text{(C7)}$$

and from equation (C2) and (C3) we have

$$\omega_{s,t-1} = f_{t-1}^{-1}(k_{s,t-1}, p_{s,t-1}) = \psi_{t-1}(k_{s,t-1}, p_{s,t-1}) - \beta_0 - \beta_k k_{s,t-1} \quad \text{(C8)}$$

So, substituting (C8) into (C7) yields

34 Solving for f and thus for f -1 would require additional assumptions and calculations, such as assumptions about the firm's demand conditions and changes in input prices, rather than merely treating f -1 as a non-parametric function. In particular, f -1 could be approximated as an n-th order polynomial in the state variable (capital stock) and the proxy (intermediate input or investment variables).

$$y_{s,t} = \beta_0 + \beta_l l_{s,t} + \beta_k k_{s,t} + g\big(\psi_{t-1}(k_{s,t-1}, p_{s,t-1}) - \beta_0 - \beta_k k_{s,t-1}\big) + \xi_{s,t} + \epsilon_{s,t} \quad \text{(C9)}$$

The second moment condition is obtained from equation (C9). Remember that from (C6) and (C1) we assume that $E[\xi_{s,t} \mid I_{s,t-1}] = 0$ and $E[\epsilon_{s,t} \mid I_{s,t}] = 0$, respectively. Thus, the second stage of the estimation techniques in OP (1996) and LP (2003) uses the following moment condition:[35]

$$E[\xi_{s,t} + \epsilon_{s,t} \mid I_{s,t-1}] = E\big[y_{s,t} - \beta_0 - \beta_l l_{s,t} - \beta_k k_{s,t} - g\big(\psi_{t-1}(k_{s,t-1}, p_{s,t-1}) - \beta_0 - \beta_k k_{s,t-1}\big) \mid I_{s,t-1}\big] = 0 \quad \text{(C10)}$$

where the first step estimates $\widehat{\beta_l}$ and $\widehat{\psi_t}(k_{s,t}, p_{s,t})$ from the first moment condition (C5) are substituted into the formula. The solution of the second moment condition (C10) gives estimates $\hat{\beta} = (\widehat{\beta_0}, \widehat{\beta_l}, \widehat{\beta_k})$.

ACF (2015) suggested a modification to the OP (1996) and LP (2003) function production estimation methods in an attempt to mitigate the problem of functional dependence between the labour demand and other regressors that cause the first stage moment condition not to identify accurately the labour coefficient β_l. ACF (2015) argue that OP-LP-based techniques can produce unrealistic estimates of β_l in many industries. This approach rests on the two moment conditions seen above, (C5) and (C10), with slight differences. The main difference between ACF (2015) and OP (1996) and LP (2003) is that the first methodology inverts the conditional rather than unconditional proxy demand equation to control for an unobserved productivity shock $\omega_{s,t}$, so that $p_{s,t} = f_t(k_{s,t}, l_{s,t}, \omega_{s,t})$ where $p_{s,t} \in (i_{s,t}, m_{s,t})$. This assumption implies that $p_{s,t}$ is chosen after $l_{s,t}$ instead of assuming that they are chosen simultaneously given the pair of state variables $(k_{s,t}, \omega_{s,t})$, which is the definition of the unconditional proxy demand equation. This way $l_{s,t}$ can be treated as a state variable decided between periods *t-1* and *t* and has dynamic implications in the sense that not only affects current but also future profits of the representative firm. From these new assumptions, that based on the strict monotonicity condition implying that $p_{s,t} = f_t(k_{s,t}, l_{s,t}, \omega_{s,t})$ is strictly increasing in $\omega_{s,t}$ and assuming a first-order Markov process for $\omega_{s,t}$, the derivation to obtain the moment conditions follows as before. First, proxy demand is inverted to obtain $\omega_{s,t} = f_t^{-1}(k_{s,t}, l_{s,t}, p_{s,t})$ and this term is substituted into the production function (C1), such that

$$y_{s,t} = \beta_0 + \beta_l l_{s,t} + \beta_k k_{s,t} + f_t^{-1}(k_{s,t}, l_{s,t}, p_{s,t}) + \epsilon_{s,t} = \psi_t(k_{s,t}, l_{s,t}, p_{s,t}) + \epsilon_{s,t} \quad \text{(C11)}$$

where $\psi_t(k_{s,t}, l_{s,t}, p_{s,t}) = \beta_0 + \beta_l l_{s,t} + \beta_k k_{s,t} + f_t^{-1}(k_{s,t}, l_{s,t}, p_{s,t})$ can be approximated by an n-order polynomial in $(k_{s,t}, l_{s,t}, p_{s,t})$. Since f_t^{-1} is a non-parametric function in $(k_{s,t}, l_{s,t}, p_{s,t})$ and none of the parameters $(\beta_0, \beta_l, \beta_k)$ can be identified, the first moment condition is given by

$$E[\epsilon_{s,t} \mid I_{s,t}] = E\big[y_{s,t} - \psi_t(k_{s,t}, l_{s,t}, p_{s,t}) \mid I_{s,t}\big] = 0 \quad \text{(C12)}$$

35 For simplicity in the exposition of these very similar methodologies, we have overlooked the fact that in LP (2003) material or intermediate consumption $m_{s,t}$ enters as input in the production function. Hence, the second step moment condition in LP (2003) is given by $E[\xi_{s,t} + \epsilon_{s,t} \mid I_{s,t-1}] = E\big[y_{s,t} - \beta_0 - \beta_l l_{s,t} - \beta_k k_{s,t} - \beta_m m_{s,t} - g\big(\psi_{t-1}(k_{s,t-1}, m_{s,t-1}) - \beta_0 - \beta_k k_{s,t-1} - \beta_m m_{s,t-1}\big) \mid I_{s,t-1}\big] = 0$, from which estimates $\hat{\beta}_0$, $\hat{\beta}_k$ and $\hat{\beta}_m$. are obtained Before that, the estimate of β_l, $\hat{\beta}_l$ (and the estimate of $\psi_{t-1}(k_{s,t-1}, m_{s,t-1}), \hat{\psi}_{t-1}(.)$) is calculated from the first stage moment condition $E[\epsilon_{s,t} \mid I_{s,t}] = E\big[y_{s,t} - \beta_l l_{s,t} - \psi_t(k_{s,t}, m_{s,t}) \mid I_{s,t}\big] = 0$, where $\psi_t(k_{s,t}, m_{s,t}) = \beta_0 + \beta_k k_{s,t} + \beta_m m_{s,t} + f_t^{-1}(k_{s,t}, m_{s,t})$.

So, unlike in (C5), β_l cannot be estimated in (C12). By contrast, this first stage yields estimates of $\psi_j(k_{s,j}, l_{s,j}, p_{s,j})$, $\hat{\psi}_j(k_{s,j}, l_{s,j}, p_{s,j})\ \forall j = 1, \dots, t-1, t, \dots, T$ that can be plugged into the second moment

$$E[\xi_{s,t} + \epsilon_{s,t} \mid I_{s,t-1}] = E\big[y_{s,t} - \beta_0 - \beta_l l_{s,t} - \beta_k k_{s,t} - g\big(\psi_{t-1}(k_{s,t-1}, l_{s,t-1}, p_{s,t-1}) - \beta_0 - \beta_l l_{s,t-1} - \beta_k k_{s,t-1}\big) \mid I_{s,t-1}\big] = 0 \qquad \text{(C13)}$$

replacing $\psi_{t-1}(k_{s,t-1}, l_{s,t-1}, p_{s,t-1})$ by $\hat{\psi}_{t-1}(k_{s,t-1}, l_{s,t-1}, p_{s,t-1})$. This moment condition is similar to (C10), although the labour term is nested inside the *g* function as it is already present in $\psi_{t-1}(.)$. As (C13) involves an estimation of an additional parameter with respect to (C10), namely the parameter β_l, ACF (2015) rely on a further condition in the second stage estimation. Assuming that labour is chosen after period *t-1*, $l_{s,t}$ will correlate with $\xi_{s,t}$ but $l_{s,t-1}$ will not.[36] Thus, lagged labour (or other lagged inputs) can be used as instrument to keep the model exactly identified and to estimate all the parameters of the production function $\beta = (\beta_0, \beta_l, \beta_k)$. Transforming conditional second stage equation (A14) into an unconditional one, according to ACF(2015)

$$E\left[y_{s,t} - \beta_0 - \beta_l l_{s,t} - \beta_k k_{s,t} - g\big(\psi_{t-1}(k_{s,t-1}, l_{s,t-1}, p_{s,t-1}) - \beta_0 - \beta_l l_{s,t-1} - \beta_k k_{s,t-1}\big) \otimes \begin{pmatrix} 1 \\ l_{s,t-1} \\ k_{s,t} \end{pmatrix}\right] = 0 \qquad \text{(C14)}$$

where $\psi_{t-1}(.)$ is replaced by its estimate from the first stage, $\hat{\psi}_{t-1}(.)$.

Wooldridge (2009) proposes an alternative to the OP (1996) and LP (2003) methods that involves minimising the first (C5) and second (C10) stage moments simultaneously, such that

$$E\begin{pmatrix} \epsilon_{s,t} \mid I_{s,t} \\ \xi_{s,t} + \epsilon_{s,t} \mid I_{s,t-1} \end{pmatrix} = E\begin{pmatrix} y_{s,t} - \beta_l l_{s,t} - \psi_t(k_{s,t}, p_{s,t}) \mid I_{s,t} \\ y_{s,t} - \beta_0 - \beta_l l_{s,t} - \beta_k k_{s,t} - g\big(\psi_{t-1}(k_{s,t-1}, p_{s,t-1}) - \beta_0 - \beta_k k_{s,t-1}\big) \mid I_{s,t-1} \end{pmatrix}$$

which is estimated by System-GMM. The main advantage of Wooldridge's approach over OP (1996) and LP (2003) methodologies is that is more efficient, as the two moment conditions are jointly estimated and the resulting estimator does not suffer from the collinearity issue identified in OP (1996) and LP (2003). Note that the latter methodologies use these two moments sequentially, identifying β_l in a first attempt using partial information given by the first stage moment.

Furthermore, in an attempt to deal with the issue of short panels, we employ MR (2017), as this Wooldridge-type estimation method streamlines the use of instruments introducing them à la Blundell-Bond. We also incorporate time dummies to isolate the effects of the business cycle across sectors (i.e. to control for cross-correlation among sectors in each period), and sector dummies to capture idiosyncratic fixed effects.

36 One could use contemporaneous labour $l_{s,t}$ instead of its lag $l_{s,t-1}$ as a natural instrument if it were decided by the firm at time t-1 (or before productivity shock $\omega_{s,t}$ is beginning to materialise or being inferred by the firm). Even this is a strong assumption it can be plausible in the presence of important labour market rigidities such as high hiring or firing costs, excessive regulation. If this were the case, the estimates would be more accurate.

Following the production function estimation methodologies proposed by the above-mentioned literature, we estimate the elasticity of output to labour and capital pooling around sixty 2-digit NACE sectors and years for each country; next, we test the null hypothesis that the sum of these elasticities is equal to one. The CompNet data is presented at the level of each sector's representative firm, where the representative firm is the output-weighted mean value of the corresponding variable across all firms in the database.

The results of the estimations including the p values from the tests of constant returns to scale are presented in Table C1 for each country. Notice that for the four countries there are more cases in which the null hypothesis of constant returns to scale is not rejected than cases in which it is rejected. Likewise, we find that estimates of the parameter of the returns to scale are consistent around values close to one across several estimation methodologies employing different assumptions, which is much more convincing than relying on one single method. Therefore, the constant returns to scale assumption appears a plausible one for the corporate sectors of the four countries.

Table C1. Estimates of output elasticity to labour and capital, and of returns to scale

France	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Tests on γ = 1 not rejected (% of total)	Avge.
Output elasticity to labor	0.81	0.80	0.76	0.77	0.75	0.69	0.77	0.76	0.77		0.76
Output elasticity to capital	0.12	0.13	0.15	0.15	0.18	0.25	0.14	0.16	0.15		0.16
Returns to scale (γ)	0.93	0.93	0.91	0.92	0.92	0.93	0.92	0.92	0.92		0.92
P-value (γ = 1)	0.40	0.22	0.12	0.01	0.38	0.00	0.23	0.04	0.21	67%	
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No		
Sector dummies	Yes	Yes	Yes	Yes	No	Yes	No	No	No		
Number of observations	646	647	646	647	592	592	536	536	592		

Germany	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Tests on γ = 1 not rejected (% of total)	Avge.
Output elasticity to labor	0.86	0.83	0.88	0.74	0.83	0.93	0.90	0.88	0.83		0.85
Output elasticity to capital	0.08	-0.04	0.01	0.03	0.12	0.03	0.10	0.10	0.11		0.06
Returns to scale (γ)	0.94	0.78	0.90	0.77	0.96	0.96	1.00	0.98	0.93		0.91
P-value (γ = 1)	0.34	0.01	0.00	0.00	0.73	0.00	1.00	0.61	0.54	56%	
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No		
Sector dummies	Yes	Yes	Yes	Yes	No	Yes	No	No	No		
Number of observations	655	657	655	657	674	674	622	622	674		

Italy	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Tests on γ = 1 not rejected (% of total)	Avge.
Output elasticity to labor	0.94	0.93	0.89	0.90	0.88	0.86	0.85	0.86	0.85		0.88
Output elasticity to capital	0.09	0.10	0.09	0.08	0.12	0.14	0.14	0.14	0.14		0.12
Returns to scale (γ)	1.03	1.03	0.98	0.98	1.00	1.00	0.99	1.00	0.99		1.00
P-value (γ = 1)	0.44	0.56	0.27	0.37	0.99	0.99	0.89	0.94	0.93	100%	
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No		
Sector dummies	Yes	Yes	Yes	Yes	No	Yes	No	No	No		
Number of observations	660	661	660	661	647	647	581	581	647		

Spain	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Tests on γ = 1 not rejected (% of total)	Avge.
Output elasticity to labor	0.87	0.87	0.87	0.86	0.73	0.85	0.72	0.71	0.71		0.80
Output elasticity to capital	0.17	0.17	0.17	0.15	0.27	0.19	0.28	0.28	0.29		0.22
Returns to scale (γ)	1.04	1.04	1.04	1.00	1.00	1.05	0.99	1.00	1.00		1.02
P-value (γ = 1)	0.32	0.18	0.03	0.87	0.96	0.00	0.88	0.97	0.92	78%	
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No		
Sector dummies	Yes	Yes	Yes	Yes	No	Yes	No	No	No		
Number of observations	987	992	987	992	907	907	839	839	907		

Sources and notes: CompNet. The results reported are estimates from several production function approaches (from (1) to (9)) of output (GVA) elasticities to labour and capital, their sum (equal to the returns to scale parameter) and the p-value of the null hypothesis of constant returns to scale (γ= 1) obtained with data from 2-digit NACE sectors of CompNet (around 60 sectors), for France, Germany, Italy and Spain. Data from Germany, Italy and Spain come from the full sample of firms, meaning all firm sizes. For France, only data on companies with more than 20 employees are available. The sample periods are the following: 2001-2012 for France, 1997-2012 for Germany, 2001-2013 for Italy, and 1995-2013 for Spain. The information exploited is data about the (output) weighted-mean across firms for each sector on turnover (total sales), gross value added, intermediate inputs (materials), labour (number of full-time equivalent employees), stock of capital, gross investment and investment ratio over capital, all variables in real terms. The function production methodologies follow: (1) and (2) Olley and Pakes (1996), OP, with investment in levels or as a ratio, respectively, to recover the productivity shock (unobserved technical efficiency parameter) in conjunction with the state variable (capital); (3) and (4) Ackerberg, Caves and Frazer (2015), ACF, correction to (1) and (2), respectively, in an attempt to mitigate the possible collinearity between labour input and other regressors; (5) Levinsohn and Petrin (2003), LP, with intermediate inputs instead of investment to overcome the empirical issue of zeroes in investment data; (6) ACF correction to (5); (7) Robinson (1988); (8) Wooldridge (2009), a more efficient estimator that does not suffer from the collinearity issue identified in OP and LP methodologies, and (9) Mollisi and Rovigatti (2017), in order to deal with short panels as it is introduced dynamic panel instruments à la Blundell-Bond.

Data Appendix: Value added and labor costs

FRANCE	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GVA (EUR billions)	589.5	598.0	611.7	649.2	676.1	717.5	753.9	778.1	803.3	836.1	866.8	910.6	962.5	990.4	948.0	981.3	1,011.5	1,021.8	1,032.9	1,054.1	1,090.0	1,114.8
Compensation of employees (EUR billions)	389.8	400.7	404.9	422.4	445.7	473.2	497.4	518.1	533.1	553.8	574.7	602.9	628.8	650.8	642.9	661.6	684.4	700.8	710.9	723.3	733.0	749.8
Compensation per FTE employee (EUR thousands)	32.3	32.7	33.4	33.9	34.5	35.1	35.7	36.9	38.0	39.5	40.6	42.0	43.0	44.4	44.9	46.5	47.6	48.5	49.2	50.1	50.7	51.2
GERMANY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GVA (EUR billions)	1,066.3	1,061.2	1,058.4	1,104.1	1,126.7	1,176.5	1,225.9	1,238.8	1,239.9	1,275.7	1,298.1	1,366.5	1,447.9	1,468.9	1,382.6	1,471.5	1,548.8	1,571.1	1,607.4	1,687.4	1,762.8	1,823.6
Compensation of employees (EUR billions)	666.8	661.5	645.2	660.4	686.5	718.3	728.3	729.4	730.4	734.3	735.1	752.8	779.1	811.8	803.6	836.1	881.2	922.2	947.7	990.1	1,033.1	1,072.2
Compensation per FTE employee (EUR thousands)	32.2	32.8	33.2	33.8	34.5	35.2	35.9	36.4	37.3	37.8	38.1	39.1	39.8	40.5	40.3	41.5	42.8	43.8	44.3	45.4	46.8	47.7
ITALY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GVA (EUR billions)	415.2	478.8	502.6	504.3	522.5	555.0	587.3	605.0	618.4	642.5	657.0	676.8	705.6	720.0	683.4	696.2	713.0	688.7	684.7	691.4	717.2	744.6
Compensation of employees (EUR billions)	203.0	234.1	248.5	250.9	263.6	275.0	290.9	303.5	316.4	328.8	342.9	357.2	375.5	388.9	384.0	389.8	401.2	396.9	394.7	397.0	411.0	423.2
Compensation per FTE employee (EUR thousands)	23.6	24.9	25.9	26.0	26.6	27.1	27.9	28.5	29.2	30.9	31.5	31.9	33.1	34.4	34.5	35.6	36.4	36.4	37.3	37.8	38.4	38.6
SPAIN	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GVA (EUR billions)	232.1	244.1	261.0	279.1	298.6	324.4	351.7	376.5	400.3	426.4	458.7	500.5	554.9	606.5	592.0	583.4	574.4	555.7	541.9	552.2	578.1	604.1
Compensation of employees (EUR billions)	140.4	148.9	160.0	172.8	186.7	203.9	223.4	239.7	255.9	271.7	291.2	317.7	346.6	371.2	355.7	347.7	341.7	321.0	306.9	315.2	334.6	345.8
Compensation per FTE employee (EUR thousands)	19.7	20.5	21.1	21.4	21.8	22.3	23.2	24.1	24.7	25.2	26.2	27.1	28.3	30.4	31.8	32.2	32.8	33.0	33.3	33.4	34.0	33.8
UNITED STATES	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GVA (USD billions)	3,682.7	3,924.4	4,219.5	4,470.8	4,745.3	5,063.1	5,026.2	5,066.0	5,228.7	5,577.0	5,958.9	6,377.9	6,571.4	6,624.1	6,253.9	6,605.7	6,921.7	7,321.5	7,583.7	7,970.3	8,294.7	8,382.4
Compensation of employees (USD billions)	2,524.6	2,667.7	2,862.6	3,093.8	3,310.0	3,597.3	3,584.6	3,542.0	3,595.7	3,762.8	3,930.3	4,129.3	4,305.3	4,358.0	4,088.4	4,158.7	4,363.4	4,593.3	4,749.7	5,004.2	5,269.3	5,406.9
Compensation per FTE employee (USD thousands)	36.2	37.4	39.0	40.0	41.7	44.2	45.1	45.9	47.5	49.4	50.9	52.8	54.9	56.3	57.1	58.8	60.5	62.1	62.8	64.5	66.2	66.9

Sources and notes: The GVA is calculated according to the definition of the income statement in Section 4, i.e. includes subsidies net of taxes on production. The compensation per full-time equivalent (FTE) employee is calculated as the compensation of employees of the non-financial corporate sector reported in Sectoral National Accounts divided by the FTE employees. The number of FTE employees for each European country is constructed from EU Labor Force Survey data available on Eurostat. Data for the US are available on BEA (NIPA Tables, Section 6 – Income and employment by industry). For each country, we aggregate FTE employees' series for each activity branch that is typical of NFCs. For each activity branch and year, the number of FTE employees is equal to the total number of employees times the average number of actual weekly hours for total employees divided by the average number of actual weekly hours for full-time employees. The total number of employees is the sum of the number of full-time employees and the number of part-time employees.

Data Appendix: Capital stock through Perpetual Inventory Method

FRANCE	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gross investment (EUR billions)	123.0	118.6	122.4	140.7	151.6	177.9	179.3	171.9	169.7	182.2	198.3	216.9	244.8	247.2	195.4	219.0	254.6	246.0	246.8	266.3	280.9	290.5
Amortization (EUR billions)	102.3	106.0	106.3	110.4	116.7	127.2	135.2	142.3	146.8	153.2	161.1	171.1	180.8	191.0	194.0	197.9	205.0	210.5	214.3	217.8	221.9	228.1
Investment deflator (1995 = 100)	100.0	100.8	100.6	100.8	101.3	105.0	106.2	107.3	107.5	108.9	111.2	114.6	116.9	119.2	119.7	120.7	123.2	124.7	125.3	125.0	124.7	125.4
Capital stock (EUR billions)	1,204.2	1,226.4	1,240.7	1,272.5	1,313.8	1,412.6	1,472.6	1,517.4	1,543.1	1,592.1	1,663.8	1,759.5	1,859.3	1,952.0	1,961.2	1,999.0	2,089.6	2,151.4	2,194.6	2,237.3	2,291.1	2,367.1

GERMANY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gross investment (EUR billions)	237.0	226.1	231.5	251.3	265.6	334.7	281.9	248.1	249.5	251.3	252.1	281.9	322.1	325.8	240.1	290.3	329.5	287.6	303.1	315.6	325.1	333.1
Amortization (EUR billions)	180.4	182.0	182.0	186.7	193.7	203.9	212.4	218.0	220.3	224.1	228.0	233.4	243.5	253.3	258.8	262.9	270.5	278.6	284.0	290.7	298.9	307.4
Investment deflator (1995 = 100)	100.0	100.2	100.4	100.2	99.4	100.6	100.4	99.7	98.5	99.0	99.2	99.1	100.2	101.1	101.5	102.3	103.9	105.4	106.2	107.3	108.5	109.9
Capital stock (EUR billions)	2,324.2	2,372.5	2,426.9	2,486.1	2,538.5	2,700.4	2,765.3	2,774.8	2,772.5	2,813.6	2,842.2	2,887.4	2,998.5	3,097.1	3,091.9	3,142.8	3,250.5	3,306.9	3,351.8	3,410.7	3,477.5	3,548.0

ITALY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gross investment (EUR billions)	89.5	97.0	105.2	111.1	120.0	145.1	138.4	148.0	148.5	152.7	153.6	170.6	181.3	177.9	134.4	162.7	173.3	137.3	136.5	144.8	154.2	152.0
Amortization (EUR billions)	71.6	82.0	87.3	91.1	95.5	102.1	108.0	114.5	118.0	123.3	128.5	134.3	140.8	147.1	148.7	154.6	160.6	163.3	162.2	162.9	164.7	165.2
Investment deflator (1995 = 100)	100.0	102.7	104.9	107.2	108.4	112.1	114.5	117.4	118.4	120.8	123.1	125.7	128.6	132.3	132.6	135.9	139.2	141.1	140.9	141.5	142.1	141.7
Capital stock (EUR billions)	1,069.3	1,113.7	1,155.4	1,200.2	1,238.2	1,323.4	1,382.4	1,451.1	1,493.5	1,553.2	1,607.5	1,677.9	1,757.1	1,839.3	1,829.4	1,882.2	1,940.5	1,941.8	1,913.1	1,903.2	1,899.9	1,881.8

SPAIN	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gross investment (EUR billions)	60.2	64.5	69.7	78.9	89.8	98.2	104.0	110.0	119.6	132.5	150.7	171.6	188.2	178.7	130.1	132.0	131.4	136.5	136.2	148.5	153.0	166.2
Amortization (EUR billions)	35.1	37.0	39.3	41.3	44.5	49.5	53.8	58.1	63.0	69.4	76.2	83.8	91.4	97.5	100.3	103.5	108.0	110.3	110.0	112.4	116.1	120.5
Investment deflator (1995 = 100)	100.0	98.7	99.0	96.4	96.0	100.4	100.4	101.5	102.6	105.2	109.0	112.4	115.4	116.9	114.8	116.1	117.2	117.3	115.0	114.0	114.4	114.7
Capital stock (EUR billions)	568.9	589.2	621.3	642.3	685.1	765.0	815.7	876.0	942.0	1,029.4	1,140.9	1,264.8	1,394.4	1,493.8	1,496.7	1,542.6	1,580.3	1,608.2	1,602.2	1,624.3	1,667.7	1,717.1

UNITED STATES	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gross investment (USD billions)	765.9	807.4	930.7	976.7	1,047.6	1,144.8	1,022.2	956.8	975.0	1,058.6	1,186.9	1,335.2	1,379.8	1,360.6	1,017.4	1,237.8	1,338.3	1,506.5	1,579.9	1,707.6	1,800.2	1,679.3
Amortization (USD billions)	523.7	557.4	598.4	638.2	683.4	741.9	785.3	804.7	818.0	850.2	909.9	979.4	1,040.3	1,093.9	1,092.0	1,094.6	1,139.2	1,186.2	1,228.2	1,285.7	1,336.1	1,364.9
Investment deflator (1995 = 100)	100.0	100.8	101.1	100.9	102.4	103.8	103.1	103.5	103.2	104.8	108.4	112.2	114.8	117.6	116.2	116.3	118.5	120.5	121.2	122.8	123.2	123.9
Capital stock (USD billions)	6,762.1	7,065.7	7,422.0	7,744.0	8,219.7	8,740.6	8,917.0	9,101.3	9,231.7	9,585.3	10,195.2	10,903.2	11,500.5	12,038.3	11,829.6	11,974.3	12,404.3	12,935.6	13,365.5	13,964.4	14,464.6	14,862.7

Sources and notes: Data from Sectoral National Accounts for NFCs in Europe come from Eurostat. Data for NFCs in the US come from BEA and it is considered corporate business and excluded noncorporate business. Series for 1995-1998 for NFCs in Spain are linked with those from Spanish Statistical Institute. The investment deflator for each country is constructed by aggregating sectors and investment components akin to NFCs from KLEMS for the nominal and real gross fixed capital formation (GFCF) available until 2015. The value of 2016 for the investment deflator, not available from KLEMS, is approximated by a weighted-average of the GFCF deflators of non-residential construction and civil engineering, equipment and other investment from AMECO, whose data provide very similar trends that those from KLEMS. The capital stock is constructed by the permanent inventory method.

Data Appendix: Determinants of the (pre-tax) user cost of capital

FRANCE	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Debt cost (%)	7.0	5.1	4.0	3.9	3.5	4.5	4.6	3.9	3.4	3.3	3.1	3.9	4.9	5.3	2.8	2.5	3.1	2.6	2.3	2.2	1.8	1.4
Equity cost (%)	11.0	9.4	8.1	6.9	6.7	7.0	6.9	7.6	7.1	7.0	6.7	7.4	8.0	9.6	9.7	8.0	9.3	8.6	7.3	6.4	5.3	5.5
Total debt / Liabilities (%)	60.3	53.6	49.3	43.7	34.2	36.3	42.7	47.0	42.9	40.3	39.1	36.4	36.3	47.4	45.1	44.3	48.5	46.5	44.3	44.9	45.1	45.4
Liabilities-weighted capital cost (%)	8.6	6.8	5.9	5.4	5.3	6.2	6.1	6.0	5.4	5.4	5.3	6.0	6.8	8.0	6.4	5.5	6.5	5.7	5.0	4.5	3.7	3.6
Depreciation rate (%)	8.6	8.7	8.7	8.9	9.1	9.3	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.1	9.9	10.0	10.0	9.9	9.9	10.0	9.9	9.9
Asset expected inflation rate (%, 5-year MA)	0.4	0.1	0.1	0.2	0.3	1.0	1.1	1.3	1.3	1.5	1.2	1.5	1.7	2.1	1.9	1.6	1.5	1.3	1.0	0.9	0.7	0.4
Corporate income tax (%)	36.7	36.7	41.7	41.7	40.0	37.8	36.4	35.4	35.4	35.4	35.0	34.4	34.4	34.4	34.4	34.4	36.1	36.1	38.0	38.0	38.0	34.4
Net Present Value of depreciation allowances (%)	82.1	82.2	82.3	82.4	82.3	82.0	81.2	81.0	80.9	80.8	80.7	80.4	80.1	80.0	80.1	80.0	79.8	80.1	80.0	80.2	80.2	80.2

GERMANY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Debt cost (%)	6.9	5.6	5.4	5.2	4.8	6.3	5.5	5.2	3.9	3.7	3.5	4.2	5.2	5.4	3.1	2.8	3.2	2.5	2.1	2.0	1.7	1.4
Equity cost (%)	9.8	8.9	8.0	6.6	7.0	7.2	7.0	7.0	6.4	5.9	5.5	5.9	6.4	7.3	7.2	5.5	5.8	5.1	4.8	4.0	3.1	3.0
Total debt / Liabilities (%)	57.9	54.5	50.8	47.3	44.0	46.5	48.3	57.0	53.4	52.0	49.6	47.5	46.2	54.8	52.6	48.5	51.1	48.3	46.0	45.3	44.8	45.0
Liabilities-weighted capital cost (%)	8.1	7.0	6.6	5.9	6.0	6.8	6.3	6.1	5.0	4.7	4.5	5.1	5.8	6.4	4.9	4.1	4.5	3.8	3.5	3.1	2.4	2.3
Depreciation rate (%)	8.0	7.8	7.7	7.7	7.9	7.9	7.9	7.9	8.0	8.0	8.1	8.2	8.3	8.4	8.3	8.4	8.5	8.4	8.5	8.6	8.7	8.7
Asset expected inflation rate (%, 5-year MA)	3.8	3.2	2.3	0.9	0.5	0.1	0.1	-0.1	-0.3	-0.1	-0.3	-0.3	0.1	0.5	0.5	0.6	0.9	1.0	1.0	1.1	1.2	1.1
Corporate income tax (%)	55.1	55.9	56.8	56.0	52.0	52.0	38.9	38.9	40.2	38.9	38.9	38.9	38.9	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2
Net Present Value of depreciation allowances (%)	74.9	75.9	76.8	79.3	79.7	80.8	74.8	74.9	75.2	75.3	75.5	80.7	80.7	71.8	76.4	77.1	72.1	72.0	72.0	71.9	71.9	71.9

ITALY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Debt cost (%)	10.8	10.1	7.9	6.0	4.3	5.2	5.2	4.6	3.8	3.5	3.4	4.1	4.9	5.4	2.8	2.3	3.3	3.6	3.5	3.1	2.2	1.7
Equity cost (%)	14.0	11.6	8.8	6.3	6.4	7.1	7.1	7.9	7.5	7.3	6.8	7.5	7.8	10.1	9.4	7.7	10.1	10.3	8.0	5.9	4.7	5.4
Total debt / Liabilities (%)	55.6	53.7	49.7	45.6	41.4	41.2	44.3	45.8	47.2	45.2	42.3	40.5	44.5	47.5	50.6	52.6	54.0	52.7	49.6	48.7	46.6	47.0
Liabilities-weighted capital cost (%)	12.2	10.8	8.3	6.1	5.5	6.3	6.4	6.4	5.8	5.5	5.3	6.0	6.6	8.0	6.3	5.0	6.5	6.7	5.6	4.5	3.5	3.7
Depreciation rate (%)	6.8	7.5	7.7	7.7	7.9	8.0	8.0	8.1	8.1	8.1	8.1	8.2	8.2	8.1	8.1	8.2	8.3	8.3	8.4	8.5	8.6	8.7
Asset expected inflation rate (%, 5-year MA)	-2.4	-2.8	-2.3	0.0	0.3	2.3	2.2	2.3	2.0	2.2	1.9	1.9	1.8	2.3	1.9	2.0	2.1	1.9	1.3	1.3	0.9	0.4
Corporate income tax (%)	53.2	53.2	53.2	37.0	37.0	41.3	40.3	40.3	38.3	37.3	37.3	37.3	37.3	31.4	31.4	31.4	31.4	31.3	31.3	31.3	31.3	31.3
Net Present Value of depreciation allowances (%)	78.2	78.3	78.5	78.3	78.2	78.1	77.8	77.4	76.5	76.5	76.4	76.7	76.9	69.8	70.4	70.8	70.2	71.4	72.2	71.2	71.2	71.2

SPAIN	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Debt cost (%)	9.6	8.3	6.3	5.2	4.2	5.0	5.2	4.4	3.6	3.3	3.3	4.0	5.1	5.6	3.0	2.7	3.6	3.5	3.6	3.5	2.6	2.2
Equity cost (%)	15.0	12.0	9.0	6.8	6.9	7.5	7.2	7.4	7.4	6.9	6.3	6.6	7.1	8.6	9.9	9.5	13.1	12.8	9.4	7.8	6.9	5.7
Total debt / Liabilities (%)	51.5	47.9	44.8	39.3	38.9	42.8	44.8	49.1	47.4	47.3	48.1	50.0	52.4	59.9	58.4	58.3	57.4	55.2	50.5	49.0	46.2	45.1
Liabilities-weighted capital cost (%)	12.2	10.1	7.7	6.1	5.9	6.5	6.3	6.0	5.5	5.2	4.9	5.4	6.1	7.0	5.8	5.5	7.6	7.5	6.2	5.6	4.8	4.1
Depreciation rate (%)	6.5	6.6	6.6	6.8	7.0	6.9	7.0	7.0	7.1	7.2	7.1	7.1	7.0	6.9	6.8	6.8	6.9	7.0	7.0	7.1	7.1	7.2
Asset expected inflation rate (%, 5-year MA)	-0.2	-0.3	0.1	-0.2	-0.4	0.1	0.4	0.5	1.3	1.9	1.7	2.3	2.6	2.6	1.8	1.3	0.8	0.3	-0.3	-0.1	-0.3	-0.4
Corporate income tax (%)	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	32.5	30.0	30.0	30.0	30.0	30.0	30.0	30.0	28.0	25.0
Net Present Value of depreciation allowances (%)	74.3	63.6	64.7	67.7	67.9	69.0	67.8	66.6	66.4	66.3	66.2	66.3	66.8	67.4	67.5	69.4	75.1	75.5	76.7	76.5	76.5	76.5

UNITED STATES	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Debt cost (%)	7.6	7.4	7.3	6.5	7.1	7.6	7.1	6.5	5.7	5.6	5.2	5.6	5.6	5.6	5.3	4.9	4.6	3.7	4.2	4.2	3.9	3.7
Equity cost (%)	9.2	8.6	8.1	6.8	7.0	7.3	6.5	6.3	5.8	6.1	6.2	6.8	6.7	6.3	6.0	5.5	5.2	4.3	4.8	4.9	4.6	4.4
Total debt / Liabilities (%)	43.9	43.8	41.1	41.5	42.0	41.0	41.3	41.0	39.6	37.1	36.4	35.2	34.9	37.4	39.3	38.1	38.1	38.5	37.0	37.4	37.0	36.4
Liabilities-weighted capital cost (%)	8.5	8.1	7.8	6.7	7.0	7.4	6.7	6.4	5.8	5.9	5.8	6.3	6.3	6.1	5.8	5.3	5.0	4.1	4.6	4.6	4.3	4.1
Depreciation rate (%)	8.0	8.2	8.4	8.6	8.7	8.9	9.0	9.0	9.0	9.1	9.2	9.3	9.3	9.3	9.2	9.3	9.3	9.4	9.4	9.5	9.5	9.4
Asset expected inflation rate (%, 5-year MA)	2.0	1.6	1.0	1.0	1.0	0.8	0.5	0.5	0.5	0.5	0.9	1.7	2.1	2.6	2.1	1.4	1.1	1.0	0.6	1.1	1.2	0.9
Corporate income tax (%)	39.6	39.5	39.5	39.4	39.4	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.2	39.2	39.2	39.1	39.0	39.1	39.0	38.9
Net Present Value of depreciation allowances (%)	71.2	70.9	70.9	70.5	70.7	70.3	69.1	69.4	69.5	69.7	69.3	68.6	67.5	66.0	65.7	67.8	68.4	68.0	67.7	67.1	67.1	67.1

Sources and notes: The debt cost is the interest rate on new loans to NFCs over five years from ECB data, except for nonfinancial corporates in the US for which is used the yield on Moody's Aaa bond portfolio. The equity cost is the equity risk premium (dividend yield of the benchmark domestic stock exchange) plus a base rate (ten-year domestic sovereign bond yield). The capital cost is the debt cost and the equity cost weighted by the liability composition in the previous year of NFCs from Financial Accounts, whose data come from Eurostat for NFCs in Europe and from BEA for NFCs in the US. The initial value for the depreciation rate is obtained from a weighted-average of the depreciation rates across sectors and capital components akin to NFCs from KLEMS for each country. The weights are the nominal capital stocks across those sectors and capital components over the aggregate capital stock in 1995. The asset expected inflation is calculated as the five-year moving average of the realized annual growth rate of the investment deflator. Data on corporate income taxes come from the OECD Tax Database and calculations of the NPV of depreciation allowances for each country over time are derived from the US Tax Foundation and the Oxford University Centre for Business Taxation. We aggregate the information available for the NPV of depreciation allowances across capital assets using as weights the time-varying composition of nominal GFCF.

Data Appendix: Input Cost and Profit Shares

FRANCE	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital stock / GVA	2.0	2.1	2.0	2.0	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1
Pre-tax user cost of capital (%)	16.8	15.8	15.3	15.0	15.1	15.5	15.4	15.1	14.5	14.6	15.0	15.4	16.1	17.0	15.4	14.9	16.3	15.5	15.1	14.8	14.2	14.3
Capital share (%)	34.4	32.4	31.1	29.4	29.4	30.4	30.1	29.5	27.9	27.9	28.8	29.7	31.0	33.5	31.8	30.3	33.7	32.6	32.2	31.5	29.9	30.4
Labor share (%)	66.1	67.0	66.2	65.1	65.9	66.0	66.0	66.6	66.4	66.2	66.3	66.2	65.3	65.7	67.8	67.4	67.7	68.6	68.8	68.6	67.2	67.3
Profit share (%)	-0.5	0.6	2.7	5.5	4.7	3.6	3.9	3.9	5.7	5.9	4.9	4.1	3.6	0.8	0.4	2.2	-1.4	-1.2	-1.0	-0.1	2.9	2.4
GERMANY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital stock / GVA	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.0	1.9
Pre-tax user cost of capital (%)	13.1	12.8	13.4	14.1	14.8	15.9	15.3	15.3	14.5	14.0	14.0	14.3	14.7	15.2	13.5	12.6	13.0	12.1	12.0	11.5	10.9	10.8
Capital share (%)	28.5	28.7	30.7	31.8	33.3	36.5	34.5	34.4	32.5	30.8	30.8	30.2	30.5	32.0	30.2	26.9	27.3	25.5	25.1	23.3	21.4	21.1
Labor share (%)	62.5	62.3	61.0	59.8	60.9	61.1	59.4	58.9	58.9	57.6	56.6	55.1	53.8	55.3	58.1	56.8	56.9	58.7	59.0	58.7	58.6	58.8
Profit share (%)	8.9	8.9	8.3	8.4	5.8	2.5	6.1	6.7	8.6	11.6	12.6	14.7	15.7	12.7	11.7	16.3	15.8	15.8	16.0	18.0	20.0	20.1
ITALY	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital stock / GVA	2.6	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.6	2.7	2.7	2.7	2.8	2.8	2.8	2.6	2.5
Pre-tax user cost of capital (%)	22.7	22.4	19.9	14.4	13.8	12.8	13.0	13.1	12.8	12.3	12.5	13.3	13.9	15.0	13.6	12.3	13.9	14.1	13.7	12.7	12.3	13.4
Capital share (%)	58.5	52.2	45.9	34.2	32.8	30.5	30.5	31.5	30.9	29.7	30.5	33.0	34.7	38.2	36.5	33.2	37.9	39.8	38.2	34.8	32.6	33.8
Labor share (%)	48.9	48.9	49.4	49.7	50.5	49.6	49.5	50.2	51.2	51.2	52.2	52.8	53.2	54.0	56.2	56.0	56.3	57.6	57.6	57.4	57.3	56.8
Profit share (%)	-7.4	-1.1	4.7	16.0	16.8	20.0	19.9	18.3	18.0	19.1	17.3	14.2	12.1	7.8	7.3	10.8	5.8	2.6	4.1	7.8	10.1	9.4
SPAIN	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital stock / GVA	2.5	2.4	2.4	2.3	2.3	2.4	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.8	2.9	3.0	2.9	2.9	2.8
Pre-tax user cost of capital (%)	19.5	18.6	15.8	14.5	14.8	14.7	14.3	14.0	12.7	11.8	11.6	11.2	11.3	11.8	11.7	12.0	14.4	14.9	14.2	13.5	12.9	12.4
Capital share (%)	47.8	44.8	37.6	33.3	34.0	34.8	33.2	32.6	29.9	28.4	28.8	28.4	28.3	29.2	29.6	31.7	39.7	43.2	42.0	39.8	37.3	35.2
Labor share (%)	60.5	61.0	61.3	61.9	62.5	62.9	63.5	63.7	63.9	63.7	63.5	63.5	62.5	61.2	60.1	59.6	59.5	57.8	56.6	57.1	57.9	57.2
Profit share (%)	-8.3	-5.8	1.1	4.8	3.5	2.4	3.3	3.7	6.1	7.9	7.7	8.1	9.2	9.6	10.3	8.7	0.8	-0.9	1.4	3.1	4.8	7.6
UNITED STATES	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Capital stock / GVA	1.8	1.8	1.8	1.7	1.7	1.7	1.8	1.8	1.8	1.7	1.7	1.7	1.8	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.7	1.8
Pre-tax user cost of capital (%)	15.7	16.0	16.6	15.7	16.2	17.1	17.0	16.6	16.1	16.3	16.0	15.8	15.4	14.6	14.7	15.0	15.1	14.4	15.4	15.0	14.7	14.6
Capital share (%)	28.8	28.8	29.2	27.3	28.0	29.5	30.2	29.8	28.4	28.0	27.4	27.0	27.0	26.5	27.9	27.1	27.0	25.5	27.1	26.3	25.6	25.9
Labor share (%)	68.6	68.0	67.8	69.2	69.8	71.0	71.3	69.9	68.8	67.5	66.0	64.7	65.5	65.8	65.4	63.0	63.0	62.7	62.6	62.8	63.5	64.5
Profit share (%)	2.6	3.3	3.0	3.5	2.2	-0.5	-1.5	0.3	2.9	4.5	6.6	8.3	7.5	7.7	6.8	9.9	10.0	11.8	10.3	10.9	10.8	9.6

Sources and notes: Data from Sectoral National Accounts for NFCs in Europe come from Eurostat. Data for NFCs in the US come from BEA and it is considered corporate business and excluded noncorporate business. Series for 1995-1998 for NFCs in Spain are linked with those from Spanish Statistical Institute. The capital stock is constructed by the permanent inventory method. The pre-tax user cost of capital is the sum of the liabilities-weighted capital cost plus the depreciation rate minus the asset expected inflation, taking into account the tax effects of deductible debt interest payments and amortisations of invested capital. The labor share is the compensation of employees divided by the GVA. The capital share is the capital payments (pre-tax user cost of capital times capital stock) divided by the GVA. The profit share is the proportion of the GVA after deducting the labor and capital shares. In the calculation of GVA we include subsidies net of production taxes.

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