The Medium Run Revisited:

An Alternative Perspective on Labour Share Developments in European and Anglo-Saxon Countries

Abstract

This thesis revisits one of the most prominent contributions to the literature on labour income shares by Blanchard (1997) and offers an alternative perspective on the developments in European and Anglo-Saxon countries between 1970 and 2019. Labour shares in both groups of countries declined resulting from changes in relative factor prices and quantities. I find that changes in relative factor prices were mainly driven by profit rate dynamics in both groups of countries. My empirical analysis identifies technical change and bargaining power of workers as determinants. Based on the contrasting developments of these determinants in European and Anglo-Saxon countries, I develop my own assessment of relative factor price and labour share developments in both groups of countries.

Keywords: European, Anglo-Saxon, labour income share, factor prices, factor quantities

Gero Kunath

19940706-T432

First Year Master Thesis

School of Economics and Management

Supervisor: Karin Bergman

March 27, 2023

LUND UNIVERSITY

1 Introduction

"It was known for some time that the share of wages and the share of profits in the national income has shown a remarkable constancy in "developed" capitalist economies of the United States and the United Kingdom since the second half of the nineteenth century."
Kaldor (1957)

The above statement is known as one of the most popular stylized facts in macroeconomics. The shares of capital and labour in national income were assumed to be constant for decades. It thus came as a big surprise, when labour shares in numerous developed economies began to fall in the early 1980s. The phenomenon has gained widespread attention ever since and continues to fascinate research. Numerous researchers have tried to solve the puzzle. Potential explanations range from technical change over globalization to industry concentration and market power (Grossman and Oberfield, 2021), to name only a few. One of the most substantial contributions to this wealth of literature is Blanchard (1997)[1].
Blanchard made two major points in his analysis: First, labour income shares declined in European countries but remained largely stable in Anglo-Saxon countries. Second, European countries experienced shifts in relative factor prices and quantities driven by wage dynamics, while Anglo-Saxon countries did not.
In this thesis, I revisit Blanchard (1997) and check whether his analysis stands the test of time to then develop an alternative assessment of labour share developments in European and Anglo-Saxon countries between 1970 and 2019.
I observe that labour income shares in European countries, after their documented declines throughout the 1980s and 90s, stabilized over the last two decades. In contrast, the seemingly stable shares in Anglo-Saxon countries began to dwindle down around the turn of the millennium. I find that labour share dynamics are driven by an interplay of changes in relative factor prices and quantities in European countries, whereas they are predominantly driven by changes in relative factor prices in Anglo-Saxon countries. Decomposing relative factor price trajectories, I show that they are not only shaped by wage dynamics as suggested by Blanchard (1997) but mostly by profit rate dynamics and that

[1] At the time of writing this thesis, the paper has 1095 citations listed in Google Scholar.

this holds for both groups of countries alike. However, profit rates trended downwards in European countries, while they trended upwards in Anglo-Saxon countries. I therefore empirically investigate profit rates and find capital productivity and unemployment as their determinants. Based on different developments of these determinants in European and Anglo-Saxon countries, I develop my own assessment of labour share developments in both groups of countries as a tale of technical change and the bargaining power of workers.

This thesis is organized as follows. Section 2 provides a review of Blanchard (1997) to lay the foundation for my further analysis. Section 3 checks the central observations and hypotheses documented in Blanchard (1997) and explores relative factor prices and quantities in European and Anglo-Saxon countries between 1970 and 2019. Section 4 decomposes relative factor prices and identifies profit rates as driving force of relative factor prices in both groups of countries. Section 5 presents the empirical analysis of profit rates and their determinants in European and Anglo-Saxon countries. Section 6 discusses the results and provides an alternative assessment of labour share developments in both groups of countries. Section 7 concludes.

2 The Medium Run

Blanchard (1997) opens his analysis by pointing out the importance of the medium run perspective in macroeconomics. He claims that modern economies are mostly driven by medium run dynamics that are distinct from short run business cycle fluctuations and long run steady state growth. Blanchard motivates his claim with the following observations. Unemployment rates and capital income shares steadily increased (and likewise labour income shares decreased) in 'European' countries beginning in the 1980s, while remaining largely stable in 'Anglo-Saxon' countries. European countries comprise Australia, Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Spain and Sweden. Anglo-Saxon countries are Canada, the United Kingdom (UK) and the United States (US). Blanchard attributes these developments to so-called 'labor' shifts that affected European countries but refrained from Anglo-Saxon countries. In the 1970s, net increases in wages at given levels of unemployment and total factor productivity (TFP) that he labels 'labor supply' shifts, brought temporary decreases in capital shares in European

countries. Firms reacted and substituted labour with capital in production leading to an increase in unemployment and an increase in capital shares. In the 1980s, net decreases of wages at given levels of the labour-to-capital ratio and TFP that he labels 'labor demand' shifts, followed and brought further decreases in employment with both combined leading to increasing capital shares. Blanchard names two prime suspects for the net decreases in wages: a redistribution of rents from workers to firms and technological bias.
He suggests the interplay of these 'labor supply' and 'labor demand' shifts to have shaped the trajectories of factor income shares in European countries between 1970 and 1996. As these shifts were not present in Anglo-Saxon countries, their factor income shares remained largely constant.

Factor Quantities and Factor Prices until 1997

Blanchard inspects the developments of relative factor prices and quantities in both groups of countries between 1970 and 1996 by drawing on a simplistic model framework. Assuming constant returns to scale for both inputs labour and capital and assuming Harrod-neutral or labour-augmenting technical change, he defines a general production function:

$$y = y(zn, k), \tag{1}$$

where y is output, z is a technology parameter, n is labour and k is capital. Redefining labour in efficiency units $\tilde{n} = zn$, gives:

$$y = y(\tilde{n}, k). \tag{2}$$

Further assuming that labour is paid its marginal product, he defines the relationship between relative factor prices and quantities:

$$\frac{\pi}{\tilde{w}} = g(\frac{\tilde{n}}{k}), \tag{3}$$

where π is the profit rate, defined as profits divided by the capital stock in volume, and $\tilde{w} = w/z$ is the wage per efficiency unit. g is some function with $g' > 0$ such that an increase in the efficient-labour-to-capital ratio (henceforth only refered to as labour-to-capital ratio) raises the profit-to-efficient wage ratio (henceforth only refered to as

profit-to-wage ratio). The degree to which relative factor prices and quantities react to one another and how ultimately factor income shares respond, depends on the elasticity of substitution between labour and capital that in this framework can be defined as:

$$\sigma = \frac{d(\tilde{n}/k)}{d(\pi/\tilde{w})}. \tag{4}$$

In case $\sigma < 1$, i.e., in case of labour and capital being complements, an increase in the profit-to-wage ratio is not fully offset by an increase in the labour-to capital ratio.
In case $\sigma > 1$, i.e., labour and capital being substitutes, an increase in the profit-to-wage ratio is overcompensated by an increase in the labour-to-capital ratio.
If $\sigma = 1$, all relative factor price changes are fully offset by corresponding changes in relative factor quantities. The elasticity of substitution is hence closely related to (relative) factor income shares and their dynamics as becomes obvious, when rewriting them:

$$\frac{wn/y}{\pi k/y} = \frac{wn}{\pi k} = \frac{(w/z)zn}{\pi k} = \frac{\tilde{w}}{\pi}\frac{\tilde{n}}{k}. \tag{5}$$

Changes in (relative) factor income shares purely result from changes in relative factor prices and quantities that, in turn, are governed by the elasticity of substitution.
Blanchard's narrative of 'labor supply' and 'labor demand' shifts heavily depends on the assumption of an elasticity of substitution greater one or a structural break in the relationship between factor prices and factor quantities. He claims that firms reacted to the net increases in wages in the 1970s (the 'labor supply' shifts) by later substituting labour with capital and thereby implicitly assumes some degree of substitutability between the two factors. Only if $\sigma > 1$, this substitution and the associated decrease in the labour-to-capital ratio outweighs the increase in the wage-to-profit ratio such that the capital share increases as suggested by Blanchard. An alternative explanation is a fundamental shift in the relationship between relative factor prices and quantities.
Blanchard explores these options both graphically and empirically. He finds that in Anglo-Saxon countries both relative factor prices and quantities fluctuated around some constant level between 1970 and 1996. In European countries, the profit-to-wage ratio decreased throughout the 1970s due to the net increase in wages (the 'labor supply' shifts) accompanied by a decrease in the labour-to-capital ratio. From the 1980s onwards, the profit-to-wage ratio recovered due to net decreases in wages (the 'labor demand' shifts),

however, accompanied by a further decrease in the labour-to-capital ratio. This raised the European capital income shares (and depressed the labour shares) and could be explained by a shift towards an elasticity of substitution greater one or a fundamental break in the relationship between relative factor prices and quantities. Blanchard estimates the elasticities of substitution for European and Anglo-Saxon countries and finds them both to be close to one such that relative factor income shares should be prone to changes in relative factor prices and quantities. A closer look at relative factor prices in European countries shows that the profit-to-wage ratio first decreased during 1970s and then increased during the 1980s and 90s more than expected given the development of relative factor quantities. Blanchard hence suspects that the relationship between relative factor prices and quantities fundamentally changed and names two prime suspects for this: shifts in the distribution of rents from workers to firms or technical change that favors capital over labour. The redistribution hypothesis assumes that there is an imbalance between the marginal product of labour and the real wage. In this setting, the marginal product of labour is equal to the real wage and some markup. At a given factor quantitity ratio and hence a given marginal product of labour an increase in the markup decreases the real wage such that the profit-to-efficient-wage ratio increases as observed in European countries. Blanchard suggests changes in the wage-setting in labour markets such as shifts in the bargaining power of firms and workers or deunionization that leads to cuts of excess employment to be behind this. The technological bias hypothesis assumes that gradual adoption of technologies that favor capital over labour increased the profit-to-wage ratio in European countries. Assuming that the adopted technologies use more and more capital but less labour such that at a given labour-to-capital ratio the marginal product of labour is lower, this implies a lower wage and hence a higher profit-to-wage ratio.

The Model

Blanchard sets up a model to formally illustrate his hypotheses and to lay the foundation for his further empirical analysis. Firms compete monopolistically, they employ labour n and they are endowed with one fixed unit of capital. The general production function for an individual firm hence is:

$$y = f(n, 1). \tag{6}$$

Blanchard assumes symmetric firms and hence n denotes not only employment, but also

the aggregate labour-to-capital ratio. He further assumes market entry and exit of firms such that the number of firms in the economy determines aggregate capital. Firms face inverse demand for their good given by:

$$p = (\frac{y}{\bar{y}})^{-\gamma} \quad \text{with} \quad 0 \leq \gamma < 1, \tag{7}$$

where p is the relative price charged by the firm depending on its output y relative to the average output level $\bar{y}$ and on the inverse elasticity of demand γ. The resulting markup charged by each firm is given by $\mu = 1/(1-\gamma)$.

Firms face costs for adjusting their labour force (and equivalently for adjusting the aggregate labour-to-capital ratio) given by $(c/2)(dn/dt)^2$ with c being some parameter. Furthermore, firms face a constant probability of 'death' or market exit δ, a real interest rate r, and a real wage w. Firms choose employment n to maximize their value v (at t=0):

$$max_n\, v = \int_0^x e^{-\int_0^t (r_s+\delta)\, ds} [\pi_t - (\frac{c}{2})(\frac{dn}{dt})^2]\, dt, \tag{8}$$

with profits given by $\pi = py - wn$. Symmetry implies that all firms charge the same price and hence a relative price level of $p = 1$. The relevant first order conditions are:

$$\frac{dn}{dt} = (\frac{1}{c})q \tag{9}$$

$$\pi_n = (\frac{1}{\mu}) f_n(n, 1) - w. \tag{10}$$

Equation (9) shows that the adjustment of employment and hence the adjustment of the labour-to-capital ratio depends on the inverse of adjustment costs parameter c and the present value of marginal profits q. Equation (10) shows that marginal profit π_n depends on the marginal revenue product of labour given by the inverse of the markup times the marginal product of labour minus the real wage.

In the long run, it holds that the marginal product of labour equals the markup and the real wage:

$$f_n(n^*, 1) = \mu w^*, \tag{11}$$

with * indicating steady state values. The condition illustrates how an increase in the markup affects the real wage and ultimately the labour income share. The markup can

be thought of as a tax on the marginal product of labour that is collected by the firm. A higher markup incentivizes firms to choose a lower level of employment that raises the marginal product of labour but lowers the labour-to-capital ratio.

Aggregate capital accumulation in the economy is subject to entry and exit of firms as mentioned before. Slow adjustment of the capital stock is modeled via adjustment costs for capital. These are defined by the relative price of capital that is given by:

$$p_k = 1 + h\frac{dK}{dt}, \tag{12}$$

where h is some parameter and dK/dt denotes the change in aggregate capital stock which is subject to entry and exit of firms. Free entry and exit of firms implies:

$$v = p_k. \tag{13}$$

The value of a firm must equal the relative price of capital, i.e., the cost for the unit of capital needed to produce output. For simplification, Blanchard assumes firms entering the market have the same labour-to-capital ratio as those already in the market. This precludes the entry and exit mechanism from affecting relative factor quantities over time. The change in the value of a firm is given by:

$$\frac{dv}{dt} = (r + \delta)v - [\pi - (\frac{c}{2})(\frac{dn}{dt})^2]. \tag{14}$$

In steady state, all endogenous variables are stable such that $dv/dt = dn/dt = dK/dt = 0$. $dK/dt = 0$ implies for equation (12) that the relative price of capital in steady state equals one and hence firms enter the market if their value is greater than one. Using dv/dt and dn/dt being equal to zero and using equation (13) as well as $v = p_k = 1$ simplifies equation (14) to:

$$\pi^* = p_k^*(r + \delta) = (r + \delta). \tag{15}$$

The equation shows that in steady state the return on each unit of capital is equal to its user cost. This fully specifies all demand side dynamics. Blanchard then turns to the supply of labour and capital. Labour supply is implicitly defined by:

$$w = \theta(\frac{N}{\bar{N}})^\beta, \tag{16}$$

with $N/\bar{N}$ being the ratio of aggregate employment $N = nK$ to the labour force $\bar{N}$, β being the elasticity of wage with respect to employment and θ being a constant. The rental rate r is given exogenously implying that the profit per unit of capital as defined in equation (15) is stable around $r + \delta$ and that the long-run supply curve of capital is infinitely elastic.

Simulation Results and Empirics

In a next step, Blanchard simulates his model to analyze the effects of 'labor supply' shifts, of changes in the distribution of rents and of technological bias. He defines a CES production function:

$$y = A[(1-a)n^{\frac{\sigma-1}{\sigma}} + a]^{\frac{\sigma}{\sigma-1}}, \tag{17}$$

where A is TFP, a and $(1-a)$ are share parameters and $\frac{\sigma-1}{\sigma}$ is a substitution parameter. The baseline elasticity of substitution is set to 1.0, but Blanchard also considers an elasticity of substitution of 2.0. The latter allows to illustrate how net wage increases lead to raising capital shares. First, Blanchard simulates a 'labor supply' shift, i.e., a net wage increase modeled as an increase in θ in equation (16). The impulse response functions (IRFs) suggest that the effects of a 'labor supply' shift are to some degree in line with observed labour share developments in European countries. The wage increase triggers an initial drop in the profit rate consistent with falling profit-to-wage ratios during the 1970s. The labour-to-capital ratio falls as firms substitute labour with capital and recovers only slowly. The profit rate and the profit-to-wage ratio recover more quickly as observed during the 1980s. The effect of these developments on the factor income shares largely depends on the elasticity of substitution. For an elasticity of substitution equal to one, the changes in the profit-to-wage ratio and in the labour-to-capital ratio fully offset each other bringing the capital share back to its initial, constant level. For an elasticity of substitution equal to two, the changes in the labour-to-capital ratio outweigh the changes in the profit-to-wage ratio leading to a slight, permanent increase in the capital share above its initial level.

Second, Blanchard simulates an increase in the markup μ as in equation (11) that can be interpreted as an increase in the imbalance between the marginal product of labour and the real wage resulting from, e.g., declining market power of workers. The IRFs for the markup change show dynamics that match labour income share developments in European

countries. As shown for equation (11), the increase in the markup lowers employment, thereby raises unemployment and triggers a pronounced and permanent decrease in the labour-to-capital ratio. Moreover, the wage rate falls and the profit rate rises causing a hike in the profit-to-wage ratio. The higher profit rate triggers entry of firms into the market. Unemployment recovers as the entry of new firms overcompensates the loss of employment in firms already in the market. Over time, free and entry and exit implies that the wage and the profit rate as well as employment and unemployment should return to their initial values. The labour-to-capital ratio, however, remains persistently lower at any given wage rate. In sum, the capital share increases and vice versa the labour share decreases. These dynamics hold for both values of the elasticity of substitution.

Third, Blanchard simulates capital-biased technical change as an increase in the share parameter a in equation (17). The IRF reveals dynamics nearly identical to those stemming from an increase in the markup μ. Accordingly, the effects on (relative) factor prices and (relative) factor quantities are nearly identical.

Blanchard concludes from his simulation results that markup changes resulting from a shift in bargaining power between workers and firms and capital-biased technical change are probable drivers of raising capital shares (and declining labour shares) in European countries. He also points out the difficulty of disentangling these two hypotheses.

In a next step, Blanchard brings his model to the data for selected countries, most detailed for France from 1970 to 1996. He constructs empirical series for the 'labor supply' and 'labor demand' shifts and for the user cost of capital. First, the model is simulated considering only shifts in 'labor supply' and in the user cost of capital. Again, he considers elasticities of substitution equal to one and equal to two. These two dynamics allow the model to mimic the fall of the capital share until the mid 1980s quite well, but fail to explain its increase in the following decade. In contrast, the simulation shows a rebound of the capital share to its 1970 level. Only when additionally including 'labor demand' shifts, the model fully fits the data. The simulation supports Blanchard's narrative of 'labor supply' shifts as driving force behind the decreases in capital shares from 1970 to the mid 1980s and of 'labor demand' shifts as driving force behind increases in capital shares from the mid 1980s to 1996. Further simulations for a number of European and Anglo-Saxon countries validate this narrative despite some cross-country variation in the performance of the model. Blanchard thus empirically explores the potential causes of

the 'labor demand' shifts, namely capital-augmenting technological bias and shifts in the distribution of rents from workers to firms. His results hint towards technological bias but do not allow for a decisive conclusion.

Blanchard closes his analysis by reinforcing the importance of 'labor supply' and 'labor demand' shifts in explaining the developments of factor income shares in European countries and by pointing out that these shifts were absent in Anglo-Saxon countries. He gives an outlook and predicts that - assuming no further 'labor demand' shifts to occur - labour-to-capital ratios should recover. He does not provide an outlook for the developments of factor income shares.

In sum, Blanchard (1997) provides valuable observations and hypotheses for the developments of factor income shares in European countries. The model captures his central observations and its simulation illustrates the effects of markup changes and of capital-biased technical change. However, the paper falls short of providing conclusive evidence for one of the two hypotheses and can not explain what lies at the root of the two phenomena. Moreover, it solely focuses on European countries.

In the following section, I will show that much has happened since 1997 and that many of the observations that Blanchard builds his analysis do not stand the test of time.

3 The Medium Run Revisited

Labour Shares, Factor Quantities and Factor Prices

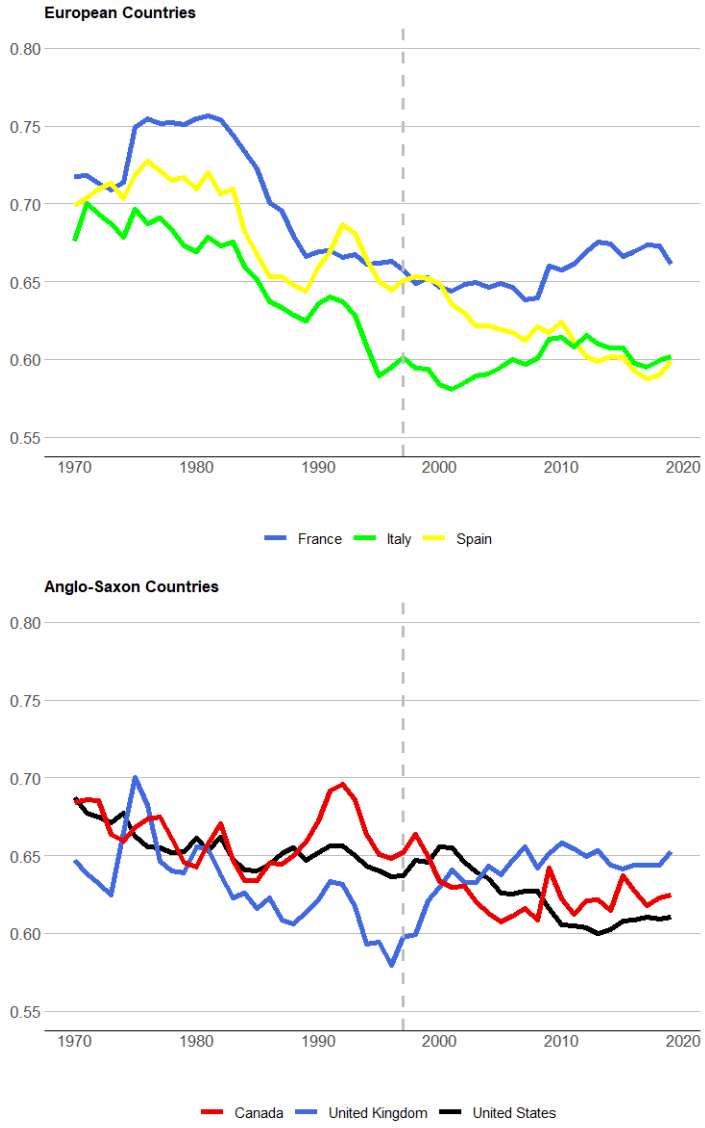
Blanchard builds his analysis on his observation of declining labour shares in European countries in contrast to constant labour shares in Anglo-Saxon countries.

Figure 1 plots the labour income shares of selected European and Anglo-Saxon countries between 1970 to 2019. I differ in my definition of European countries from Blanchard (1997) in two cases: I do not include Australia as I see no reason for it being a European country and I do not include Germany as there is no consistent data available due to the reunification. Figure 1 plots the same[2] limited set of European countries as in Blanchard (1997) since France, Italy and Spain not only constitute the three largest economies among my observed European countries but their trajectories are also largely representative for

[2]Apart from Germany due to aforementioned reasons.

other countries in this group[3]. Data is taken from the AMECO database of the European Commission's Directorate General for Economic and Financial Affairs as it provides the most comprehensive and most consistent data for all relevant measures for all observed countries for the largest time span. The measure of the labour income share is the adjusted wage share as percentage of GDP at current factor cost (ALCD2)[4]. The dotted vertical lines in the plots indicate the year 1997.

Figure 1: Labour Income Shares in Selected European and Anglo-Saxon Countries, In Percent, 1970 - 2019



Source: AMECO (2022)

[3]Belgium is a notable exception as labour income shares here increased during the 1970s and remained stable around this elevated level ever since.

[4]The measure is also available for GDP at market prices, but GDP at factor cost is net of taxes and is thus the more approriate measure as it does not confuse taxes with return to capital or land (Guerriero, 2019).

The developments of labour shares cast doubt on Blanchard's sharp distinction between declining labour shares in European countries on the one hand and constant labour shares in Anglo-Saxon countries on the other hand. As in France and Italy, labour income shares in most European countries[5] rose in the mid 1970s and started to dwindle down in the mid 1980s until the early to mid 1990s. Since then, they remained largely stable. Only in Spain and Ireland, the share continued to trend downwards over the last two decades. The developments in Anglo-Saxon countries were a little more ambiguous. In the US, the share slightly decreased during the 1970s and remained stable around that lowered level throughout the 1980s and 90s. It then substantially contracted over the 2000s to its historical trough in the early 2010s around which it hovered for the rest of the decade. In Canada, the labour income share also slightly decreased during the 1970s and remained stable around that lowered level over the following decade. The share then sharply rose to its historical peak around the early 90s followed by a period of pronounced contraction, reaching its low in the late 2000s. It then slightly recovered over the last decade. In the UK, the labour income share followed a trajectory similar to that of European countries with a sudden hike in the mid 1970s followed by a steady decline throughout the 1980s and 90s and a recovery back to its initial level over the last two decades.
I conclude that even though European countries uniformely exhibited more pronounced declines than the US or Canada between 1970 and 1997, the latter are not fully shielded from them but were only affected at later points in time.

Figure 2 plots relative factor prices and quantities for both groups of countries to shed light on the mechanisms behind the observed labour share developments. Again, all data is taken from the AMECO database.
I construct the measures for both factor ratios in line with Blanchard (1997) to allow for comparability. Both factor ratios are therefore adjusted by some measure for technology and expressed in efficiency units. While Blanchard constructs this measure by dividing the Solow residual by the contemporanous labour share and by integrating it over time, I use the labour share in total factor productivity (ZVDGE) as provided by the AMECO database. It is calculated as GDP in volume divided by total employment to the power of the share of labour remuneration in output. I then construct the factor ratios as follows. For the labour-to-capital ratio $\frac{\tilde{n}}{k}$, I take the aggregate capital intensity measure con-

[5]Namely Austria, Denmark, Netherlands and Sweden.

structed as net capital stock at constant 2015 prices per person employed (RKNDE), divide it by the labour share in TFP and then invert the series.

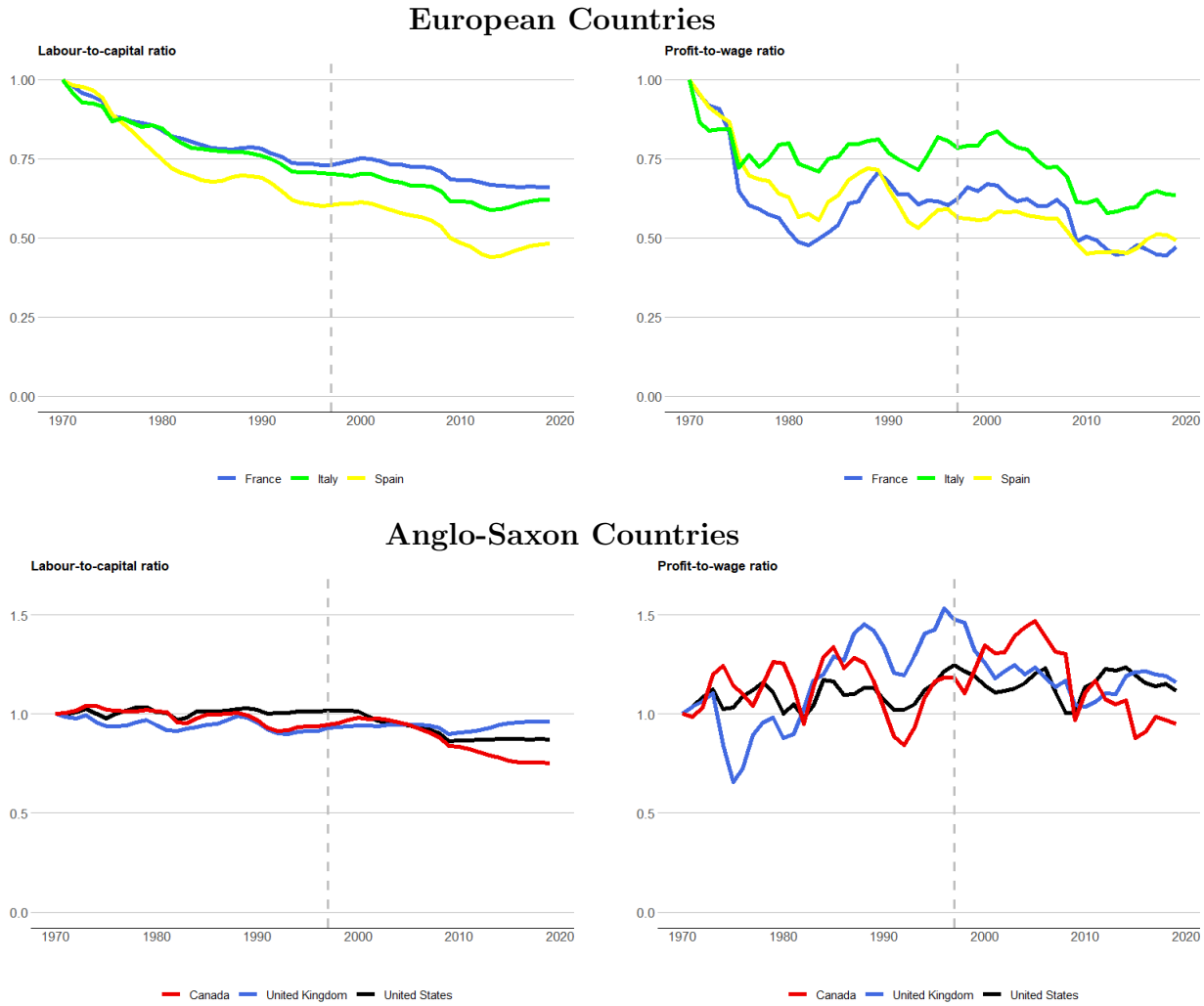
For the profit-to-wage ratio $\frac{\pi}{\tilde{w}}$, I first construct both factor prices separately and then calculate their ratio. Blanchard defines the wage in efficiency units as real product wage divided by his measure of productivity. I first construct the real product wage by taking the nominal compensation per employee in local currencies (HWCDW) and by dividing it with the according GDP deflator (PVGD) to express it in constant 2015 prices. I then divide the real product wage by the labour share in TFP to get the wage in efficiency units.

The profit rate is defined by Blanchard as profit divided by the capital stock in volume but no further information on the data used for the analysis is given. I therefore construct the profit rate as net operating surplus (UOND) divided by the net capital stock (OKND). Both measures are in local currencies but the former is in current prices while the latter is in constant 2015 prices. Hence, I adjust the net operating surplus to constant 2015 prices using the GDP deflator, before dividing it by the net capital stock to ultimately get the profit rate. Finally, I divide the profit rate by the efficient wage to construct the profit-to-wage ratio.

The plots reveal contrasting developments of relative factor prices and quantities in European and Anglo-Saxon countries. European countries uniformely experienced pronounced declines in relative factor prices and quantities over the observation period. Between 1970 and the mid 1980s profit-to-wage ratios fell substantially and labour-to-capital ratios started to trend downwards. However, the declines in profit-to-wage ratios were more pronounced than those in labour-to-capital ratios such that overall labour income shares rose. In the mid 1980s, profit-to-wage ratios recovered but labour-to-capital ratios continued to decline bringing the overall declines in labour income shares in the second half of the decade. Throughout the 1990s, the profit-to-wage ratios remained largely stable, before trending down again from the mid to end 2000s onwards.

The decreasing profit-to-wage ratios combined with the decreasing labour-to-capital ratios stabilized labour income shares in European countries over the last two decades.

Figure 2: Relative Factor Prices and Quantities in Selected European and Anglo-Saxon Countries, 1970 - 2019, Index 1970 = 1



Source: measures constructed from AMECO (2022) data

The developments in Anglo-Saxon countries were vastly different. Here, relative factor prices fluctuated pronouncedly while relative factor quantities remained largely stable for most of the observation period. In the US, the profit-to-wage ratio moderately fluctuated around a slight upward trend standing above its 1970 level for the full observation period. The labour-to-capital ratio hovered around its initial level, before a moderate but steady decline since the turn of the millennium. In Canada, the profit-to-wage ratio fluctuated more pronouncedly but largely remained around its 1970 level until the early to mid 1990s. It then sharply increased until the mid 2000s before dwindling down over the following years. The labour-to-capital ratio remained largely stable until the early 2000s when it began to trend downwards. In the UK, the profit-to-wage ratio dropped sharply

in the mid 1970s before trending upwards until peaking in the late 1990s and trending downwards ever since. The labour-to-capital ratio remained stable around its 1970 level over the whole observation period.

In sum, Figure 2 shows that the drivers of labour share dynamics largely differ between the two country groups. European labour share developments are driven by an interplay of relative factor prices and quantities while Anglo-Saxon labour share developments are predominantly driven by relative factor prices for most of the time.

A thorough analysis of the relationship between relative factor prices and quantities is hence crucial. The elasticity of substitution measuring changes in relative factor quantities relative to changes in relative factor prices here is a valuable indicator. I estimate it via the following panel regression similar to that in Blanchard (1997) using pooled OLS for both European and Anglo-Saxon countries:

$$\text{price pratio}_{it} = \gamma \text{ quantitiy ratio}_{it} + \epsilon_{it}, \tag{18}$$

where price ratio$_{it} = log(\frac{\pi_{it}}{\tilde{w}_{it}})$ is the logarithm of the profit-to-wage ratio and quantity ratio$_{it} = log(\frac{\tilde{n_{it}}}{\tilde{k}_{it}})$ is the logarithm of the labour-to-capital ratio for country i at time t[6].

The parameter γ can be interpreted as the inverse of the elasticity of substitution and vice versa its inverse can be interpreted as the elasticity of substitution. I used the full sets of European and Anglo-Saxon countries as in Blanchard (1997)[7] to allow for comparability. I truncate the sample in 2019 to avoid potential distortive effects of the COVID-19 pandemic and to get balanced panels.

Table 1 reports the results for three different sample periods.

The estimates are highly significant as indicated by the p-values in parantheses. All estimates are greater than one suggesting the elasticities of substitution to be lower than one. The implied elasticity of substition over the full sample period is 0.9 for European countries and 0.83 for Anglo-Saxon countries. The split of the full sample into pre and post 1996 samples does not reveal any substantial level shift between the two observation periods. In sum, the estimates suggest that the relationship between relative factor prices and relative factor quantities is fully intact over the observation period and is characterized

[6]Note that the regression equation is derived from the definition of the elasticity of substitution given in equation (4).

[7]Except for Australia and Germany due to aforementioned reasons.

by an elasticity of substitution smaller than one.

Table 1: Estimates of Inverse Elasticities of Substitution in European and Anglo-Saxon Countries, 1970-2019

Group of countries	**Full sample**	**Pre 1996**	**Post 1996**
European	1.11	1.07	1.17
	(0.00)	(0.00)	(0.00)
Anglo-Saxon	1.20	1.35	1.16
	(0.00)	(0.00)	(0.00)

Source: own calculations based on measures constructed from AMECO (2022) data

Running the regression for each country individually using OLS reveals some heterogeneity among the estimates. Table 2 reports the results with p-values in parantheses. For European countries, a slight majority of the significant estimates for European countries exceeds unity when running the regression over the full sample. The estimates range from 0.57 (for Austria) to 1.79 (for Denmark) implying that the elasticities of substitution fall between 0.56 and 1.75. For the pre 1996 sample, most of the significant estimates exceed unity while some fall below. Overall, estimates range from 0.40 (for Italy) to 1.80 (for Denmark) and hence the elasticities of substitution range from 0.56 to 2.5. For the post 1996 sample, the significant estimates are overall higher, with 0.86 (for Spain) being the only outlier below unity. All others exceed unity, with 3.82 (for Sweden) being the upper limit. The implied range for the elasticities of substitution here is between 0.26 and 2.38. In sum, there is an observable pattern of overall lower elasticities of substitution in the post 1996 period in number and in magnitude. This observation may partly be behind the recovery in labour income shares in European countries in the past two decades.
For Anglo-Saxon countries, the majority of full panel estimates is not significant. The only reliable estimate is 0.69 (for Canada) implying an elasticity of substitution of 1.45. For the pre 1996 sample both significant estimates (for Canada and the US) exceed unity with implied elasticities of substitution of 0.58 and 0.40. For the post 1996 sample, all estimates are significant and range between 0.36 (for the US) and 2.18 (for the UK) implying the elasticities of substitution to lie between 0.46 and 2.78. The estimates do not reveal a clear pattern for the developments of elasticities of substitution in Anglo-Saxon countries. In Canada, the elasticity of substitution appears to be largely stable over the

observation period. In the US, it exhibits a pronounced shift from below unity pre 1996 to above unity post 1996.

Table 2: Regression of factor prices on factor quantities by country

	Full sample	**Pre 1996**	**Post 1996**
European			
Austria	0.57	1.00	2.04
	(0.00)	(0.00)	(0.00)
Belgium	1.38	1.40	0.29
	(0.00)	(0.00)	(0.64)
Denmark	1.79	1.80	1.30
	(0.00)	(0.00)	(0.01)
France	1.40	1.40	2.99
	(0.00)	(0.00)	(0.00)
Ireland	0.35	0.60	1.08
	(0.35)	(0.01)	(0.04)
Italy	0.66	0.40	1.82
	(0.00)	(0.00)	(0.00)
Netherlands	-0.23	0.12	1.11
	(0.51)	(0.77)	(0.00)
Spain	0.84	0.96	0.86
	(0.00)	(0.00)	(0.00)
Sweden	1.04	0.47	3.82
	(0.00)	(0.02)	(0.00)
Anglo-Saxon			
Canada	0.69	1.73	1.30
	(0.00)	(0.00)	(0.00)
United Kingdom	-0.08	-0.61	2.18
	(0.93)	(0.67)	(0.02)
United States	-0.06	2.47	0.36
	(0.62)	(0.00)	(0.05)

Source: own calculations based on measures constructed from AMECO (2022) data

While conceptually correct, the framework is very simplistic and the estimates should be treated with caution and compared to other findings in the literature.

Mallick (2012) estimates a normalized CES production function for a sample period from 1950 to 2000 and provides estimates of σ for numerous countries. All estimates for the countries of interest, except for the UK, are statistically significant at least at the 5 percent significance level. When compared to the estimates from the pre 1996 sample, they are considerably lower except for the US and less than one except for Sweden. The results suggest that the elasticities of substitution in both European and Anglo-Saxon countries do not exceed unity.

However, the study only considers data up to the year 2000 and does not allow for a conclusion about potential shifts in the elasticities of substitution towards values above unity over the past two decades such as that observed for the US.

Knoblach et al. (2020) provide estimates of σ from a meta-regression of 77 studies published between 1961 and 2017 for the US. The aggregate long-run estimates range between 0.45 and 0.87, while the short-run estimates range 0.16 to 0.19 lower. My estimates for the US might hence be spurious.

The most recent and most comprehensive contribution to the literature by Gechert et al. (2022) covering 3,186 estimates from 121 studies lends additional strong support that overall elasticities of substitution indeed fall below unity. One of the most popular contributions to the literature that finds estimated elasticities of substitution well above unity is Piketty (2013). However, his estimates are outliers within the literature and have been repeatedly criticized and even been refuted (Raval, 2017; Semieniuk, 2017).

The literature on the estimation of elasticities of substitution exhibits substantial heterogeneity with respect to methodologies and results and is by no means unambiguous. However, the majority of studies point towards values below unity. Most of my estimates are in line with the literature and I therefore conclude that elasticities of substitution in both European and Anglo-Saxon countries fall below unity and that labour and capital are complements. This implies that labour income shares react to changes in relative factor prices and quantities which is at odds with Blanchard (1997) and his estimates close to unity that imply little to no reaction of factor income shares to changes in relative factor prices or quantities.

Reconciling the findings presented in this section is crucial in order to solve the puzzle.

4 Solving the Puzzle

The three central findings of the previous section can be summarized as follows:

European and Anglo-Saxon countries exhibit periods of declining labour shares
However, at different points in time. While labour shares in European countries as well as in the UK uniformely declined during the 1980s, they only started to decline in the 1990s in Canada and in the 2000s in the US (see Figure 1).

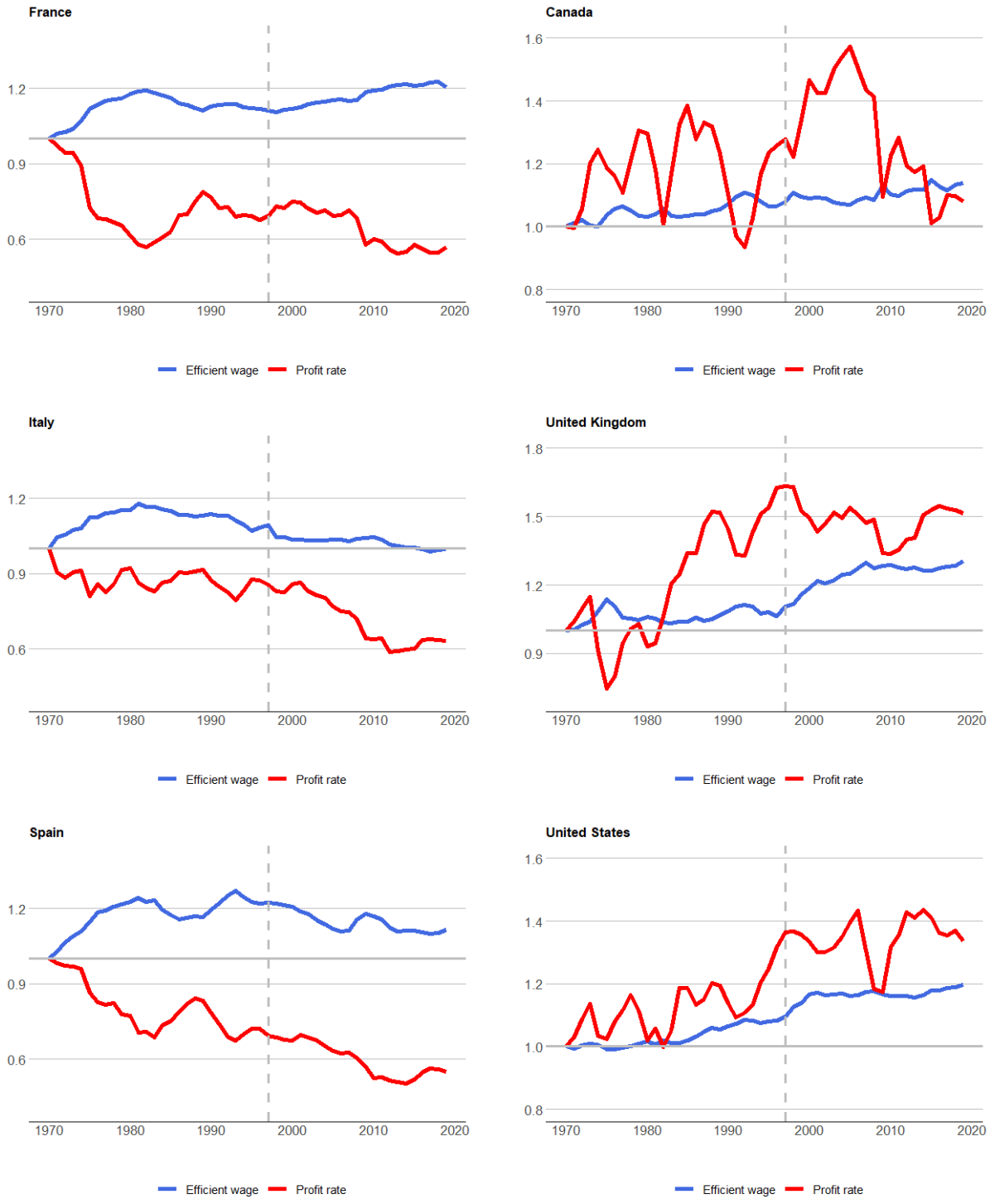
Labour share dynamics differ between European and Anglo-Saxon countries
While labour shares are driven by an interplay of relative factor prices and quantities in European countries, they are predominantly driven by relative factor prices in Anglo-Saxon countries (see Figures 1 and 2).

Labour shares should reflect changes in relative factor prices and quantities
Elasticities of substitution in both groups of countries fall below unity. Factor income shares should thus reflect the interplay of changes in relative factor prices and quantities (see Tables 1 and 2).

I discuss and reconcile these findings to motivate my further empirical analysis.
To make sense of the first finding, one could fall back on 'labor supply' and 'labor demand' shifts as in Blanchard (1997). One could argue that the 'labor demand' shifts of the 1980s faded and hence labour income shares in European countries stabilized over the past two decades. One could then argue that 'labor demand' shifts arrived with a lag in Canada and the US and brought the observed declines of the 1990s and 2000s. While this is tempting, it is probably not true.

Figure 3 disentangles profit-to-wage ratios for selected European and Anglo-Saxon countries. Again, the selected European countries are largely representative for other countries within in the group. In both groups of countries, relative factor price developments are predominantly driven by profit rates and not by wages. However, in most European countries profit rates markedly decreased while they substantially increased in Anglo-Saxon countries between 1970 and 2019.
As in France, wages trended upwards over the full observation period in Austria, Belgium, Denmark and Sweden. As in Italy and Spain, wages in Ireland and the Netherlands first increased but contracted again at later points in time.

Figure 3: Efficient Wages and Profit Rates in Selected European and Anglo-Saxon Countries, 1970 - 2019, Index 1970 = 1



Source: measures constructed from AMECO (2022) data

However, in most countries[8] profit rates decreased much more than wages increased.

[8]In Ireland profit rates substantially increased between 1970 and 2019. In the Netherlands they remained largely stable.

The overall decreasing profit-to-wage ratios in European countries hence primarily resulted from decreasing profit rates and not from increasing wages.
In Anglo-Saxon countries, the developments were substantially different. Here, both factor prices trend upwards over the whole observation period. Wages exhibit a stable and pronounced upward trend in all three countries. Profit rates fluctuate considerably but overall increase more than wages putting slight downward pressure on profit-to-wage ratios. Again, profit rates explain the bulk of the observed developments in relative factor prices.
To conclude, wage dynamics such as 'labor suppply' and 'labor demand' shifts tell only a minor part of the story. The major part is told by profit rates. Understanding profit rates and their contrasting dynamics in European and Anglo-Saxon countries is a major piece to solving the puzzle and at the center of my further empirical analysis.

The second finding could be explained by differences in the levels of elasticities of substitution in European and Anglo-Saxon countries. An elasticity of substitution close to zero implies little reaction of relative factor quantities to changes in relative factor prices, while a value close to one (or above) implies a more pronounced reaction. The former fits the developments in Anglo-Saxon countries until the turn of the millennium, while the latter matches those in European countries and in Anglo-Saxon countries since the 2000s. Drawing on my results presented in Tables 1 and 2, I can not find a distinct difference in levels between the two groups of countries. Reviewing the literature on estimated elasticities of substitution also yields mixed evidence and does not allow for a final conclusion. I do not investigate this finding in my further analysis as I suspect the previous one to offer more valuable insight.
While I can not explain why relative factor quantities react differently to changes in relative factor prices in European and Anglo-Saxon countries, I can nonetheless conclude with my third finding: they should react to each other and their interplay should affect labour shares in both groups of countries.
In sum, declining labour shares reflect changes in relative factor prices and quantities that, in turn, are mainly driven by profit rate dynamics.

5 Developments in Profit Rates

In this section, I analyze the dynamics of profit rates in order to understand the observed developments in relative factor prices. This will bring me closer to understanding the observed developments in labour shares. I shortly put my findings of decreasing European profit rates in contrast to inreasing Anglo-Saxon profit rates into perspective, before setting up my empirical framework.

The economics of profit rates are extensively studied throughout different periods of time and different schools of thought.

Tomasson and Bezemer (2010) provide a review of the literature and conclude the following. Classical economists assumed that pure profits do not exist and hence profit rates should not exist. Karl Marx later wondered how capitalists were able to extract more money from their undertakings than they invested and thereby brought up the 'Profit Puzzle'. He also prominently suggested a tendency of the profit rate to fall in capitalist economies. Some of the great economists such as Schumpeter and Keynes acknowlegded the 'Profit Puzzle' but failed to solve it. Neoclassical economists later largely neglected the paradox again.

Kaldor (1957) contributed to the literature and famously stated stability of the profit rate as one of his 'stylized facts', assuming away any major dynamics.

The theoretical debate is far from settled and there is no consensus on neither the direction of the trend nor on potential determinants of profit rates.

I thus focus on empirical findings and shortly summarize some of the more recent research on the topic to put my findings into perspective and to motivate the setup of my own empirical analysis.

Basu and Manolakos (2013) and Duménil and Lévy (2002) both investigate profit rate developments in the US between the late 1940s and the early 2000s.

Basu and Manolakos (2013) find a decline in the US profit rate and estimate an annual decrease of 0.2 percent over the full observation period. However, they point out that the profit rate exhibits periods of both boooms and busts. They identify overpopulation and exploitation to positively affect profit rates and net wage increases as well as the price of capital to negatively affect them. Moreover, they point out that factors that positively affect profit rates could drive them upwards if they are strong enough.

Duménil and Lévy (2002) also observe periods of booms and busts in profit rates that are largely driven by according developments in capital productivity.
Trofimov (2017, 2022) finds that profit rates in OECD countries can both decrease and increase over time and exhibit various patterns ranging from trends over random walks to stability. He identifies trade surpluses and bugdet deficits as potential drivers of profit rates.
In sum, my contrasting findings of decreasing profit rates in European countries and of increasing profit rates in Anglo-Saxon countries fit somewhat perfectly into the literature.

In the following, I analyze determinants of profit rates in European and Anglo-Saxon countries in the period between 1970 and 2019 using time series analysis and panel regression.
My variable selection is based on Grossman and Oberfield (2021) and their review of the literature on declining labour shares. The suggested determinants include technical change, globalization and the rise of China, increased product market power, declining market power of workers and demographics and education. All these determinants are likely not only associated with labour shares but also with profit rates and are thus a reasonable choice. It must be noted that Grossman and Oberfield (2021) conclude that the literature explains declines in labour shares many times over and that many of the suggested determinants are only proximate and not fundamental causes and that their effects are hard to disentangle. I am not able to resolve this problem with my analysis. However, I take it into account by including only a selected number of variables to avoid overfitting my analysis and to avoid multicolinearity. Table 3 summarizes my choice of variables and their measurement.

Table 3: Measures of Potential Determinants of Profit Rates and Labour Shares

Determinant	Proxy	Measure
Technical Change	Capital productivity	Capital share in TFP
Competition	Trade openness	Share of trade in GDP
Bargaining Power	Labour market tightness	Unemployment rate
Education	Enrollment	Secondary education enrollment

To measure technical change such as automation or digitalization, I choose the capital

share in TFP (ZVGDK) provided by AMECO (2022), which is constructed as GDP in volume divided by net capital stock to the power of the share of capital remuneration in output. Alternative measures such as investment in information and communications technology are provided by the OECD. I did not choose this measure as it is only available for a shorter period of time and because I do not want to a priori restrict technical change to digitalization.

To proxy competition, I choose the share of trade in GDP provided by the World Bank (2023) that measures the sum of exports and imports of goods and services as a share of GDP. This measure serves as a proxy for multiple aspects related to competition that are mentioned in Grossman and Oberfield (2021) such as globalization, product market power or monopolization and the superstar firm phenomenon. The trade indicator captures the involvement in international trade of a country and is hence not only a reasonable measure for its degree of globalization but also for its exposure to and its involvement in (international) competition. More direct measures of product market power or monopolization such the Herfindahl-Hirschman Index are not available at the country level.

The bargaining power of workers is proxied by unemployment rates provided by AMECO (2022). There is one missing observation for the UK for the year 1970 that is imputed with the 1971 value. In a standard search and matching labour market framework, labour market tightness measured as vacancies relative to unemployment is closely related to the bargaining power of workers. The tighter the labour market, the higher the bargaining power. More direct measures of labour market tightness such as the job vacancy rate or the vacancy to unemployment rate are provided by various sources, however, only for periods shorter than my observation period. Furman and Powell III (2021) show that the unemployment rate is highly correlated with other measures of labour market tightness over my observation period. I therefore choose unemployment rates as proxy for labour market tightness and ultimately the bargaining power of workers.

Education is proxied by secondary education enrollment measured as total gross enrollment relative to the population in the age group in percent and is provided by the World Bank (2023). This is by no means the best proxy for national education levels and a result of poor data availability. Alternative measures such as the Human Capital Index and its components or tertiary education enrollment provided by the World Bank are only available for rather short time periods or exhibit substantial missing observations. Even

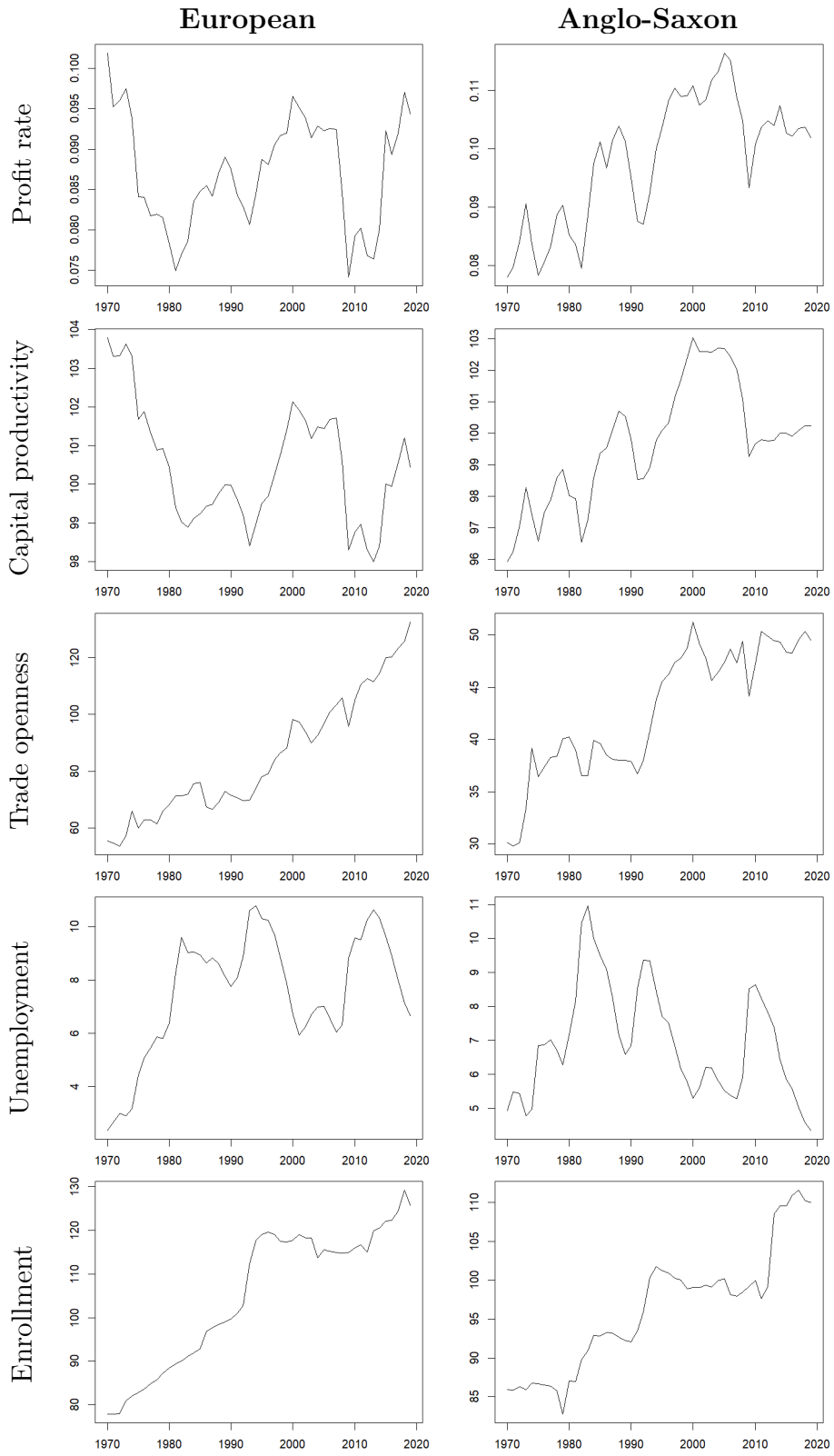
though the series on secondary education are hence the best available measures, they are also not perfect and have numerous missing values. All series have missing values for 1970 that are filled with the 1971 values. All intermittent gaps that are mainly prevalent in the series for the US and Canada are filled by applying compound annual growth between the last and the next available observation.

5.1 Time Series Analysis

I start my empirical exploration of profit rates and their determinants at the country group level. My goal is to identify potential determinants of profit rates and to find out if they differ between European and Anglo-Saxon countries. For this purpose, I employ time series analysis to fully account for the time-dependent structure of the data. First, I run several tests on the series to check for stationarity. I then pre-assess potential determinants of profit rates using Granger causality tests and set up and estimate Autoregressive Distributed Lags (ADL) models for both European and Anglo-Saxon countries.
In order to get series at country-group level, I aggregated the country level series using weights constructed from data on gross domestic product per capita in constant 2015 US dollars and constant purchasing power parities provided by the OECD (2023).
Figure 4 plots the resulting series for all variables.

As a first step, I investigate the properties of all series. To check for stationarity, I run augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests on all series to test for the presence of unit roots as well as KPSS tests to test for trend stationarity. The p-values from the test results are reported in Table 4.
The ADF and PP tests for level-stationarity nearly uniformely suggest non-stationarity for all series. For the ADF and the PP tests, the null hypothesis of unit root presence can not be rejected for any of the series at 5 percent significance level. For the KPSS test, the null hypothesis of trend-stationarity can not be rejected for the series on European profit rates and on Anglo-Saxon trade openness and enrollment. For all other series, the test results suggest presence of a unit root.
In sum, all series unambiguously exhibit unit roots except for three cases. In case of European profit rates, the tests yield mixed results suggesting both a unit root and stationarity around a determinstic trend.

Figure 4: Time Series of Profit Rates and Potential Determinants in European and Anglo-Saxon Countries, 1970-2019



Source: series constructed from AMECO (2022) & World Bank (2023) data using GDP weights constructed from OECD (2023)

Table 4: Test results for ADF and KPSS tests for level- and trend-stationarity

	Profit rate	Capital productivity	Trade openness	Un-employment	Enrollment
Original series					
Augmented Dickey Fuller (ADF)					
European	0.1343	0.1546	0.9589	0.2463	0.7412
Anglo-Saxon	0.6951	0.7545	0.393	0.1862	0.2602
Phillips-Perron (PP)					
European	0.4525	0.6425	0.6885	0.726	0.822
Anglo-Saxon	0.4211	0.6675	0.345	0.5353	0.3685
Kwiatkowski–Phillips–Schmidt–Shin (KPSS), trend-stationarity					
European	>0.1	0.0517	<0.01	0.0207	<0.01
Anglo-Saxon	0.0176	0.0119	>0.1	0.0496	>0.1
First differenced series					
Augmented Dickey Fuller (ADF)					
European	0.228	0.1725	<0.01	0.0724	0.1031
Anglo-Saxon	<0.01	0.0241	<0.01	<0.01	0.0158
Phillips-Perron (PP)					
European	<0.01	<0.01	<0.01	0.0171	<0.01
Anglo-Saxon	<0.01	<0.01	<0.01	<0.01	<0.01

Source: own calculations

Looking at the plot in Figure 4, I can not detect a clear deterministic trend and therefore assume unit presence as suggested by the ADF and PP tests. In case of Anglo-Saxon trade openness and enrollment, I assume trend stationarity to be prevalent after looking at the plots.

Based on my test results, I take first differences for all series and run another round

of ADF and PP tests for level-stationarity. Again, the p-values from the test results are presented in Table 4. Both tests suggest that Anglo-Saxon series do not exhibit a unit root anymore. However, for several European series the ADF tests again suggest presence of a unit root, while the PP does not. I run a KPSS test for level-stationarity as a tiebreaker and in all cases the p-value exceed 0.1 so that the null hypothesis of level-stationarity can not be rejected. In sum, the test results allow the conclusion that the first differenced series are now level-stationary suggesting that all series are integrated of order one.

Since all series are integrated of the same order, I could use a multi equation Vector Autoregressive (VAR) or a single equation ADL model. I choose the latter, because a VAR model does not provide additional informative insights. Since my goal is to examine how factors such as capital productivity, trade openness, unemployment and enrollment affect profit rates, I clearly differentiate between independent and dependent variables. It is therefore sufficient to employ an ADL model as all other potential interdependencies among the variables estimated in a VAR model are of no interest in this setting.

If cointegration relationships among the variables exist, an extended ADL model, the Error Correction model should be applied to account not only for short-run but also for long-run effects of potential determinants on profit rates. I do not assume cointegration to be an issue for the following reasons. First, the observations and the theoretical framework from which I derive my empirical framework are all located in the medium run. I therefore by definition do not assume long-run relationships between the variables to be at play. Second, even if there were cointegration relationships among the variables I could not reliably detect them. The Johansen test, which is the most appropriate cointegration test in a multivariate setting where all variables are I(1), is found to yield flawed results when applied to relatively small samples of annual data spanning less than 50 years (Zhou, 2001). My series span exactly 50 years and hence still fall under the critical threshold.

The general form of the ADL models to be estimated is:

$$\text{Profit rate}_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \text{Profit rate}_{t-i} + \sum_{i=0}^{p} \theta_i \text{Capital productivity}_{t-i} + \sum_{i=0}^{p} \theta_{i+1} \text{Trade openness}_{t-i} + \sum_{i=0}^{p} \theta_{i+2} \text{Unemployment}_{t-i} + \sum_{i=0}^{p} \theta_{i+3} \text{Enrollment}_{t-i} + u_t \tag{19}$$

Before setting up the final models, I pre-asses each potential determinant of profit rates using Granger causality tests at first lags. The null hypothesis that a potential determinant does not Granger cause profit rates is rejected for European trade openness as well as for Anglo-Saxon trade openness, unemployment and enrollment. Including two or more lags does not alter the results.

I then choose the optimal lag lengths relying on the Akaike Information criterion (AIC) and the Bayesian information criterion (BIC). For the European model, both information criteria identify an ADL(1,1,0,0,0) as optimal specificiation. For the Anglo-Saxon model, the AIC suggests an ADL(1,0,0,1,1) and the BIC an ADL(1,0,0,1,0) specification.
I estimate all three models and run robustness checks as suggested in Wooldridge (2020). First, I run the Breusch-Godfrey to test for first order autocorrelation of the residuals. The null hypothesis of no autocorrelation can not be rejected for all specifications at 5 percent significance level. Next, I test for heteroskedasticity using the studentized Breusch-Pagan test. The null hypothesis of homoskedasticity can not be rejected for any of the specifications at the 5 percent significance level. Since all models pass both robustness checks, I expect the models to yield reliable results.
Table 5 reports the estimates for the models in first differences. The European model finds significant estimates for contemporaneous and first lagged capital productivity. The Anglo-Saxon models finds significant effects for contemporaneous capital productivity and for lagged unemployment.

The results in sum suggest capital productivity in both groups of countries and unemployment in Anglo-Saxon countries as potential determinants of profit rates. Since these specifications only include lags for some of the potential determinants and the optimal lags as suggested by the AIC and the BIC are at odds with the potential determinants

suggested by my Granger causality tests, I also run an ADL model using only first lags for both European and Anglo-Saxon countries. Table 6 reports in short the results.

Table 5: Results for optimal European and Anglo-Saxon ADL models in first differences

Lag order	(1,1,0,0,0)	(1,0,0,1,0)	(1,0,0,1,1)
Series	**European**	**Anglo-Saxon**	
Intercept	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Profit rate$_{t-1}$	0.238*	0.117	0.112
	(0.124)	(0.101)	(0.104)
Capital productivity$_t$	0.006***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)
Capital productivity$_{t-1}$	−0.002**		
	(0.001)		
Trade openness$_t$	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Unemployment$_t$	0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)
Unemployment$_{t-1}$	0.001	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
Enrollment$_t$	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Enrollment$_{t-1}$	0.000	0.000*	
	(0.000)	(0.000)	
Observations	48	48	48
Multiple R^2	0.875	0.805	0.789
Adjusted R^2	0.856	0.770	0.758
AIC	−482.1	−441.1	−439.4
BIC	−467.1	−424.3	−424.4
RMSE	0.00	0.00	0.00

Note: *p < 0.1; **p < 0.05; ** p < 0.01

Table 6: Results for first lag European and Anglo-Saxon ADL models in first differences

Lag order	(1,1,1,1,1)	(1,1,1,1,1)
Series	**European**	**Anglo-Saxon**
Intercept	0.000	0.000
Profit rate$_{t-1}$	0.3662	0.3954*
Capital productivity$_{t-1}$	0.0007	0.0029
Trade openness$_{t-1}$	−0.0004*	−0.0007**
Unemployment$_{t-1}$	0.0011	0.0034***
Enrollment$_{t-1}$	0.0001	0.0007**

Note: *p < 0.1; **p < 0.05; ** p < 0.01

The ADL(1,1,1,1,1) models find significant effects for lagged trade openness in European countries and for lagged trade openness, unemployment and enrollment in Anglo-Saxon countries as in line with my Granger causality tests.
In sum, the results from time series analysis hint towards capital productivity as important determinant of profit rates in both groups of countries. Trade openness, unemployment and enrollment appear to be relavant only in Anglo-Saxon countries. I take these findings as first hint, but do not single out any of the variables.

5.2 Panel Regression

I augment my time series analysis with panel regressions to get a deeper understanding of direction and magnitude of the effects of potential determinants on profit rates. In above time series analysis, my focus is on the time dimension of the data. In the following panel regressions, I concentrate on the cross-sectional dimension.
First, I run panel regressions jointly for both European and Anglo-Saxon countries to get an overall impression of model specifications and performances as well of directions and sizes of the effects.
Second, I run panel regressions for European and Anglo-Saxon countries separately to explore how determinants and their effects might differ between the two country groups.
For my panel regressions, I consider pooled OLS models, fixed effects (FE) models with time and country fixed effects and random effects (RE) models. I suspect the FE with time

and country fixed effects to perform the best. The country fixed effects allow to control for time-invariant differences between the countries such as differences in macroeconomic fundamentals. The time fixed effects account for time-varying differences such as political reforms. To formally decide on the optimal specification, I rely on several tests based on Greene (2003). I compare pooled OLS and FE models using F-tests checking for the significance of fixed effects. To compare RE and FE models, I rely on the Hausmann test and to compare pooled OLS and RE models, I employ the Breusch-Pagan Lagrange multiplier (BPLM) test checking for significance of random effects.

I start with the full panel covering all European and Anglo-Saxon countries.
Table 7 reports summary statistics for all variables.

Table 7: Summary Statistics of Variables, Full Panel, 1970-2019

Variable	N	Mean	Std. Dev.	Min	Max
Profit rate	600	0.090	0.026	0.040	0.208
Capital productivity	600	100.240	6.421	77.870	120.674
Trade openness	600	72.856	39.444	10.757	252.249
Unemployment	600	7.664	3.948	0.600	26.100
Enrollment (imputed)	600	102.715	19.742	53.959	163.935

I first run all three models in their baseline specification. I then test for heteroskedasticity of the residuals using the studentized Breusch-Pagan test. For all three models, the null hypothesis of homoskedasticity is rejected. I therefore use White robust standard errors in all specifications.
Table 8 summarizes the results.

Table 8: Full Panel Estimates of Determinants of Profit Rates

	Dependent variable:		
	Profit rate		
	Pooled OLS	FE	RE
Capital productivity	0.001210**	0.003096***	0.003424***
	(0.000469)	(0.000470)	(0.000426)
Trade openness	0.000328	0.000200*	0.000122
	(0.000216)	(0.000110)	(0.000083)
Unemployment	0.001650**	−0.000272	0.000183
	(0.000716)	(0.000392)	(0.000295)
Enrollment	−0.000598***	−0.000214***	−0.000115**
	(0.000224)	(0.000069)	(0.000058)
Constant	−0.006587		−0.251850***
	(0.043657)		(0.038019)
FE	no	country&year	no
Observations	600	600	600
R^2	0.230	0.729	0.685
Adjusted R^2	0.224	0.697	0.683
F Statistic	44.319*** (df = 4; 595)	360.450*** (df = 4; 535)	1,294.629***
Note:			*p<0.1; **p<0.05; ***p<0.01

The pooled OLS regression finds significant effects of capital productivity, unemployment and enrollment. A one unit increase in capital productivity raises profit rates on average by 0.00121 units (or by 1,3% of its mean[9]). A unit increase in unemployment increases profit rates on average by 0.00165 units (or by 1,8% of its mean). The effect of enrollment is negative with a unit increase lowering profit rates on average by 0.000598

[9]Percentage is calculated by dividing the effect by the mean value of profit rates given in the summary statistics in Table 7.

units (or by 0,6% of its mean). However, I do not consider the pooled OLS estimates to be reliable since I assume cross-country heterogeneity.

The FE and the RE model yield quite similar results. Both models find highly significant positive effects for capital productivity and significant negative effects for enrollment. The magnitudes of the estimated effects differ substantially from the pooled OLS. The effect of capital productivity is much more pronounced with a one unit increase raising profit rates by 0.003096 units (or by 3,4% of its mean) in the FE model and by 0.003424 units (or by 3,8% of its mean) in the RE model.

The F-test suggests significant fixed effects and the BPLM tests suggests significant random effects. The Hausmann test as a tiebreaker points towards the FE model as optimal specification.

I then turn to the European and Anglo-Saxon panels.

Table 9 reports summary statistics for all variables in both panels.

Table 9: Summary Statistics of Variables, European and Anglo-Saxon Panels, 1970-2019

Variable	N	Mean	Std. Dev.	Min	Max
European					
Profit rate	450	0.087	0.028	0.040	0.208
Capital productivity	450	100.467	6.801	77.870	120.674
Trade openness	450	82.256	40.127	25.822	252.249
Unemployment	450	7.890	4.384	0.600	26.100
Enrollment (imputed)	450	104.817	21.617	53.959	163.935
Anglo-Saxon					
Profit rate	150	0.098	0.014	0.057	0.125
Capital productivity	150	99.558	5.076	88.456	109.198
Trade openness	150	44.655	18.299	10.757	82.765
Unemployment	150	6.984	2.036	3.700	12.018
Enrollment (imputed)	150	96.410	10.259	76.493	126.390

Again, I first run all three models in baseline specification on both panels. Again, I employ the studentized Breusch-Pagan test to check for heteroskadicity and again the null hypothesis of homoskedasticity is rejected for all three models for both panels. I thus once more apply White robust standard errors. Running the tests for determining the optimal model specification, I find that the F-test and the BPLM test again suggest both significant fixed and random effects in both panels. The Hausmann test as tiebreaker once more hints towards the FE model in both cases.

Table 10 reports the results of the European and Anglo-Saxon FE models.

Table 10: European and Anglo-Saxon Panel Estimates of Determinants of Profit Rates

	Dependent variable:	
	Profit rate	
	European	Anglo-Saxon
	FE	FE
Capital productivity	0.002123***	0.002934***
	(0.000484)	(0.000219)
Trade openness	0.000541***	−0.000408*
	(0.000079)	(0.000206)
Unemployment	−0.000451	0.002524**
	(0.000282)	(0.001235)
Enrollment	−0.000169**	−0.000340**
	(0.000075)	(0.000144)
FE	country&year	country&year
Observations	450	150
R^2	0.812	0.574
Adjusted R^2	0.782	0.325
F Statistic	417.717*** (df = 4; 388)	31.708*** (df = 4; 94)

Note: *p<0.1; **p<0.05; ***p<0.01

The FE model on the European panel finds highly significant effects for capital productivity and trade openness and a significant negative effect for enrollment. A unit increase in capital productivity on average pronouncedly raises profit rates by 0.002123 units (or by 2,4% of its mean[10]). The effect of trade openness is significant but small with a unit increase raising profit rates on average by 0.000541 units (or by 0,6% of its mean). A unit increase in enrollment reduces profit rates on average by 0.000169 units (or by 0,2% of its mean).

The FE model on the Anglo-Saxon panel also finds a highly significant effect for capital productivity with a unit increase raising profit rates on average by 0.002934 units (or by 3% of its mean[11]). The effect of trade openness is only weakly significant at the 10 percent level and small in magnitude. However, in contrast to the European estimate the effect is found to be negative. A unit increase here reduces profit rates on average by 0.000408 units (or by 0,4% of its mean). Unemployment significantly and positively affects profit rates with a unit increase raising profit rates on average by 0.002524 units (or by 2,6% of its mean). Enrollment has a small but significant negative effect with a unit increase decreasing profit rates on average by 0.00034 units (or by 0,3% percent of its mean).

In sum, the panel regressions uniformely identify capital productivity as a strong driver of profit rates in both European and Anglo-Saxon countries. There is no evidence for trade openness as a determinant of profit rates in the full panel but highly significant evidence in the European panel. For unemployment, there is no reliable effect in the full panel but a strong and significant effect in the Anglo-Saxon panel. Enrollment is convincingly identified as determinant of profit rates in all specifications. However, its effect is rather small in comparison to other determinants.

5.3 Summary

The findings from my empirical analysis can be summarized as follows.

My time series analysis hints towards capital productivity as most important determinant of profit rates in both European and Anglo-Saxon countries. Trade openness, unemployment and enrollment affect only Anglo-Saxon but not European profit rates.

My results from panel regressions are mostly in line with these findings. Capital pro-

[10]Percentage is calculated by dividing the effect by the country group mean value of profit rates given in the summary statistics in Table 8.

[11]See footnote 9.

ductivity has pronounced positive effects in both groups of countries. The effect of trade openness is significant only in the European panel and small in magnitude. Unemployment has no significant effect in European countries but a strong positive effect in Anglo-Saxon countries. Enrollment negatively but negligibly affects profit rates in both groups of countries.
In sum, the most relevant effects considering size and significance are hence those of capital productivity and unemployment.

6 Discussion

Based on my findings in the previous section, I develop my own assessment of labour share developments in European and Anglo-Saxon countries.
I therefore discuss the potential effects of capital productivity and unemployment on profit rates, relative factor prices and ultimately labour shares in both groups of countries.

Capital productivity is the prime mover of profit rates in both European and Anglo-Saxon countries. In both country groups, I find capital productivity to exert a strong positive effect on profit rates. This raises the question why the trajectories of profit rates in the two country groups differ so substantially. The answer lies in the contrasting developments of capital productivity. In European countries, it was on the decline over the past five decades, while it was on the rise in Anglo-Saxon countries (see Figure 4 for capital productivity and profit rate developments).
In European countries, capital productivity and profit rates dramatically decreased between 1970 and 1980. Simultaneously, wages increased during that decade as suggested by Blanchard's 'labor supply' shifts (see Figure 3 for wage developments). In sum, the profit-to-wage ratio contracted (see Figure 2 for relative factor prices and quantities developments) and caused a temporary hike in labour income shares (see Figure 1 for labour share developments). Between 1980 and the early 2000s, capital productivity and profit rates rebounded to some degree while wages remained largely stable around their heightened levels. Profit-to-wage ratios hence partly recovered as suggested by Blanchard's 'labor demand' shifts. However, this did not result from wage decreases but rather from profit rate increases. Labour-to-capital ratios still trended downwards, albeit less pronounced. In sum, the recovery of profit rates and the further decline in labour-to-capital

ratios brought the declines in European labour income shares. Around the mid 2000s, capital productivity and profit rates sharply declined again and brought profit-to-wage ratios temporarily down once more. These declines compensated for the ever declining labour-to-capital ratio such that labour income shares stabilized over the past two decades. In Anglo-Saxon countries, capital productivity and profit rates fluctuated around an upward trend for the 1970s, 80s and 90s before both pronouncedly contracted after the turn of the millennium. Wages also persistently increased during these decades but mostly fell behind profit rates such that profit-to-wage ratios slightly increased. Labour-to-capital ratios remained stable in that period. In sum, labour income shares slightly decreased. Following the turn of the millennium, capital productivity and profit rates contracted and did not recover. Profit rates fell and so labour shares should have increased. However, the beginning decline of labour-to-capital ratio offset this positive impetus and labour income shares trended downwards.

Another contributing factor to profit rate and labour share developments in European and Anglo-Saxon countries might be unemployment or labour market tightness and the bargaining power of workers. I found it to have no significant effect on profit rates in European countries but to have a strong positive one in Anglo-Saxon countries, pointing towards fundamental differences in labour markets between the two groups of countries. One possible explanation might be that in more regulated European labour markets unemployment does not transmit into wages and profit rates as much as in more flexible Anglo-Saxon labour markets.

I used unemployment as a proxy for labour market tightness and ultimately for the bargaining power of workers. Higher unemployment implies lower labour market tightness and ultimately lower bargaining power of workers and is intuitively associated with a redistribution of profits from workers to firms. Higher unemployment should thus raise profit rates and, in turn, lower unemployment should lower them. In Anglo-Saxon countries, unemployment sharply rose during the 1970s to its historic peak in the early 1980s. The resulting lower labour market tightness and bargaining power of workers implies a redistribution of rents from workers to firms that contributed to rising profit rates in that decade. In the following decades, unemployment overall trended downwards and thereby increased labour market tightness, which should have strengthened the bargaining position of workers and should have led to a redistribution of rents from firms to workers,

causing downward pressure on profit rates. Wages in fact trended upwards during these decades, however, profit rates outperformed them most of the time.
I see two potential explanations for this.
First, the downward pressure on profit rates from increasing labour market tightness was dominated and counteracted by other developments such as the upward trend in capital productivity.
Second, labour market structures might have changed such that higher labour market tightness did not transmit into higher bargaining power of workers. One example here could be deunionization assuming that workers are not able to exploit the beneficial labour market situation, when bargaining individually rather than collectively.
There is, however, another channel how the bargaining power of workers might have affected Anglo-Saxon labour income shares. The rising bargaining power could have induced firms to substitute to labour with capital. It thus might be behind the observed declines in labour-to-capital ratios since the turn of the millennium.

To conclude, I find that developments in capital productivity and hence in technical change explain the bulk of factor price variation in labour income shares. I do not solve the puzzle why labour-to-capital ratios continued to trend downwards despite the recovery of profit rates between 1980 and the early 2000s in Europe and only guess why relative factor quantities only started to react to relative factor prices after the turn of the millennium in Anglo-Saxon countries. Moreover, I find that differences in labour market structures such as in the bargaining power of workers between European and Anglo-Saxon countries might have contributed to profit rate and most importantly to labour share developments in the two groups of countries.

7 Conclusion

In this thesis, I revisited Blanchard (1997) and offered an alternative perspective on labour share developments in European and Anglo-Saxon countries between 1970 and 2019. I found that some of his observations did not stand the test of time, while others hold remarkably true. His sharp distinction between declining labour shares in European countries and constant labour shares in Anglo-Saxon countries turned out invalid. Over the past two decades, labour income shares in European countries stabilized around their

lowered levels while the presumably constant shares in Anglo-Saxon countries dwindled down. I found that in European countries relative factor prices and quantities equally shaped labour income share developments, while in Anglo-Saxon countries relative factor prices drove them for most of the time. Decomposing relative factor prices, I found that other than suggested by Blanchard (1997) the bulk of changes in profit-to-wage ratios did not result from wage dynamics but rather from profit rate dynamics. I showed that profit rates decreased in European countries, but increased in Anglo-Saxon countries. To find out more about the reasons behind this, I investigated determinants of profit rates and their effects in both groups of countries using time series analysis and panel regressions. My empirical analysis identified technical change as prime mover of profit rates and hinted towards labour market outcomes as another contributing factor. Based on these findings, I developed an own assessment of labour share development in European and Anglo-Saxon countries.

Despite refuting some of the central findings in Blanchard (1997), I went somewhat full circle with my analysis.

As Blanchard, I conclude that developments in relative factor prices and quantities are a tale of technical change as well as of labour markets and the bargaining power of workers. However, these factors transmitted via profit rates and not via wages into European and Anglo-Saxon labour income shares.

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