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# Labor market rigidity, social policies and the labor share: Empirical evidence before and after the big crisis

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## Highlights

- Labor market institutions and policies are shown to affect the labor income share.
- Continental Southern Europe mostly sustains income with welfare expenditures.
- Active and passive measures are particularly sensitive to the 2007 structural break.
- Minimum wage affects the re-distributional impact of social policies.
- EPL is strongly positively correlated to the labor share in minimum wage countries.

## Abstract

This paper provides evidence of the impact of three important and general policies shaping the degree of labor market rigidity on the labor share: welfare expenditures, government expenditures on active labor market programs, and passive labor market measures. It analyzes the impact of regulation, such as the intensity of employment protection, and evaluates whether trade unions and minimum wage institutions play a role in the relationship between all measures and the labor share. The labor income share has experienced a declining trend since the mid-1970s in most advanced economies, and the existing literature found little if no correlation of this decline to general labor market characteristics. However, the present paper finds that some institutions are correlated to the downward trend, depending on the welfare system adopted, and that welfare and employment protection counteract the decline. Moreover, many countries saw an upsurge in their labor share after the burst of the financial crisis. Evidence of whether the effect of the policies weakened or reinforced the labor share after 2007 is reported.

*JEL classification: E02, E25, H53*

*Keywords:* Labor income share, Employment protection legislation, Active labor market programs, Minimum wage, Welfare systems

## 1. Introduction

The last financial and economic crisis aggravated macroeconomic distortions such as unemployment, especially for the young and of the long-term type, increasing social and income disparities, and also hit the macroeconomic distribution of income. We are interested in the role of institutions in explaining this phenomenon. Every advanced economy has a set of established policies and institutions designed to reduce those disparities in order to sustain household incomes. There is extensive research on the effectiveness of institutions (such as, e.g., employment protection legislation or the wage bargaining process) on wage determination and employment. Some of these studies focus on attributing the decreasing path of the labor income share to globalization, labor-saving technological progress, or competition, but find little or no effect of labor market institutions. At the beginning of the new century and after the depression of 2008-2009, data reveal that the labor shares of European countries declined more than those of Anglo-Saxon countries. Labor share dynamics depend on factors moving the growth rates of real wages and labor productivity. Vergeer and Kleinknecht (hereafter VK, 2010) document that many European countries and Japan had substantially larger real wage growth and labor productivity growth than Anglo-Saxon countries, at least until 2005, but that real wage growth followed labor productivity growth more closely in the latter than in the former. For example, labor productivity growth declined from an average rate of 2.8% in 1963-1973 to 0.7% in 2003-2010 in the UK, and wage growth was 3.1% and 0.6% in the corresponding periods (UK Office for National Statistics, 2011). Scholars attribute the main causes of this different behavior to the reduction of union representation, accruing bargaining power of employers, inducing (downward) wage flexibility. In Europe, however, unions may have a role in increasing productivity by providing agency services, which boost both the supply of and demand for firm-specific human capital (Young and Zuleta, 2011, and the literature mentioned therein). More stringent employment protection legislation and more generous unemployment benefits counteract the flexibility of European labor markets (less wage flexibility and higher hiring/firing

costs). Furthermore, a lower demand for unskilled labor, due to the ICT revolution of the 1990s, deregulation and more competition in product markets, and lower barriers to entry pushed productivity growth up in Europe at the end of the 1990s. Vergeer and Kleinknecht (2014) argue that the higher productivity of European workers is due to labor-capital substitution induced by labor-saving technological change, the slow innovative process of ‘creative destruction’, longer job tenure, training and firm loyalty. Furthermore, they argue that lower employment protection forces workers to work more hours to reach the same GDP growth rate (VK, 2014, p.382), as happened in Anglo-Saxon countries, thus resulting in jobs with lower productivity. As labor productivity behaves differently in each country, real wage changes are not the only drivers of change in the LS (Bentolila and Saint-Paul, 2003). This paper follows the empirical approach of these authors and Young and Zuleta (2011) to estimate the impact of social policy expenditures and labor market institutions on the labor share, controlling for factors such as globalization, (labor-saving or skill-biased) technological progress, competition, physical and human capital accumulation, and labor force participation. Finally, it provides an empirical analysis of whether the impact of each policy weakened after the beginning of the crisis. The paper is structured as follows. Section 2 reviews the empirical literature on the main determinants of the labor income share. Section 3 provides a description of the diverse labor market institutions and government social policies characterizing the countries in our sample and discusses the expected impact of such institutions on the labor share. Section 4 describes the data, while Section 5 defines the econometric framework and discusses the results. Finally, Section 6 concludes.

## **2. The main determinants of the labor share**

Many empirical studies found different explanations for the labor share decline, but there is no consensus on how different factors affected the labor share. Bentolila and Saint-Paul (2003) use a production function approach (neoclassical or more general non-monotonic function) to show that the LS is a function of the capital-output ratio, which is in turn affected by changes in factor prices (real wages or real interest rates) and labor-augmenting technological progress. There are factors shifting the exact relationship between LS and capital output, e.g. capital-augmenting technological progress (TFP) or imports of raw materials. When the capital-output ratio and TFP show the same estimated sign, technology is strictly capital-augmenting. Both Jayadev (2007) and Jaumotte and Tytell (2007) explain that technological progress is

biased towards labor-saving technologies rather than labor-augmenting ones. Guerriero and Sen (2012), on the other hand, find a positive correlation between the labor share and either international trade or technological progress. According to their results, exports of consumption goods and capital goods, and the consequent need for good managerial practices, lead to a rise in both employment and wages, thus increasing the labor share. Karabarbounis and Neiman (2014), besides demonstrating that the labor share indeed declined, find that technological progress lowers the ratio, which is consistent with most previous literature. Bassanini and Manfredi (2012) find that ICT progress creates opportunities for innovations. However, innovations appear to be mostly labor-saving, thus lowering the labor share. Other scholars suggest that trade openness negatively affects the labor share (especially since the 1980s). Harrison (2005) and Guscina (2006) find that an increase in trade openness causes a decrease in the labor share, although globalization improves the general conditions of workers. Jayadev (2007) and Jaumotte and Tytell (2007) find that globalization affects the labor share negatively because it increases the mobility of workers and weakens the bargaining power of unskilled workers. Grossman and Rossi-Hansberg (2006) argue that the productivity-enhancing effect of trade in intermediates could be even larger than that in final goods because, in addition to a competition effect for producing sectors, trade in intermediates also reduces the costs of production of using sectors. Elsby et al. (2013), in their analysis of US economic activity, explore the relationship between offshoring (outsourcing or outward foreign investment) and the labor share. Offshoring the most labor-intensive component of US production, they argue, makes the remaining domestic part more capital-intensive, especially if the capital-labor elasticity of substitution is high. Such a practice undermines the position of workers. In 1997, Rodrick claimed that increasing trade openness magnifies the amplitude of fluctuations in real wages at home, and that labor is exposed to high risk. The value of intermediate imports as a percentage of GDP is used here and is expected to reduce the labor share.

Blanchard and Giavazzi (2003) analyzed the effects of competition on the labor share. They found that deregulation in the product market (PM) may trigger subsequent deregulation in the labor market. With lower rents, induced by goods market deregulation, workers may have no incentives to fight for a share of those rents. Nonetheless, reliable measures of product market regulation are available only at the level of network industries (see Bassanini and Manfredi, 2012), and no such measure is included here.

Guerriero and Sen (2012) put forward ‘Kaldorian’ arguments to show that, if real investment demand increases, the returns to capital (and labor) adjust in order to finance investments. Income distribution will support the right level of savings, shifting towards groups with higher savings propensity. An increase in investment may cause redistribution from wages to profits, and the expected impact of investments on the LS is negative.

The amount of human capital that workers possess is also an important determinant of the labor share. Guerriero and Sen (2012) argue that increasing human capital levels are associated with high wages and higher levels of employment, thus affecting the labor share positively. While (new) machineries are generally substitutes to unskilled labor, they are also complements to skilled labor. Arpaia et al. (2009) show that the labor share responds negatively to an increase in the relative supply of skilled workers, if skilled and unskilled labor are highly substitutive. Given an excess supply of skilled labor, its relative wage decreases (skill-premium), the labor demand for the unskilled decreases and the overall effect is negative. Even Bentolila and Saint-Paul (1998) show that the skill-mix of employed workers has the potential to affect the LS, moving it along the LS-capital-output schedule. Finally, activity rates in terms of labor force participation may alter the meaning of the labor share statistics because by supplying more (usually female) labor, households might in principle sustain their incomes, but at a very great non-pecuniary cost. Moreover, gender gaps in labor compensation and labor participation are significant. When women enter the labor force they are forced into or choose greater flexibility than men, accepting jobs with lower or no pay (Bettio and Rosenberg, 1999). In Germany, women earn on average 49.8 percent less during their employment career (Boll et al., 2017). In the US, the gender pay gap has been narrowing over the last two decades (Hadavand and Thomas, 2013). An increase of the female participation rate is associated with decreased male participation in the labor force. This substitution effect contributes to the decline of the labor share. Therefore, the female participation rate might be a better proxy of labor adjustment costs than employment changes, and is expected to reduce the aggregate labor share.

### **3. Labor market institutions and social policies**

This section provides a discussion of important and general features shaping the degree of labor market flexibility. The strictness of employment protection usually depends on the implementation and

content of employment protection legislation (EPL) in a country. EPL includes, among others, regulation on individual and collective dismissals and severance pay.<sup>1</sup> As the OECD (2004) argues, employment protection may diminish firms' ability to cope with a rapidly changing environment driven by globalization, technological change and the derived organizational innovation. The European Commission (2003) and ILO both recommended governments to reform employment legislation appropriately to balance the needs for more flexibility in the labor market, but with an eye on worker security. Although there has been convergence in reviewing employment legislation across OECD countries at least until the mid-2000s, especially by introducing many different types of temporary work contracts, there is still quite a lot of variability across countries. In Denmark, for example, employment services seem to be rather effective in "activating" benefit recipients, while EPL is moderate in this country – the so-called "flexicurity" approach. In countries like the US and New Zealand, only workers under collective agreements may benefit from severance pay, but the share of workers covered by collective agreements is quite low. In Germany, 70% of workers are covered by collective agreements, but there is no severance pay in EPL, except for senior workers. France, Greece, and Spain, in Southern Europe, offer the strictest employment protection among OECD countries for temporary contracts, while not having particularly stringent provisions for regular contracts. EPL may therefore influence the labor market dynamics and the aggregate level of employment in a countercyclical way (see, e.g., Young, 2003), which is one component of the labor income share. We should expect to observe an average positive impact, if any, even if it is enforced by collective agreements like in the US or Germany, unless wage adjustments are possible. On the other hand, by strengthening the position of protected workers ("insiders") in wage bargaining, EPL may have negative impacts on employment, raising labor costs indirectly through its effect on bargaining power.<sup>2</sup> In the empirical literature, Guerriero and Sen (2012) argue that legal adjustments may protect workers when their bargaining power is weak. Therefore, the authors find a positive relationship between regulations and the labor share. In the past some other scholars (e.g., Nickell, 1999; Besley and Burgess, 2004) found that these kinds of

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<sup>1</sup> The measure of employment protection, developed by the OECD back in 1999, is mainly based on legislative provisions, but also incorporates some aspects of contractual provisions and judicial practices. Provisions regarding fixed-term contracts and temporary work agencies are also considered. This component of the EPL index is intended to measure restrictions on the use of temporary employment by firms, the type of work for which these contracts are allowed and their duration. The OECD also built a separate index for the latter component of EPL.

<sup>2</sup> Coordination and centralization of the wage bargaining process are also important factors in country classification. There is an extensive literature on the possible "hump-shape" hypothesis relating the degree of wage centralization and market performance. See, for example, Traxler and Kittel (2000) for a thorough discussion of this topic. Given the lack of updated data on these measures, the present paper is not using such a variable, but rather a general measure of union density.

impositions could have an ambiguous effect on employment levels. Summarizing, EPL should have a negative direct impact on the labor share by reducing labor mobility, increasing hiring and firing costs, and lowering labor demand. On the other hand, EPL serves both to protect workers and reduce the negative impact of employment and income loss during recessions. Depending on the strength of these two forces, the impact on the labor share is an empirical issue.

Trade union density is a way of measuring potential union bargaining pressure.<sup>3</sup> Union bargaining power on wages should positively affect the labor share by lowering turnovers and dispersion of pay. Young and Zuleta (2011) argue that the effect of unions on the LS depends on the degree of substitutability of labor and capital: wage pressures push firms to substitute capital for labor. Nonetheless, the action of unions might prevent labor demand expansion. According to which force predominates, one can expect either a positive or a negative impact. Fichtenbaum (2011) provides empirical evidence for US manufacturing, in which union density is positively correlated to the labor share, and the decline in unionization in the US between 1997 and 2006 explains up to 16% of the LS decline. Azmat et al. (2012) also include trade union density as an explanatory variable in their model. However, their estimate is not statistically significant.

Active labor market policies (ALMP) are capable of limiting the EPL-induced mechanisms, in particular reducing long-term unemployment and favoring hiring. ALMP are government expenditures on public employment services, training, subsidized employment such as direct job creation and incentives, job rotation and sharing, and supported employment and rehabilitation.<sup>4</sup> Until 2005, Australia, Canada, New Zealand, the US and Norway spent on average 0.5% of GDP on ALMP, while European countries' expenditure was on average 1% of GDP, with Denmark peaking at a high 5% (both on active and passive programs). The Swedish government designed a multitude of active programs to lower the unemployment rate, especially after 1994, and the average expenditure on ALMP in Sweden in 1996-2000 was more than five times higher than in the UK and 27% higher than in Germany (Calmfors et al., 2004). However, countries have different targets: most Anglo-Saxon countries spend more on public employment services, training and programs for the disabled, while EU countries focus on employment incentives, direct job

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<sup>3</sup> Bargaining coverage instead captures the ability of unions to defend minimum labor standards and employment protection (Visser, 2006). This measure is therefore positively correlated to our EPL index and is not used in our analysis.

<sup>4</sup> Starting in 2002, the OECD adopted a new classification and definition of labor market programs, which changed the types of programs according to Eurostat (2006). For the OECD countries belonging to the EU and for Norway, these expenditures were re-classified going back to 1998, our first year of observation. See Grubb and Puymoyen (2008) for details.



creation, and start-up incentives (Grubb and Puymoyen, 2008). In general, total “active” spending is typically distributed across transfers to (unemployed/young/trainees) individuals, transfers to employers and transfer to service providers, in the form of wages (OECD, 2014). Active programs such as training, employment incentives, direct job creation and early retirement should therefore all help to increase employment (unless a direct crowding-out effect of regular employment takes place due to subsidized employment). Nonetheless, the intended and unintended effects of ALMP on the real wage rate are ambiguous regarding whether it helps increase labor productivity, the reservation wage of the unemployed (putting upward pressure on wages), job competition and matching (putting on downward pressure, see Calmfors et al., 2004). The general effect on the labor share is an empirical issue.

Passive labor market policies (PLMP) include “unemployment subsidies”. Sometimes PLMP strictly depend on the ALMP. In the Scandinavian countries, for example, unemployed people receive subsidies conditional on entering active programs such as training and job search starting with the first day of unemployment. Schneider (2011) finds that unemployment benefits have a short-run positive effect on wages (while employment reacts slowly), thus increasing the labor share. However, in the long run, employment is adjusted and the labor share could even decrease (especially for low-skilled individuals).

Welfare expenditures (*Welfare*) refer to government spending on public health, pensions and other forms of social assistance, including education, protection of the environment and access to cultural resources. Scandinavian countries are renowned to have adopted a “Nordic model”, where those services are granted extensively. Continental countries developed a “European social model” and the others adopted a “third way”, with fewer and residual services provided to special categories of people.<sup>5</sup> Policies such as household income subsidies or pensions and public health may increase the labor share, for example when governments finance day care for children up to 6 years, helping mothers get back to their jobs.

Fixing a minimum wage (*MW*) is another form of salary protection, given that it is usually binding for low-skilled occupations. Given that a minimum wage keeps workers’ (in general, those employed in low-skilled occupations, i.e. young people, women or part-time workers) income higher, but lowers their labor demand (especially if the elasticity of substitution between skilled and unskilled labor is high), it is not clear whether such a policy favors the labor share (*ceteris paribus*). A minimum wage scheme affects the

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<sup>5</sup> Southern European countries adopted a “Mediterranean model”, which spends more than 50% of welfare expenditures on pensions for the elderly.

earning distribution in at least three ways: reducing the proportion of workers earning below the minimum, increasing the proportion of those earning exactly the minimum, and affecting those earning above the minimum wage (see OECD, 1998). In the empirical analysis, countries are also grouped according to whether they have such regulations or not (Italy is in the no minimum wage group, although it has a similar system of minimum requirements in collective bargaining).<sup>6</sup>

#### 4. Data description

Parisi and Penta (2015) document the labor share trends in six large economies, where the decrease concerned European countries and Japan much more than Anglo-Saxon countries. Similar patterns are documented in other research (e.g. Blanchard and Giavazzi, 2001; Boggio et al., 2010). In the 1970-1990 period, the labor share decreased by 3.3% in the US, -2% in Canada, and -1.9% in Australia. In Europe, the growth rate was -2% in Germany, -5.2% in France, -4.5% in Italy, and -8.8% in the Netherlands. On average, Europe suffered a larger decline, and this discrepancy is still present in later periods, even after the latest economic crisis (see Appendix A and IMF, 2007, p.168). Most of the decline in the labor share can be attributed to the fall in unskilled sectors, which was more pronounced in Europe and Japan than in the Anglo-Saxon countries. The income share of labor in skilled sectors, on the other hand, has been rising, especially in Anglo-Saxons, where it increased by about 5 percentage points.

This section reports evidence on five groups of 25 countries with complete observations between 1998 and 2014 on the labor share and other factors. The groups differ regarding their features in terms of labor institutions, welfare expenditures and educational systems.<sup>7,8</sup> The labor income share is composed of returns to skilled and unskilled labor, or, in other words, to human capital and raw labor. Human capital consists of past investments in education, training and experience, and raw labor is the remuneration of a

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<sup>6</sup> The no minimum wage group includes Austria, Denmark, Finland, Iceland, Italy, Norway and Sweden.

<sup>7</sup> Anglo-Saxons are Australia, Canada, Iceland, Ireland, New Zealand, United Kingdom and USA; Southern Europe includes France, Greece, Italy, Portugal and Spain; Continentals include Austria, Belgium and Germany; Scandinavian countries are Denmark, Finland, Netherlands, Norway and Sweden; New EU Members include Czech Republic, Estonia, Hungary, Poland and Slovakia. This classification is widely used in the literature. Esping-Andersen (1990) proposed this grouping and Ebbinghaus (2012) compared and enlarged different welfare state regimes in OECD countries.

<sup>8</sup> Educational systems vary across countries even within homogeneous groups. In Scandinavian countries like Finland, the government finances student education from age 6 to university degree, which is entirely free, with one of the highest percentages of GDP devoted to education among the OECD countries. Germany adopts a 'dual' system of education and work. Southern countries have a 'sequential' model of school to work transition.

zero-skill labor (Prados de la Escosura and Rosés, 2003; Schneider, 2011). Thus, the value of the labor share is determined by the level of employment, total labor compensation and the value added:

$$LS_{it} = \frac{\text{Wage compensation of employees}}{\text{Value Added}} * \frac{\text{Employees} + \text{Self-employed}}{\text{Employees}}$$

This ‘adjusted’ definition is standard according to the discussion in OECD (2004) and Gollin (2002).<sup>9</sup>

Figure 1 illustrates the trend of the LS for all groups. The Anglo-Saxon countries’ labor share declined over the entire period, reaching a minimum in 2011 (61%).<sup>10</sup> The continental countries converged to a minimum 61.5% in 2007, with a U-shaped trend. The Southern European countries, in the ten years from 1996 to 2006, saw a converging downward trend, spreading out a bit after 2007. The Scandinavian countries’ low labor share declined until 2006 (59%), then grew by more than 5 percent points, and remained stable thereafter. The right panel shows the labor share dynamics for New EU members compared to Anglo-Saxons. Although for this group the labor share is quite low (53% in 2006), its trend is similar to the Scandinavian and Continental U-shape (there is no converging or diverging trend within this group).

Next, the 25 countries are divided into two groups, those currently implementing a minimum wage policy and those that do not (see footnote 6). Figure 2 shows the average labor share for minimum wage and non-minimum wage countries. Clearly, the latter have always had a higher and more volatile labor income share over time. The minimum wage group’s labor share declined sharply until 2006, and then increased again sharply until 2009. A minimum wage policy seems to insert a wedge on the average labor share, because the two groups do not show signs of convergence either before or after the burst of the crisis.

It is interesting to note that the big crash actually reversed the trend in the labor income share almost everywhere, with larger fluctuations, with the exception of the Anglo-Saxon group.

Table 1 reports the descriptive statistics of all variables of interest. The capital-output ratio is the ratio of the real capital stock to GDP. The sum of exports and imports over GDP measures trade openness.

<sup>9</sup> Gollin (2002) discusses the problem of considering self-employed workers’ compensation, which is missing in the naive measures of the labor share of national income. One way of doing this is by assuming that the self-employed average wage is equal to the average employee’s wage, which is a reasonable assumption for the richest countries.

<sup>10</sup> Within Anglo-Saxons, the labor share behaves differently, where the US, Canada and Australia have experienced a continuous decrease in their average labor share, and the UK has quite a stable and high labor share over time with a jump after 2007. Ireland’s labor share is volatile, while New Zealand, which has the lowest level of labor share in the group, saw a constant increase at least until 2008. See Figure A.4 in Appendix A.

Imports of intermediates are an alternative measure capturing offshoring. Technological progress is measured with TFP levels, growth and/or by a country's distance from the US frontier (calculated as each country's GDP difference from US GDP, over US GDP). A low index means that a country is close to the frontier (it is technologically advanced). Investment in physical capital is the intensity of fixed capital formation to GDP. Human capital is measured by the share of labor force individuals with tertiary education. Female participation rate is the share of female labor force in the active population.<sup>11</sup> The average labor share in the seventeen years until 2014 spans from 54.6% in New EU Members as the lowest to 64.4% in Continental countries and 64.6% in Southern Europe.

In terms of welfare spending, there appear to be two main routes: the core European countries, including Southern, Continental and Scandinavian countries, reserve at least one fourth of their GDP for pensions and public health. Peripheral European countries, similarly to Anglo-Saxons, devote much less to those items.

Active labor market expenditures have a peak in Scandinavian countries (at 1.22% of GDP, it was 2.68% until 2012). Passive labor market measures absorb 1.96% of GDP in Southern Europe and 0.5% in New EU Members. Everywhere but in the latter group, passive policy expenditures are about twice the active policy, on average. The employment protection index is lowest in Anglo-Saxon countries (1.64) and highest in Southern Europe (2.98), where a higher value indicates more protection (against firing, to get high severance pay, etc.). Overall, the US, the UK and Canada remain the least regulated countries, while Southern Europe has the highest level of protection, with some exception in France and Italy.

Trade union density is the percentage of employees enrolled in a union over total employment. Trade union wages is the sum of wages of union members over total wages paid to employees.<sup>12</sup> Both variables indicate that almost 60% of employees are enrolled in a trade or labor union in Scandinavian countries versus 20.8% in Southern Europe, 33% in Anglo-Saxons and about 17% in New European members.

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<sup>11</sup> Information on most variables comes from several OECD databases. TFP growth comes from the Conference Board (2015), however levels here are missing for 9 countries of the sample. TFP level (in current PPPs, USA=1) thus comes from the Penn World Table, April 2015 update, as well as real capital stock at current PPPs (in million 2011 US\$). The shares of educated labor force come from the World Bank's World Development Indicators. The female participation rate is downloaded from UNCTAD data.

<sup>12</sup> The correlation between these two measures is 0.96 on average across countries. We then use the wage ratio in the regression analyses.

## 5. Econometric framework and results

This paper uses an “extended” general multiplicative functional form for the labor share as the aggregate version of Bentolila and Saint-Paul’s (BS, 2003) and Young and Zuleta’s (YZ, 2011) LS-capital-output schedule,

$$LS_{it} = g(A, k_{it}, \alpha) \omega(Z_{it}, X_{it}, \varepsilon_{it}), \quad (1)$$

where the sub-indices  $i$  and  $t$  refer to country and year, respectively. Function  $g(A, k_{it})$  captures the relationship of the labor share derived strictly from a production function approach (technological progress and capital-output ratio,  $k_{it}$ ) plus a country-specific error term,  $\alpha_i$ . The separate (exponential) function  $\omega(Z_{it}, X_{it})$  is an augmented form with respect to that conceived by BS (2003) or YZ (2011). Their original function is meant to capture all factors shifting the LS- $k$  schedule or pushing the economy off that relationship.<sup>13</sup> As discussed in Sections 2 and 3, function  $\omega(\bullet)$  captures the potential effects of variables that are expected to influence the dynamics of the labor share, other than the capital-output ratio. According to previous research,  $X_{it}$  includes measures of globalization, competition and employment changes. In the present analysis, globalization is measured with imports of intermediates to capture international effects on labor demand. Instead of employment changes, that BS (2003) admit to be a poor proxy for labor adjustment costs, we include the female participation rate and human capital accumulation measured by the share of tertiary educated workers. The rationale behind this choice is discussed in Section 2. The augmented function considers labor market institutions and policy variables as potential shifting factors,  $Z_{it} = \{Welfare, ALMP, PLMP, EPL, Union\}$ . Finally, an idiosyncratic error captures possible shocks over countries or time. Both functions are expressed in multiplicative form as well, such that we express the LS (in log-linear form) as in equation (2),

$$ls_{it} = \beta_0 + \beta_1 A_{it} + \beta_2 \ln k_{it} + \omega_1 Welfare_{it} + \omega_2 ALMP_{it} + \omega_3 PLMP_{it} + \omega_4 EPL_{it} + \omega_5 Union_{it} + \Gamma' X_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

where  $\varepsilon_{it}$  is alternatively assumed to be white noise or following an AR(1) process. Because the objective of this paper is to check for differences in the effects of labor market policies on the labor share in different groups of countries – and whether there was any difference before and after the crisis – Equation (2) is

<sup>13</sup> In BS (2003), the  $\omega(\bullet)$  function reduces to  $h(X)$ , where  $X$  includes oil prices, employment changes and the labor conflict rate. However, as already mentioned, their study used industry data. YZ (2011) add to those variables a measure of uncertainty as the standard deviation of an industry value added, which cannot be used at this level of aggregation. See the discussion in Section 2 for the expected impact of  $X$  variables of choice.

estimated on the whole sample and on different panels. Moreover, interacting the right-hand side variables in Equation (2) with a dummy equal to 1 for years after 2006 corresponds to the assumption that parameters  $\beta$  and  $\omega$  may vary over time, so Equation (2) becomes a “variable coefficients” model. Furthermore, Equation (2) is estimated for minimum wage and non-minimum wage countries separately. This method controls for any interaction existing between minimum wage and other policies affecting labor market outcomes and income distribution. One of the common concerns in time series analysis of the labor share in levels is a potential presence of unit roots. Non-stationarity would force a re-specification of Equation (2) in first or longer differences. After running the augmented Dickey-Fuller test for panel unit root, test and p-values are reported at the bottom of Table 2. The null hypothesis assumes that every panel in the sample presents a non-stationary labor share, versus the alternative that at least some of the panels have a stationary share. The test is run both on the 1998-2014 period and on the two time intervals before and after the crisis, verifying that a deterministic trend and drift may affect the results. Given that the ADF test is not robust to structural breaks in time series, the alternative robust Phillips-Perron test for panel unit root is performed on the same null hypothesis. If the results of the test reject the null hypothesis, in the overall interval, then labor share in the panel can be safely considered (drift) stationary. The result is, however, different when the sample is split, due to the evident structural break of 2007. The PP unit root test reveals the non-stationarity feature of the labor share (net of a drift) after the burst of the crisis.

## **5.1 Results**

Table 2 shows the results of the within-group FE estimator applied to Equation (2) on the entire sample of countries. Column 1 reports benchmark estimates of the elasticities of LS to standard factors (K/Y, TFP level, intermediate imports) plus LMI. Column 2 assumes that the residuals follow an AR(1) process, which seems reasonable when we look at the autocorrelogram of the residuals in column 1 (not reported) for a few panels. Column 3 reports the estimates when the set of explanatory variables is augmented with human capital and the female participation rate. The results in columns (4) to (8) are discussed in Subsection 5.5. The complete regression results are reported in Tables 2.A and 2.B in Appendix B. Capital/output ratio and TFP level have negative and significant estimated elasticities, as found in

Bentolila and Saint-Paul (2003), meaning that technological progress is strictly capital-augmenting.<sup>14</sup>

Globalization appears to affect the labor share negatively, as in Guerriero and Sen (2012).<sup>15</sup> However, Table 2.A shows that the share of employees with tertiary education is negatively correlated to the labor share (as predicted in Guerriero and Sen, 2012). Tertiary education is highly correlated to the participation rate of women in the labor force. Female participation rate is negatively correlated as well. This result confirms the substitution effect of female participation to male participation in contributing to lower the labor share (due to gender pay gap, flexibility, low-paid jobs, and the like). Although female participation is always lower than men's, the education level of those entering the labor force is higher than average. This might explain why the impact of tertiary education on the labor share is negative for the whole sample.<sup>16</sup>

Differently from most of the previous empirical literature, there is a significant effect of labor institutions and social policies on the labor share. The labor share responds strongly and positively to welfare expenditures. Its estimated elasticity (+0.155) implies that a 10% increase in spending on welfare would accrue the labor share by 1.55%. Although the LS is not significantly related to ALMP on average in the whole sample, it behaves differently before and after the break. On the other hand, LS elasticity to PLMP is robustly negative and significant. Indeed, the weak side effects of passive measures include disincentives to job search, long-run unemployment and skill deterioration, which appear to more than compensate for the intended benefits to supporting income, giving evidence of employment downward adjustment. EPL elasticity is either nil or significant and positive, as found in Guerriero and Sen (2012) or European Commission (2007), meaning that protection legislation has a positive effect on employment more than compensating for the negative direct and indirect adjustment costs (due to bargaining power). Union representation is negatively correlated to the labor share. This might be due to the prevailing effect of bargaining pressure on depressing labor demand. When introducing AR(1) error dynamics in column 2, the results lose their statistical significance for PLMP, ELP and trade union, whose variability is not typically high enough.

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<sup>14</sup> As Bentolila and Saint-Paul (2003) emphasized, if total factor productivity is strictly capital-augmenting, it should have the same sign as the capital/output ratio. When TFP growth substitutes TFP levels, its estimated sign is negative and significant as well.

<sup>15</sup> We used other measures of technological progress or innovation, i.e. the total number of patent applications, the share of patents with respect to the average of the group, Business R&D expenditures and the distance to the Norway frontier. Distance to the US frontier appears to be the variable correlated most with the labor share.

<sup>16</sup> While the unconditional correlation between tertiary education and female participation is high (0.492 at 1% level), tertiary education is also slightly positively correlated to ALMP (0.104 at 5% level). The evidence in Appendix A may capture the fact that some ALM programs are targeted to highly educated women in the labor force.

## 5.2 Labor market institutions by country grouping

Table 3 reports the contributions of each group of countries to the average elasticities of the augmented model in columns 7 and 8 of Table 2 (differential effects over subpopulations of countries). Welfare elasticities are below the average for Anglo-Saxon and New EU Members, and above average for all other groups. Continental and Southern Europe have the highest (positive) estimates, while Anglo-Saxons have the lowest elasticity (0.120). It turns out that the ‘European model’ as well as the ‘Mediterranean model’ are the most successful at sustaining the labor share through welfare. Scandinavia has the highest estimates for ALMP, as expected, although on average this is not significant, while Anglo-Saxons and New EU countries have a negligible estimated elasticity. Significant results are found when considering the structural break in Subsection 5.5. Passive measures seem to be mostly detrimental to Continental Europe’s LS (-0.036, highly significant) because they are not accompanied by active programs. New EU members have the lowest estimated elasticity to PLMP (-0.01), although it is still significant at the 1% level, due to their more recent experience of high unemployment at the end of the 1990s (see Figure A.9 in Appendix A). Employment protection helps to sustain the labor share mostly in Southern Europe (+0.074) and Continental Europe (+0.070), while it is below average in Anglo-Saxon countries (+0.041). It either helps or softens the negative impact of trade union and PLMP, and does not appear to have increased labor adjustment costs. Trade union density appears detrimental especially in Scandinavia (-0.197) and, to a lower extent, in Continental Europe (-0.123), where the model predicts a predominant negative impact on labor demand. All other elasticities are below average (in absolute value), yet the estimates are negative, contrary to what was found in the literature.

## 5.3 Minimum wage

The estimated elasticities after dividing countries into those implementing a minimum wage policy (18 countries), at least during the sample period (MW), versus those that never adopted this measure until 2014 (NMW, 7 countries), are reported in Table 4. Governments may sustain household income through tax schemes, preferring pre-tax and pre-transfer income distribution policies, such as the minimum wage, or adopting post-tax post-transfer distribution policies such as tax credits and welfare benefits. These two



approaches are part of the so-called “redistributive policies” (Castater, 2015) to alleviate the problem of inequality and unemployment. Indeed, they are found to reinforce each other at least for some individual categories, improving distributional effects (Neumark and Wascher, 2011). Table 4 shows that welfare effects are strongly positive for NMW (+0.361) overall, while they are smaller in MW countries (+0.06), meaning that MW countries are less inclined to simultaneously adopt the two schemes discussed above. AMLP elasticity is never significant for both groups on average. Nonetheless, there is a significant change from the pre-crisis to the post-crisis period for MW countries.<sup>17</sup> Passive measures seem to be negatively correlated to LS only for NMW, in the whole period, while they are positive for MW countries in the pre-crisis period, turning insignificant thereafter. The EPL effect is positively correlated with the labor share in minimum wage countries, while it is positive but not significant in the other group. Overall, the minimum wage policy interacts with other re-distributional policies in a significant way, modifying their intended impact on the labor share, or even lessening them. Trade union, on the other hand, has a negative impact on the LS for both groups, which is significant in MW only.

Tertiary education is negatively correlated to the LS in both groups (with the exception of NMW in the post-crisis period, where its impact is null). Female participation rate has a depressing effect only in the NMW group, overall and across time periods, while it has no significant impact in the MW countries, where the substitution effect between females and males in minimum wage occupations is much smaller.

#### *5.4 Endogeneity issue*

As a robustness check, an instrumental variable estimator is applied to take into account the potential endogeneity of some variables in order to reduce reverse causation bias. Endogeneity may affect either main policy and LMI variables, and/or the capital-output ratio, TFP or intermediate imports. Table 5 shows the results for the 2SLS-IV estimation with fixed effects applied to the whole sample of countries (replicating the standard regression of Table 2). Column 1 shows the results from instrumenting only the policy variables welfare, ALMP, PLMP, EPL and trade union. The instruments used in the 2SLS estimation are the first

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<sup>17</sup> The effects of active labor market measures on the labor share appear to be offset by capital-labor substitutability and total factor productivity. If these latter variables are omitted, ALMP turns positive and significant in all model specifications. The unconditional correlation of ALMP to LS is 0.2143 significant at the 1% level, and to TFP level 0.4556 (at 1%). Active programs help increase TFP (and vice versa). This might explain why a negative effect of TFP on the LS causes ALMP to be almost never significant (apart from splitting the time interval, as will be shown next).

difference of welfare and lagged values of all other policy and LMI variables. The Sargan-Hansen test never rejects the validity of these instruments. Moreover, the null hypothesis that the set of instrumented variables are exogenous is rejected in all regressions (the p-value is below 10%). When all explanatory variables are instrumented, we get significant estimates for all the policy variables (except ALMP) with the same direction discussed above. The complete Table 5 is in Appendix B.

### *5.5 The burst of the crisis*

The latest financial and economic crisis hit Southern European countries and the UK and Ireland very harshly. Ineffective labor market policies, flexibility, high private indebtedness and low private savings, together with high public debts, increased income inequality and lowered labor productivity for at least a couple of subsequent years. One exception is Germany, where the labor market reforms of 2003-2004 allowed bringing the unemployment rate down to 6% even during the crisis years, but jobs are not stable and very low paid, pushing the German labor share down (and inequality up). In 2008 and 2009, labor productivity decreased in European countries, while it was about constant in Anglo-Saxon countries. Starting in 2009, until 2014, labor productivity grew at the same rate in both groups (see Appendix A). However, after the burst of the financial crisis, the labor income share experienced a sudden upsurge and after that volatile dynamics, which differed across countries. To take this structural break into the regression analysis, the explanatory variables are interacted with a time dummy FC that is equal to 1 for time-year  $\geq$  2007. Table 2 shows these results in columns 4, 5, 7 and 8 and reports a Wald test of parameter equality in column 6. This latter test indicates whether there is a significant increase or decrease of the impact of our variables of interest on the labor share after the burst of the crisis. The welfare impact does not change its significance over time, actually increasing its LS elasticity. This result is robust to all specifications (see Appendix B). ALMP turns out to be strongly positive in the after-crisis period from negative or nil before. This result is compatible with the positive impact of active programs on employment services, training or direct job creation, especially necessary after a recession. They do not show a crowding-out effect on employment, maybe exerting a general upward wage pressure effect or at least offsetting a downward trend. The Scandinavian countries in particular (Table 3) sustain labor income through the implementation of active programs (education, incentives for unemployed workers for immediate job search) whose target

appears to be more successful than the Anglo-Saxon one (based on employment services and training). PLMP turns out as depressing the LS during the recession. EPL is positive before and even after the crisis, when the negative consequences on declining employment and wages were limited by the existing regulations on labor protection. However, its equality test confirms a significant negative difference, therefore the strength of EPL at sustaining income lost power after 2007. The negative impact of trade union is robust over time; however, in the post-crisis period it depresses the labor share in all countries even more. In Table 4, welfare expenditures are strongly correlated to the LS both before and after the crisis period. Moreover, this policy impact is even stronger after 2007. Active LM programs appear to be significant and negative for MW countries in the pre-crisis period, and change to non-significant afterwards. On the other hand, passive LM programs are negatively correlated to the LS in NMW countries over time. In MW countries, it is even significantly positive before the start of the crisis. EPL is positively correlated to LS in MW countries only. Trade union elasticity is strongly negative in MW and negative but not significant in NMW countries. These results confirm that the minimum wage policy interacts with the other re-distributional policies, especially after an economic recession, when active and passive labor market programs change their intended impact on the LS.

## 6. Summary and conclusions

The focus of this paper is to evaluate the impact of social policies and labor market institutions on the level of the labor income share for groups of countries with different labor market and educational structures, and welfare regimes. It first discusses the control variables that potentially influence the declining trend of the labor share in most advanced economies, i.e. trade openness, technological progress, market competition, physical and human capital endowment in terms of skilled labor and (female) labor supply. Differently from other empirical research, the impact of policies and institutions appear to be relevant at sustaining (or depressing) the labor income share and vary quite substantially across countries and over time. The ‘European model’ (in Continental Europe) and the ‘Mediterranean model’ (Southern Europe) are the most successful at sustaining the labor share through expenditures on welfare (public health, pensions and other forms of social assistance, etc.). Scandinavian countries keep their level of labor income share mainly through the implementation of active labor market programs (education programs, incentives to unemployed

for immediate job search, start-up incentives) whose aim appears to be more successful than the Anglo-Saxon target (based on employment services and training). Moreover, Scandinavian passive measures such as unemployment benefits are conditional on participating in active programs. On the other hand, passive labor market measures seem to be robustly negative and detrimental in Continental Europe because they are usually not accompanied by active policies, causing long-run unemployment or discouraging job search. Generous unemployment benefits in fact counteract wage flexibility in European labor markets. New EU members have the lowest estimated elasticity to passive programs due to their more recent experience of high unemployment at the end of the 1990s. Active and passive measures are sensitive to the structural break in 2007, when their correlation to the LS becomes even stronger. Instead, the impact of welfare expenditures does not change over time (it remains strong and positive).

Like other empirical research findings, employment protection legislation has a positive effect on employment, which more than compensates for the negative direct and indirect labor adjustment costs, especially in Southern Europe, where hiring and firing costs are usually high. This result is compatible with the argument that higher employment protection brings about higher productivity growth and a higher labor share of income (VK, 2014). Nonetheless, the EPL impact becomes weaker after 2007. As in YZ (2011), union density elasticity is negatively correlated with the labor share in every group of countries. This might be due to the prevailing effect of bargaining pressure on depressing labor demand, when firms tend to substitute costly labor with capital. LS elasticity to trade union, however, is highest in Scandinavian countries and lowest in New EU members. In the post-crisis period, it depresses the labor share even more, especially in Scandinavian countries, but not in New EU members. Governments may sustain household income alternatively, preferring pre-tax and pre-transfer income distribution policies such as the minimum wage to alleviate the problem of inequality and unemployment. Indeed, the minimum wage is found to reinforce welfare policies at least for some individual categories, improving distributional effects. Nonetheless, minimum wage countries are on average less inclined to spend on welfare than NMW countries, rather preferring active or passive labor market measures. The elasticity of passive measures is even positive and slightly significant for minimum wage countries before 2007. Employment protection appears to be strongly positively correlated to the labor share in minimum wage countries and has no

significant impact in non-minimum wage countries, which appear to rely the most on welfare expenditures to sustain households' or individuals' incomes.

Overall, as expected in theoretical arguments, after 2007 policies sustaining labor income move to counteract the negative impact of employment and income loss. Welfare expenditures have the most important role in this respect. Employment protection is an important driver for the labor share. Finally, the minimum wage interacts with the other re-distributional policies, especially after the economic recession, when active and passive labor market programs change their intended impact on the LS on average in the group.

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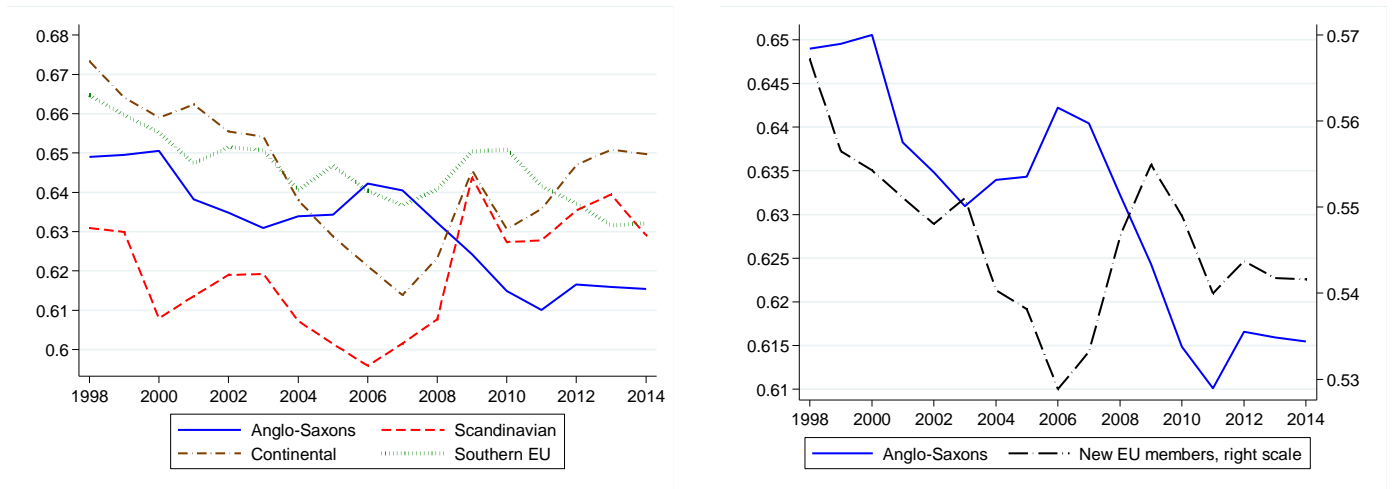
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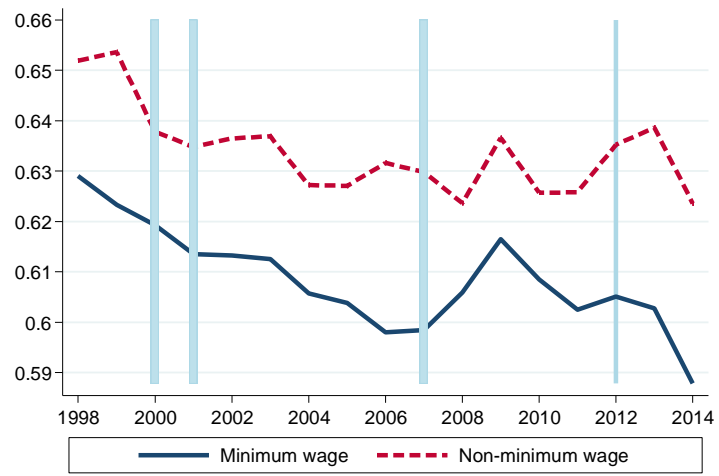
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**Figure 1. Labor share of countries by group**



**Figure 2. Minimum wage adopting and non-adopting countries' labor share**

Notes: Blue bars denote years of economic recession. Source: OECD database with elaboration by the author.

## Appendix A. More cross-country evidence on the causes of the declining labor income share

Evidence using different data is useful, both on the LS and on real wages and labor productivity. Starting from a simple accounting approach, in general, there exist several definitions of the labor share, but most of them depend on wage compensation unadjusted/adjusted by a correction factor for self-employed individuals. As explained in Section 4, the specific measure of LS (at year  $t$ ) in the paper depends on three variables: the total amount of employees' wage compensation, the value added of an economy, and the number of employees and self-employed individuals. With a bit of obvious notation, we can express the LS in the following way:

$$1. \quad LS = \frac{\text{Wage compensation of employees}}{\text{Value Added}} * \frac{\text{Employees+Selfemployed}}{\text{Employees}} = \frac{W}{VA} * \frac{L}{E}$$

$$2. \quad LS = \frac{W}{VA} * \frac{L}{E} = \frac{\frac{W}{E}}{\frac{VA}{L}}$$

Roughly speaking, the numerator is a measure of unit (real) wage, while the fraction at the denominator is an aggregate measure of labor productivity. If we take the growth rate of the LS, we get

$$3. \quad \frac{\dot{LS}}{LS} = \frac{\dot{W}/E}{\frac{W}{E}} - \frac{\dot{VA}/L}{\frac{VA}{L}}$$

That is, the growth rate of the labor share depends positively on the (unit) wage growth rate and negatively on the labor productivity growth rate.

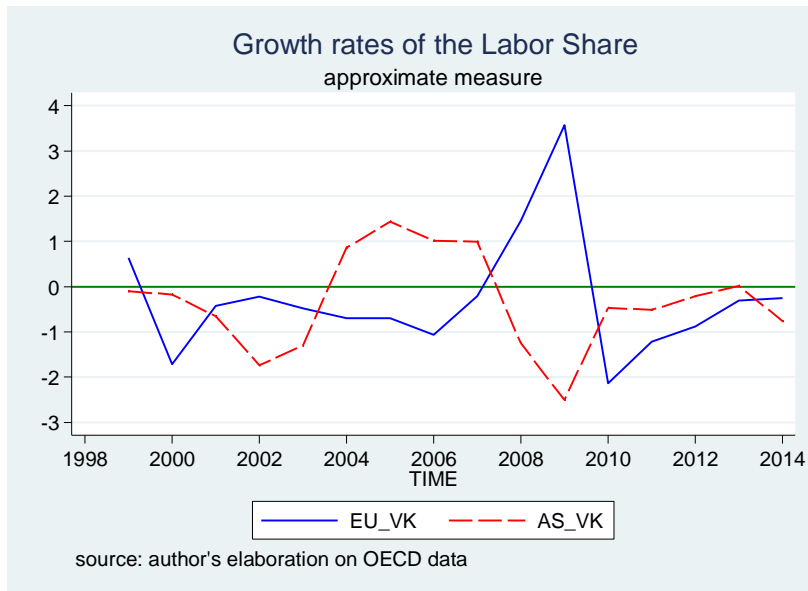
Alternatively, take total hours of work (growth) into account and rewrite Equation 3 as follows:

$$4. \quad \frac{\dot{LS}}{LS} = \frac{\dot{W}}{W} - \frac{\dot{E}}{E} - \frac{\dot{VA}/L}{\frac{VA}{L}}$$

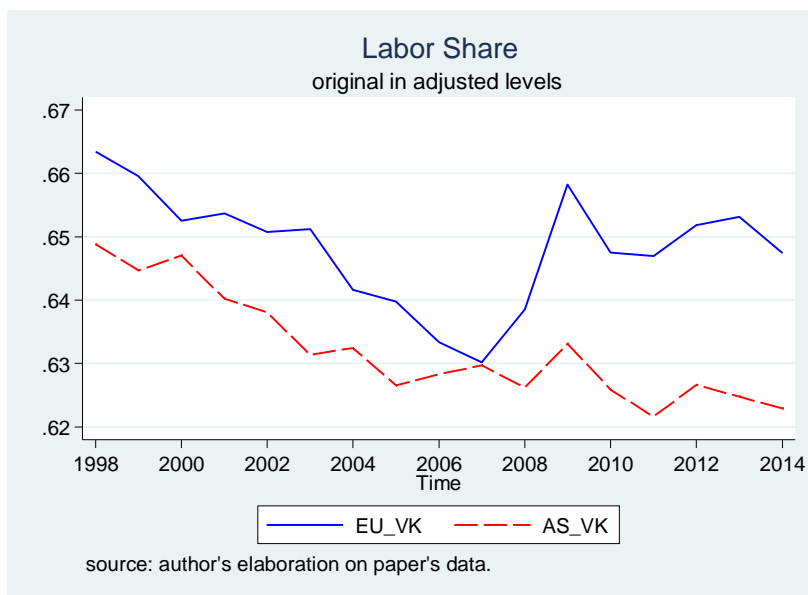
As pointed out in the article, European countries in general and Japan had substantially larger real wage growth and labor productivity growth than most Anglo-Saxon countries, at least until 2005. According to the relationship above, we should compare the "relative" growth in the two terms between countries or groups of countries in order to explain the declining trend in the LS. In other words, coordinated market economies had larger real wage growth and labor productivity growth than Anglo-Saxons (Liberal Market Economies, LME), but THEIR DIFFERENCE might have been higher than that for LME (especially for the period 1970-2012).

I analyze this possibility here for the period 1998-2014 (the period of observation in the article) using a different source of data and an approximate measure of the variables in Equation 3 above than that in Vergeer and Kleinknecht (2011) and Vergeer and Kleinknecht (VK, 2014), who used data from the Groningen Growth and Development Centre. Finally, the correlation of unemployment to passive labor market programs is depicted in Figures A.7 to A.9.

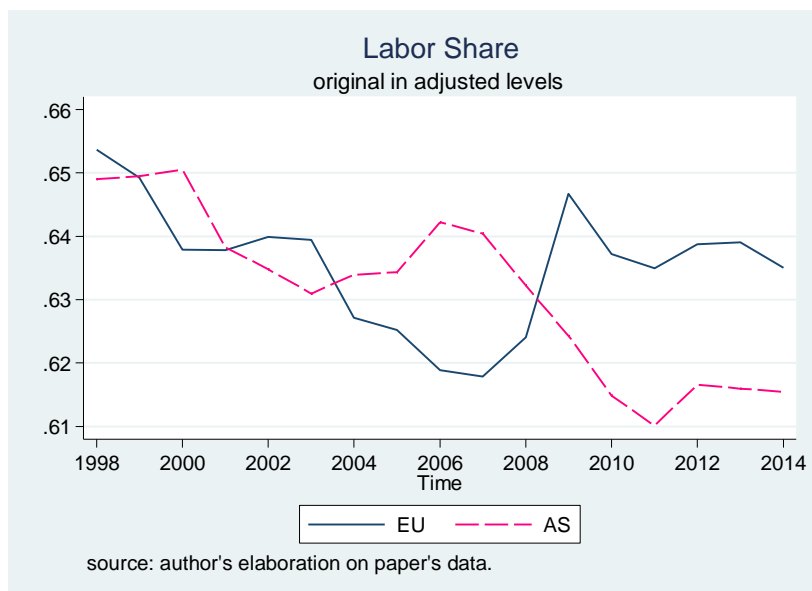
The EU group includes Continental, Southern Europe and Scandinavia (13 countries) and the AS group includes seven Anglo-Saxon countries. The latter groups differ from the VK groups because Greece and Norway are added to the European countries, and Ireland and Iceland are added to the Anglo Saxons. EU\_VK includes 11 countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Portugal, Spain and Sweden. AS\_VK includes Australia, Canada, New Zealand, UK and USA.



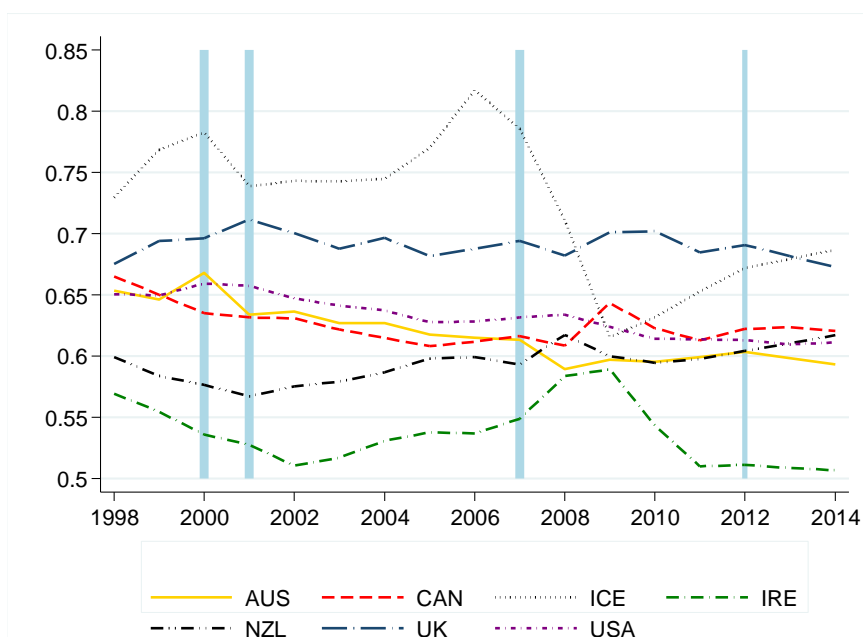
**Figure A.1. Labor share in growth rates, based on approximate measure and VK groups**



**Figure A.2. Labor share in levels, based on original definition and VK groups**

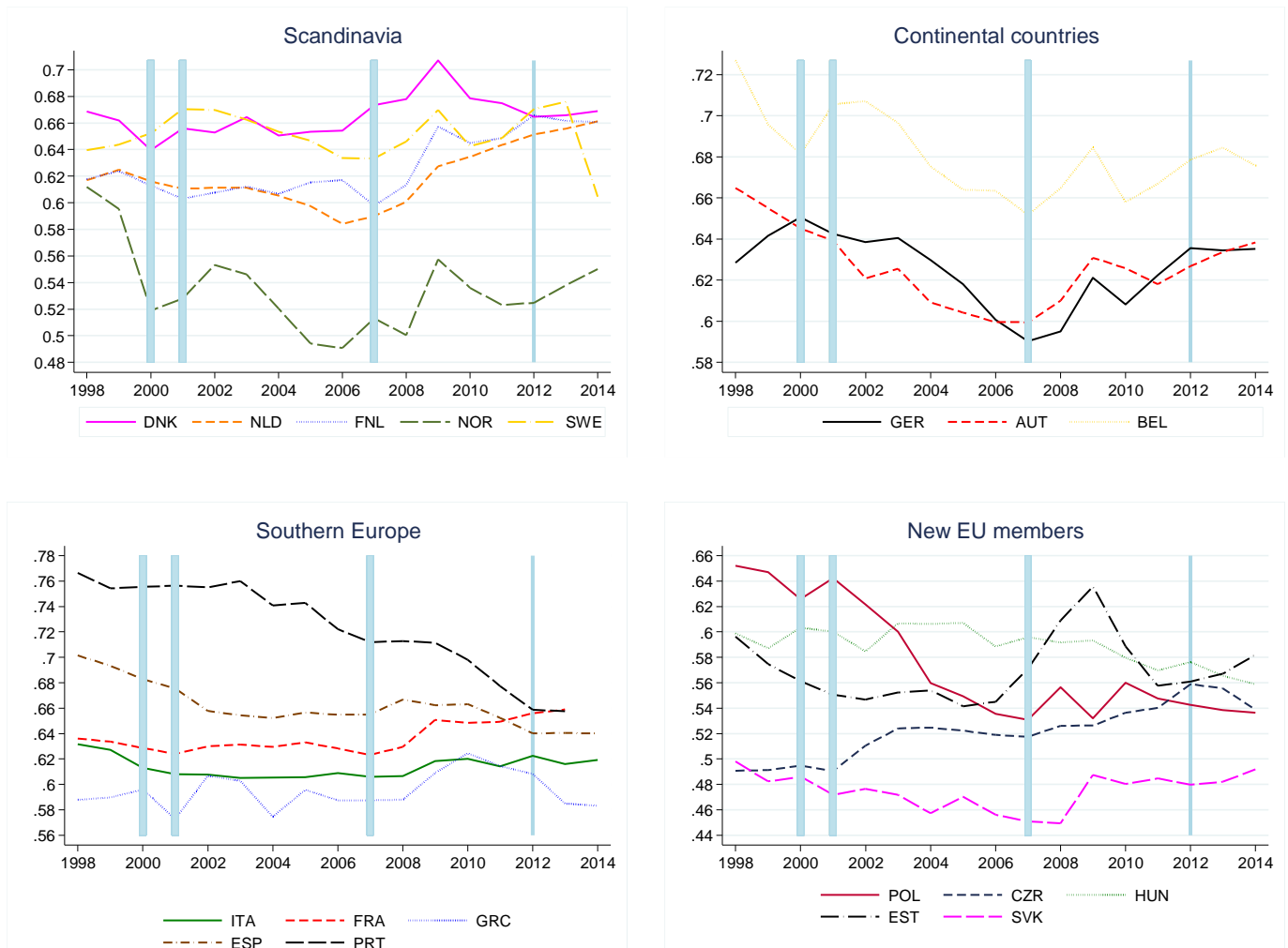


**Figure A.3. Labor share in levels, based on original definition and paper's groups**



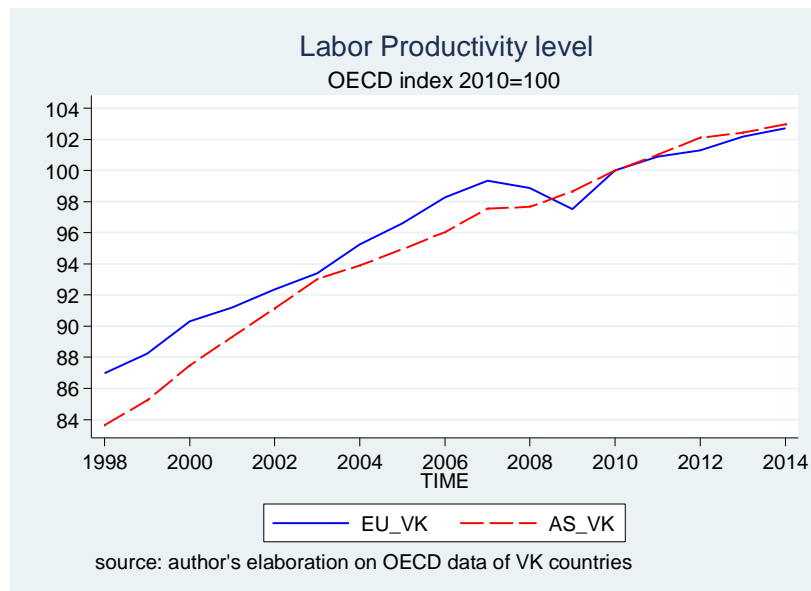
**Figure A.4. Labor share trend in Anglo-Saxon countries**

*Notes:* Blue bars denote years of economic recession. Source: OECD data with elaboration by the authors.

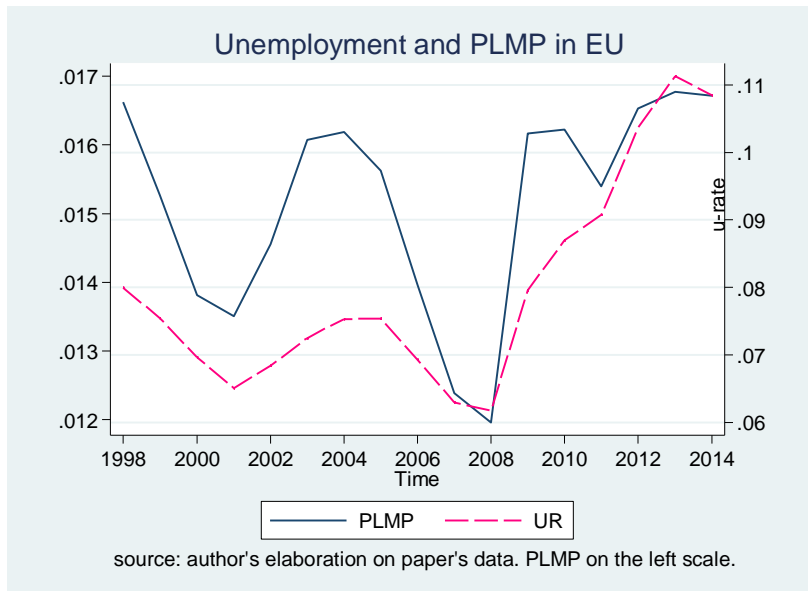


**Figure A.5. Labor share trend of all other groups**

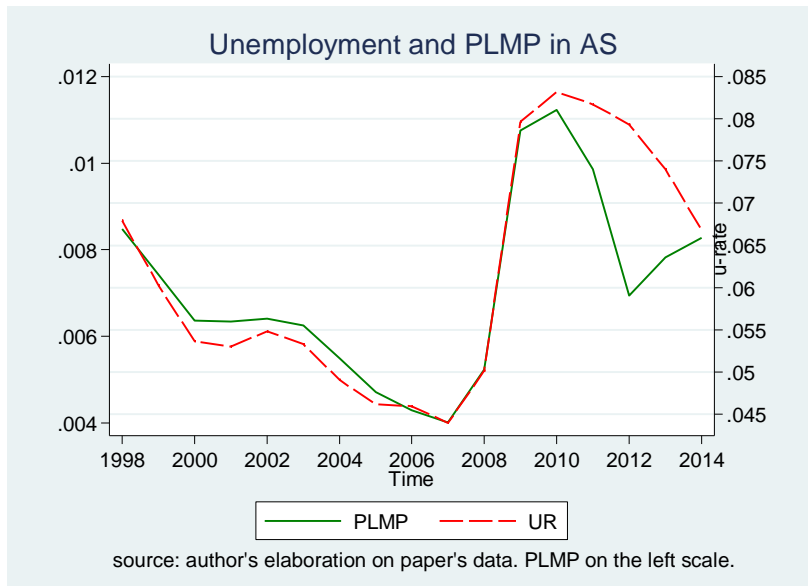
Notes: Blue bars denote years of economic recession. Source: OECD data with elaboration by the authors.



**Figure A.6. Labor productivity for VK countries**



**Figure A.7. Unemployment and passive labor market expenditures for EU countries**



**Figure A.8. Unemployment and passive labor market expenditures for AS countries**

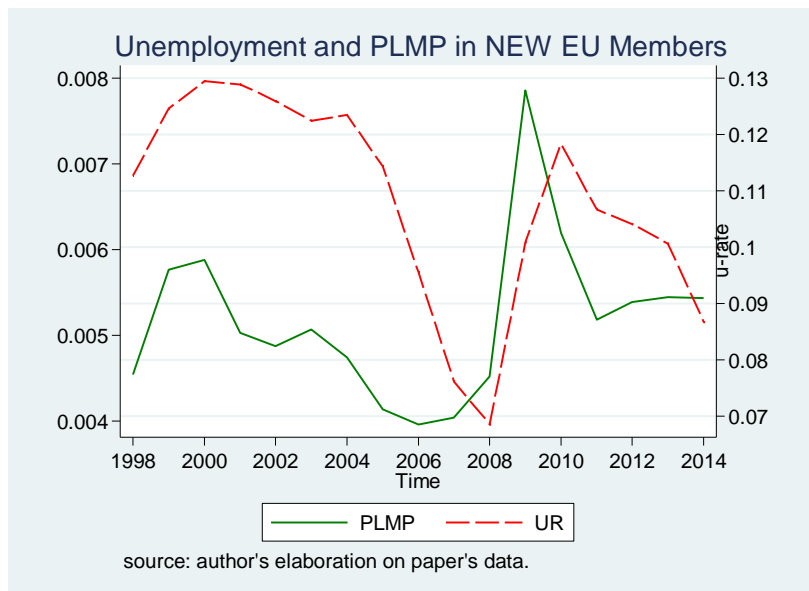


Figure A.9. Unemployment and passive labor market expenditures in New EU members



**Table 1. Descriptive statistics: 1998-2014**

	Anglo-Saxons	Scandinavia	Continental	Southern Europe	New EU members	All countries
Labor Share	0.631	0.620	0.644	0.646	0.546	0.616
Welfare	13.13	18.29	20.87	20.45	15.46	17.02
ALMP	0.350	1.22	0.828	0.655	0.290	0.630
PLMP	0.705	1.55	1.96	1.21	0.518	1.09
OSS	3.67	4.19	3.12	2.20	2.51	3.18
EPL	1.64	2.48	2.82	2.98	2.42	2.37
Trade union wages	32.91	57.78	36.12	20.82	16.89	32.65
Trade openness	52.11	77.87	105.56	38.57	68.61	64.3
Import of Intermediates	11.51	18.16	27.50	11.94	21.14	16.8
Distance to US	18.12	11.77	19.63	36.88	58.19	28.8
Distance to Norway	25.43	20.08	26.95	42.50	62.56	35.4
Investments	22.53	23.84	21.35	19.12	14.55	20.4
Capital Output ratio	3.27	3.48	3.59	4.33	3.26	3.56
TFP level	0.895	1.04	0.938	0.820	0.594	0.854
TFP growth	0.088	-0.181	0.174	-0.831	0.730	-0.011
Secondary education	44.15	47.67	53.21	33.57	68.49	48.69
Tertiary education	33.18	31.23	26.30	22.63	20.90	27.40
Female participation	71.8	75.0	64.74	60.78	62.62	67.53
Unemployment rate	6.14	5.65	6.85	10.98	10.82	8.03
Observations	119	85	51	85	85	425
Countries	7	5	3	5	5	25

*Notes:* Mean values for each group. Welfare is the percentage of GDP devoted to welfare expenditures (elders, survivors, impaired, health expenditures). ALMP refers to active labor market policy (including PES and administration, training, job rotation and sharing incentives, etc.).

PLMP refers to passive labor market policy (including subsidies for the unemployed). OSS refers to other social spending (including family and housing). These variables are in percentage of GDP. EPL refers to the Employment Protection Legislation OECD index measuring the strictness of employment protection, varying in the [0,6] interval: a higher index corresponds to higher protection. Trade union measures the percentage of wage and salary earners who are union members over total employees. Trade openness is the sum of imports and exports as a percentage of GDP. Import of intermediates measures the values of intermediate goods imported as a percentage of GDP. Distance to US measures the distance to the technological frontier; the higher this value, the less innovative the country. We also consider Norway as the technological frontier and measure its distance as a percentage of Norwegian GDP (Distance to Norway). TFP level is total factor productivity relative to US  $TFP = 1$ . TFP growth measures the yearly growth rate of the country's TFP (in %). Secondary education is the percentage of LF with at least a secondary degree. Tertiary education is the percentage of LF with a university or college degree. Female participation is the participation rate in the labor force of women aged 15-64. Unemployment rate is the average yearly national rate.

Table 2. Elasticities for all countries, 1998-2014, Labor market institutions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	standard	standard	(1)+HC+FP	(1) var. coeff.		Test	(3) var. coeff.	
	$\varepsilon \sim WN$	$\varepsilon \sim AR(1)$	$\varepsilon \sim WN$	pre	post		pre	post
<b>Welfare</b>	0.145***	0.163***	0.155***	0.115***	0.142***		0.132***	0.160***
	(0.0295)	(0.0289)	(0.0284)	(0.0285)	(0.0329)	[0.17]	(0.0279)	(0.0320)
<b>ALMP</b>	0.004	-0.002	0.006	-0.017**	0.031***		-0.013	0.029***
	(0.0087)	(0.0093)	(0.0084)	(0.0086)	(0.0106)	[0.00]	(0.0085)	(0.0106)
<b>PLMP</b>	-0.021***	-0.016**	-0.020***	0.004	-0.028***		0.005	-0.029***
	(0.0069)	(0.0067)	(0.0066)	(0.0084)	(0.0076)	[0.00]	(0.0084)	(0.0074)
<b>EPL</b>	0.038	0.050	0.059**	0.136***	0.064*		0.097***	0.064*
	(0.0303)	(0.0342)	(0.0290)	(0.0338)	(0.0332)	[0.00]	(0.0373)	(0.0326)
<b>Union</b>	-0.044*	0.017	-0.111***	-0.005	-0.025		-0.071**	-0.080***
	(0.0240)	(0.0413)	(0.0251)	(0.0258)	(0.0236)	[0.00]	(0.0279)	(0.0250)
<b>Obs.</b>	425	400	425	425			425	
<b>Countries</b>	25	25	25	25			25	
<b>R<sup>2</sup> within</b>	0.264	0.302	0.338	0.383			0.431	
<b>ADF (p=1)</b>	[0.023]			[0.000]	[0.000]			
<b>PP (p=1)</b>	[0.032]			[0.000]	[0.381]			

Notes: Standard errors are in parentheses, p-values in brackets. \* $\alpha \leq 0.10$ , \*\* $\alpha \leq 0.05$ , \*\*\* $\alpha \leq 0.01$ . Within-group FE estimates. The original specification contains a constant term. ADF(p=1) is the Augmented Dickey-Fuller test for panel unit root of the ln-labor share. PP is the Phillips-Perron panel unit root test, which is robust to structural breaks in the series. The standard regression includes K/Y, TFP level, intermediate imports. Augmented regression includes HC: Tertiary educated labor force share; FP: Female participation rate. Pre-crisis refers to the period before the initial crisis year (FC=0 if  $t < 2007$ ), Post-crisis refers to the period  $t \geq 2007$  (FC=1). Wald test of equality of coefficients across the two periods (4) and (5).

Table 3. Decomposition of marginal effects for country groups and structural break

		Anglo-Saxons	Scandinavians	Continental	Southern EU	New EU Members
<b>Welfare</b>	FC=0	0.101***	0.143***	0.166***	0.154***	0.121***
		(0.021)	(0.030)	(0.035)	(0.033)	(0.026)
	FC=1	0.125***	0.169***	0.191***	0.197***	0.143***
		(0.025)	(0.034)	(0.038)	(0.040)	(0.029)
<b>ALMP</b>	FC=0	-0.007	-0.026	-0.017	-0.013	-0.005
		(0.005)	(0.017)	(0.011)	(0.009)	(0.003)
	FC=1	0.016***	0.054***	0.038***	0.031***	0.015***
		(0.006)	(0.020)	(0.014)	(0.011)	(0.005)
<b>PLMP</b>	FC=0	0.003	0.008	0.009	0.005	0.002
		(0.005)	(0.014)	(0.015)	(0.008)	(0.004)
	FC=1	-0.020***	-0.035***	-0.051***	-0.035***	-0.014***
		(0.005)	(0.009)	(0.013)	(0.009)	(0.004)
<b>EPL</b>	FC=0	0.064***	0.100***	0.113***	0.124***	0.100***
		(0.025)	(0.039)	(0.044)	(0.048)	(0.039)
	FC=1	0.046**	0.067**	0.077**	0.077**	0.063**
		(0.023)	(0.034)	(0.039)	(0.040)	(0.032)
<b>TU</b>	FC=0	-0.071**	-0.124**	-0.078**	-0.044**	-0.043**
		(0.028)	(0.049)	(0.031)	(0.017)	(0.017)
	FC=1	-0.082***	-0.144***	-0.089***	-0.054***	-0.033***
		(0.026)	(0.045)	(0.028)	(0.017)	(0.010)

Notes: Standard errors are in parentheses. \* $\alpha \leq 0.10$ , \*\* $\alpha \leq 0.05$ , \*\*\* $\alpha \leq 0.01$ . Based on total sample observations, these are estimated elasticities decomposed by country group and time period. FC=1 refers to time  $t > 2006$ . Other variables are K/Y, TFP level, intermediate imports, HC: Tertiary educated labor force share, FP: Female participation rate.

Table 4. Elasticities for minimum wage (MW) and non-minimum wage (NMW) countries

	MW	NMW	MW		NMW	
			Pre	Post	Pre	Post
<b>Welfare</b>	0.061*	0.316***	0.062**	0.093**	0.274***	0.352***
	(0.0332)	(0.0523)	(0.0300)	(0.0376)	(0.0713)	(0.0640)
<b>ALMP</b>	0.010	0.007	-0.021*	0.016	-0.008	-0.000
	(0.0121)	(0.0119)	(0.0119)	(0.0146)	(0.0132)	(0.0163)
<b>PLMP</b>	0.003	-0.066***	0.021**	0.006	-0.063***	-0.061***
	(0.0084)	(0.0112)	(0.0098)	(0.0092)	(0.0152)	(0.0116)
<b>EPL</b>	0.064**	0.039	0.175***	0.110***	0.100	0.056
	(0.0325)	(0.0878)	(0.0408)	(0.0351)	(0.1139)	(0.0880)
<b>Trade union</b>	-0.082***	-0.035	-0.045*	-0.073***	0.132	-0.058
	(0.0214)	(0.0737)	(0.0237)	(0.0207)	(0.1058)	(0.0963)
<b>Observations</b>	287	138	287		138	
<b>Countries</b>	18	7	18		7	
<b>R<sup>2</sup></b>	0.166	0.585	0.424		0.813	

Notes: Standard errors in parentheses. \* $\alpha \leq 0.10$ , \*\* $\alpha \leq 0.05$ , \*\*\* $\alpha \leq 0.01$ . R<sup>2</sup> is within group R-square. “Pre” refers to period before the initial crisis year (<2007), “Post” refers to the period 2007-2014. Other variables are K/Y, TFP level, intermediate imports, HC: Tertiary educated labor force share, FP: Female participation rate.

Table 5. 2SLS-IV estimated coefficients for standard regression

	(1)	(2)	(3)	(4)	(5)	(6)
	1998-2014	before	after	1998-2014	before	after
<b>Welfare</b>	0.040***	-0.003	0.044**	0.032***	-0.024	0.029**
	(0.0114)	(0.0459)	(0.0195)	(0.0091)	(0.0192)	(0.0129)
<b>ALMP</b>	0.039	0.019	-0.012	0.022	-0.070	0.004
	(0.0431)	(0.1410)	(0.1579)	(0.0396)	(0.0789)	(0.1345)
<b>PLMP</b>	-0.077***	0.011	-0.138***	-0.066***	0.024	-0.113***
	(0.0149)	(0.0357)	(0.0492)	(0.0129)	(0.0266)	(0.0364)
<b>EPL</b>	0.033*	0.177	0.065	0.032*	0.050	0.029
	(0.0198)	(0.1109)	(0.0412)	(0.0172)	(0.0770)	(0.0334)
<b>Trade union</b>	-0.002*	-0.010	-0.004	-0.004***	-0.013***	-0.004
	(0.0012)	(0.0087)	(0.0035)	(0.0015)	(0.0049)	(0.0031)
<b>Observations</b>	375	175	200	375	175	200
<b>Countries</b>	25	25	25	25	25	25
<b>R<sup>2</sup></b>	0.236	0.244	0.568	0.076	.	.
<b>Sargan p-value</b>	[0.489]	[0.567]	[0.779]	[0.659]	[0.150]	[0.974]
<b>Instrumented</b>	LMI	LMI	LMI	all	all	all

Notes: Standard errors are in parentheses, p-values in brackets. \*  $p \leq 0.1$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Elasticities of 2SLS-IV estimator with small sample correction. Excluded instruments are  $\Delta$ Welfare, twice lagged ALMP, lagged PLMP, lagged TFP, lagged trade union, lagged EPL; included instruments are K/Y, TFP, Intermediate imports in (1)-(3). Regression in column 4 instruments all variables. Excluded instruments are lagged  $\Delta$ Welfare, twice lagged ALMP, lagged PLMP, lagged K/Y, lagged  $\Delta$ K/Y, lagged trade union, lagged  $\Delta$ Intermediate imports,  $\Delta$ Trade openness; included instrument EPL. In (5) and (6) centered R<sup>2</sup> are negative and not reported.

## Appendix B

Table 2.A. Within-group-FE marginal effects on whole sample with standard and augmented variables + LMI

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	standar d	(1)+HC	(2)+FP R	Inv.	(4)+K/ Y	TFP growth	D	(5)+D	(3)+U	(5)+D+ U
Welfare	0.145** *	0.151** *	0.155** *	0.143** *	0.163** *	0.168** *	0.179** *	0.166** *	0.168** *	0.168** *
	(0.0295 )	(0.0281 )	(0.0284 )	(0.0272 )	(0.0281 )	(0.0300 )	(0.0305 )	(0.0277 )	(0.0285 )	(0.0279 )
ALMP	0.004 (0.0087 )	0.007 (0.0083 )	0.006 (0.0084 )	0.008 (0.0084 )	0.007 (0.0083 )	0.014 (0.0089 )	0.012 (0.0090 )	0.004 (0.0082 )	0.001 (0.0085 )	0.003 (0.0084 )
PLMP	- 0.021** *	- 0.020** *	- 0.020** *	- 0.014**	-0.012*	- 0.021** *	- 0.022** *	-0.012*	-0.013*	-0.011
	(0.0069 )	(0.0066 )	(0.0066 )	(0.0069 )	(0.0069 )	(0.0069 )	(0.0071 )	(0.0068 )	(0.0070 )	(0.0071 )
EPL	0.038 (0.0303 )	0.059** (0.0290 )	0.059** (0.0290 )	0.064** (0.0275 )	0.038 (0.0291 )	0.130** (0.0288 )	0.136** (0.0293 )	0.012 (0.0295 )	0.031 (0.0302 )	0.009 (0.0300 )
Trade union	- 0.0438*	- 0.111** *	- 0.111** *	- 0.117** *	- 0.115** *	- 0.059**	- 0.085** *	- 0.079** *	- 0.109** *	- 0.081** *
	(0.0240 )	(0.0250 )	(0.0251 )	(0.0249 )	(0.0247 )	(0.0263 )	(0.0287 )	(0.0262 )	(0.0248 )	(0.0265 )
K/Y	- 0.135** *	- 0.068** *	- 0.061** *	-	- 0.056** *	0.036*	0.040**	- 0.088** *	-0.044*	- 0.081** *
	(0.0188 )	(0.0206 )	(0.0220 )		(0.0217 )	(0.0186 )	(0.0189 )	(0.0231 )	(0.0226 )	(0.0252 )
TFP level	- 0.291** *	- 0.254** *	- 0.250** *	- 0.194** *	- 0.244** *	-	-	- 0.330** *	- 0.254** *	- 0.325** *
	(0.0333 )	(0.0321 )	(0.0325 )	(0.0257 )	(0.0320 )			(0.0395 )	(0.0322 )	(0.0405 )
Intermediate Imports	-0.017* (0.0089 )	- 0.017** (0.0085 )	- 0.017** (0.0085 )	- 0.032** (0.0088 )	- 0.029** (0.0089 )	-0.007 (0.0090 )	-0.011 (0.0090 )	- 0.028** (0.0087 )	- 0.025** (0.0088 )	- 0.029** (0.0090 )
Tertiary education	- (0.0190 )	- 0.124** * (0.0190 )	- 0.121** * (0.0194 )	- 0.142** * (0.0177 )	- 0.123** * (0.0191 )	- 0.141** * (0.0202 )	- 0.138** * (0.0209 )	- 0.131** * (0.0189 )	- 0.131** * (0.0195 )	- 0.132** * (0.0191 )
Female participation	- (0.0618 )	- (0.0582 )	-0.053 (0.0618 )	- 0.147** (0.0582 )	-0.091 (0.0617 )	-0.122* (0.0646 )	-0.111* (0.0666 )	-0.104* (0.0609 )	-0.063 (0.0613 )	-0.103* (0.0609 )
Investment intensity	- (0.0082 )	- (0.0081 )	-	0.031** * (0.0082 )	0.030** * (0.0081 )	-	-	0.022** * (0.0083 )	-	0.021** (0.0085 )

				)	)			)		)
TFP growth	-	-	-	-	-	-	-	-	-	-
						0.004** *				
						(0.0010 )				
Distance to US	-	-	-	-	-	-	0.011	-	-	-
							(0.0128 )	(0.0148 )		(0.0163 )
Unemployment rate	-	-	-	-	-	-	-	-	-	-0.005
									0.020** *	(0.0076 )
Within-group R <sup>2</sup>	0.264	0.337	0.338	0.350	0.361	0.264	0.239	0.382	0.353	0.382
Observations	425	425	425	425	425	425	425	425	425	425

Notes: HC: tertiary educated labor force share. FPR: female participation rate. Inv.: investment intensity over GDP. D: distance to US frontier. U: unemployment rate. In column 4 capital/output is substituted with investment intensity. In column 6 TFP level is substituted with TFP growth. In column 7 TFP level is substituted with distance to US frontier. In column 8, TFP level and distance to US are both in the regression.





*Notes:* FC=1 if year $\geq$ 2007. Variable coefficients model. The test indicates the p-value of the test of  $H_0$ : equality of parameters before and after 2007; HC: tertiary educated labor force share; FPR: female participation rate; Inv.: investment intensity over GDP; D: distance to US frontier; U: unemployment rate.

Table 3.A. Contribution to marginal effects of each group of countries: Standard regression (1)

	Anglo-Saxons	Scandinavians	Continental	Southern EU	New EU Members
<b>Welfare</b>	0.112***	0.155 ***	0.177***	0.174***	0.131***
	(0.0227)	(0.0317)	(0.0362)	(0.0355)	(0.0268)
<b>ALMP</b>	0.002	0.008	0.005	0.0041	0.002
	(0.0048)	(0.0169)	(0.0115)	(0.0091)	(0.0040)
<b>PLMP</b>	-0.0134***	-0.030***	-0.037***	-0.023***	-0.0098***
	(0.0045)	(0.0099)	(0.0125)	(0.0077)	(0.0033)
<b>EPL</b>	0.026	0.039	0.045	0.047	0.038
	(0.0209)	(0.0316)	(0.0360)	(0.0380)	(0.0309)
<b>Trade union</b>	-0.044*	-0.078*	-0.049*	-0.028*	-0.023*
	(0.0242)	(0.0425)	(0.0266)	(0.0153)	(0.0124)

		Anglo-Saxons	Scandinavians	Continental	Southern EU	New EU Members
<b>Welfare</b>	FC=0	0.088***	0.125***	0.144***	0.134***	0.106***
		(0.022)	(0.031)	(0.036)	(0.033)	(0.026)
	FC=1	0.111***	0.151***	0.170***	0.176***	0.127***
		(0.026)	(0.035)	(0.039)	(0.041)	(0.029)
<b>ALMP</b>	FC=0	-0.010**	-0.035**	-0.023**	-0.018**	-0.007**
		(0.005)	(0.017)	(0.011)	(0.009)	(0.003)
	FC=1	0.017***	0.057***	0.040***	0.032***	0.016***
		(0.006)	(0.020)	(0.014)	(0.011)	(0.006)
<b>PLMP</b>	FC=0	0.002	0.006	0.007	0.004	0.002
		(0.005)	(0.014)	(0.015)	(0.008)	(0.004)
	FC=1	-0.020***	-0.034***	-0.049***	-0.034***	-0.014***
		(0.005)	(0.009)	(0.013)	(0.009)	(0.004)
<b>EPL</b>	FC=0	0.091***	0.141***	0.160***	0.175***	0.141***
		(0.023)	(0.035)	(0.040)	(0.043)	(0.035)
	FC=1	0.046*	0.068*	0.078*	0.078*	0.064*
		(0.024)	(0.035)	(0.040)	(0.040)	(0.033)
<b>TU</b>	FC=0	-0.005	-0.008	-0.005	-0.003	-0.003
		(0.026)	(0.045)	(0.028)	(0.016)	(0.015)
	FC=1	-0.026	-0.046	-0.028	-0.017	-0.010
		(0.024)	(0.043)	(0.026)	(0.016)	(0.010)

Other variables: K/Y, TFP level, Intermediate imports.

**Table 4.A. Elasticities for minimum wage (MW) and non-minimum wage (NMW) countries:  
Standard regression (1)**

	MW	NMW	MW		NMW	
			Pre	Post	Pre	Post
<b>Welfare</b>	0.048	0.280***	0.058**	0.089**	0.160**	0.237***
	(0.0339)	(0.0552)	(0.0292)	(0.0369)	(0.0722)	(0.0680)
<b>ALMP</b>	0.006	0.009	-0.017	0.008	-0.016	0.017
	(0.0121)	(0.0128)	(0.0111)	(0.0142)	(0.0145)	(0.0182)
<b>PLMP</b>	0.009	-0.079***	0.021**	0.003	-0.050***	-0.051***
	(0.0086)	(0.0113)	(0.0093)	(0.0086)	(0.0165)	(0.0128)
<b>EPL</b>	0.047	0.114	0.186***	0.112***	0.274***	0.078
	(0.0333)	(0.0835)	(0.0370)	(0.0346)	(0.0895)	(0.0957)
<b>Trade union</b>	-0.043**	0.106	-0.015	-0.060***	0.173**	0.115
	(0.0205)	(0.0686)	(0.0215)	(0.0200)	(0.0854)	(0.0907)
<b>Observations</b>	287	138	287		138	
<b>Countries</b>	18	7	18		7	
<b>R<sup>2</sup></b>	0.166	0.585	0.399		0.699	

**Table 4.B. Elasticities for minimum wage (MW) and non-minimum wage (NMW) countries:  
Augmented regression (8)**

	MW	NMW	MW		NMW	
			Pre	Post	Pre	Post
<b>Welfare</b>	0.066**	0.409***	0.078**	0.095**	0.257***	0.422***
	(0.0330)	(0.0616)	(0.0304)	(0.0401)	(0.0675)	(0.0631)
<b>ALMP</b>	0.007	-0.001	-0.031**	0.022	-0.009	-0.010
	(0.0121)	(0.0160)	(0.0125)	(0.0150)	(0.0122)	(0.0145)
<b>PLMP</b>	0.002	-0.040***	0.026**	0.006	-0.048***	-0.034***
	(0.0087)	(0.0113)	(0.0104)	(0.0095)	(0.0155)	(0.0116)
<b>EPL</b>	0.037	0.033	0.177***	0.075**	0.086	0.047
	(0.0342)	(0.0845)	(0.0409)	(0.0367)	(0.1106)	(0.0797)
<b>Trade union</b>	-0.059**	0.070	-0.015	-0.043*	0.163	0.062
	(0.0234)	(0.0871)	(0.0270)	(0.0240)	(0.1015)	(0.1117)
<b>Observations</b>	287	138	287		138	
<b>Countries</b>	18	7	18		7	
<b>R<sup>2</sup></b>	0.251	0.715	0.453		0.863	

Table 5. Estimates of model (2) with 2SLS-IV method

	(1)	(2)	(3)	(4)	(5)	(6)
	policy	before	after	all	before	after
<b>Welfare</b>	0.040***	-0.003	0.044**	0.032***	-0.024	0.029**
	(0.0114)	(0.0459)	(0.0195)	(0.0091)	(0.0192)	(0.0129)
<b>ALMP</b>	0.039	0.019	-0.012	0.022	-0.070	0.004
	(0.0431)	(0.1410)	(0.1579)	(0.0396)	(0.0789)	(0.1345)
<b>PLMP</b>	-0.077***	0.011	-0.138***	-0.066***	0.024	-0.113***
	(0.0149)	(0.0357)	(0.0492)	(0.0129)	(0.0266)	(0.0364)
<b>EPL</b>	0.033*	0.177	0.065	0.032*	0.050	0.029
	(0.0198)	(0.1109)	(0.0412)	(0.0172)	(0.0770)	(0.0334)
<b>Trade union</b>	-0.002*	-0.010	-0.004	-0.004***	-0.013***	-0.004
	(0.0012)	(0.0087)	(0.0035)	(0.0015)	(0.0049)	(0.0031)
<b>K/Y</b>	-0.068***	-0.039	-0.046**	-0.057***	-0.025	-0.064***
	(0.0162)	(0.0324)	(0.0204)	(0.0144)	(0.0190)	(0.0206)
<b>TFP</b>	-0.257***	-0.377	-0.259	-0.275***	-0.472***	-0.457
	(0.0621)	(0.2305)	(0.2097)	(0.0786)	(0.1544)	(0.2810)
<b>Intermediate imports</b>	-0.000	-0.004	-0.003	-0.003**	-0.007*	-0.006***
	(0.0009)	(0.0056)	(0.0021)	(0.0015)	(0.0035)	(0.0021)
<b>Observations</b>	375	175	200	375	175	200
<b>Sargan-Hansen</b>	0.478	0.328	0.079	0.833	3.791	0.053
<b>p-value</b>	[0.489]	[0.567]	[0.779]	[0.659]	[0.150]	[0.974]

Notes: Standard errors are in parentheses, P-values in brackets. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The 2SLS-IV method on standard regression is in column 1 of Table 2. In (1)-(3) policy and LMI variables are instrumented with the lagged difference of welfare, twice lagged ALMP, lagged PLMP, lagged TFP, lagged trade union density, lagged EPL index.