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Labour shares, employment protection and unions in European economies

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Abstract

We analyse the role that the liberalisation of temporary contracts plays in labour share in some EU countries. The empirical analysis mainly relies on the EUKLEMS database and applies a *difference-in-difference* approach. Our results, focused on periods of different length (1996–2007 and 1996–2013), show that legislative innovations that favour the extensive use of temporary contracts negatively affect the labour share, likely because they lower employees' average compensations. We hypothesize that these labour reforms, which lead to enduring skill deficits and job instability, have influenced the functional distribution of income, thus failing to halt the erosion of the labour share of previous decades.

Keywords: factor income distribution, labour regulation

JEL Classifications: E25; J50.

Introduction

The slowdown of the labour share (LS) recorded in industrial countries from the early 1980s has spurred a resurgence of interest in the functional distribution of income and has led many economists to reconsider the role of factors such as globalization, total factor productivity growth, the Information and Communications Technologies (ICT) revolution, and capital deepening (OECD, 2012). In particular, since the early 1990s, technological progress and exposure to routine-based occupations has explained about half of the overall decline in LS in advanced economies (IMF, 2017a). Only during the global crisis LS paused or slightly reversed, mainly because during recessions wages tend to be less volatile than profits.

Furthermore, since the mid-1990s, as signaled by the IMF (2017a), in a number of European countries, the fall in LS is the result of the failure of wage growth to keep up with weak productivity growth. We suspect that in this new scenario, characterized by the waning of the ICT revolution, slower innovation, and slower human capital accumulation (IMF, 2017b, p. 5-6), the substantial liberalisation of labour markets recorded since the mid-1990s has played a role. We suggest that a higher utilisation of temporary contracts has not only discouraged investment in skills, with detrimental effects on labour productivity (European Commission, 2013, p.85), but has also lowered workers' bargaining power, with a negative impact on LS.

The liberalisation of labour markets has followed the key recommendations of the 1994 OECD Jobs Strategy, in particular in terms of new regulatory frameworks to liberalise the utilisation of temporary contracts. As a result, extensive use of these contracts has been a distinctive characteristic of European labour markets, and temporary contracts are more common now than in the mid-1990s. However, these trends have also coincided with 'subdued' nominal wage growth and wage weakness (IMF, 2017c, p. 89). Furthermore, as shown by Blanchard and Landier (2002) and Boeri and Garibaldi (2007), labour market reforms that increase flexibility 'at the margin',

reducing legal restrictions on temporary contracts and leaving untouched the legislation applying to open-ended contracts, have not produced lasting effects on employment. Indeed, the gains in terms of additional temporary jobs only compensate for the loss of permanent employment. This appears to be a relevant factor, but previous literature on LS has only analysed the role of overall employment protection legislation (Checchi and Garcia-Peñalosa, 2008; 2010; OECD, 2012), without considering separately regulation of temporary forms of employment.[i]

The main aim of this paper is to fill that gap. We hypothesize that this liberalisation, which in some countries has increased the diffusion of precarious jobs, has weakened workers' bargaining power without inducing offsetting effects through the channel of increased job opportunities. Thus, this liberalisation has failed to reverse the long-run trend where "labour is losing to capital" (OECD, 2012) and has instead exerted a negative impact, independent of that exerted by non-labour-augmenting technical progress. Today, these issues are extremely important for EU countries because welfare-enhancing policy packages that counteract the declining trend of LS may be relevant in wage-led demand regimes, typically represented by the euro area, where these political reforms could sustain demand and a return to sustainable growth.

We use industry-level data for a sample of 9 sectors of the market economy in 12 EU countries for the period 1996 to 2013, to verify whether relaxation of employment protection legislation of temporary employment (*EPLT*) has influenced the functional distribution of income.

After providing summary statistics and preliminary descriptive investigations, first we apply a difference-in-difference econometric method to verify whether reform of temporary contracts in labour legislation has had a negative effect on LS, especially in industries with a higher propensity to employ temporary workers. We analyse this relationship separately for the extended period of 1996–2013 and the sub-period preceding the outbreak of the economic crisis (1996–2007) in order to identify effects caused by the global recession shocks. The results of our research show that these liberalisations have had a negative influence which is additional to that of the non-labour-augmenting technological process, which also negatively affected LS. This negative influence has been exerted under general conditions in which the power relationship between unions and employers has altered and unions have reduced their wage demands, thus contributing to the decline of LS.

Secondly, using fixed effects, generalized methods of moments (GMM), and error-correction approaches, we explore long-term impacts and how the adoption of temporary contracts has influenced labour share in the short and longer run between 1996 and 2013.

The paper is organised as follows. Section 2 briefly reviews the related literature on functional income distribution and discusses the conceptual framework behind our empirical strategy. Section

3 discusses the econometric strategy, while section 4 presents data, some descriptive statistics, and estimates. Section 5 concludes.

2. Background discussion

2.1 The determinants of labour share: a brief review of the literature

The decline in LS, observed from the early 1980s onwards in nearly all OECD countries, has led to a resurgence of interest in the analysis of factor share dynamics and also international organisations have tried to identify the main factors behind movements in LS (IMF, 2007 and 2017a; European Commission, 2007; BIS, 2006; ILO, 2013).

Globalisation has been identified as a main driving force behind this decline, measured by different openness indicators (Harrison, 2002; Jayadev, 2007), under the general belief that immigration flows and offshoring in emerging economies with lower labour costs have exerted downward pressure on European and US labour shares (IMF, 2007; Elsby et al., 2013). In addition, it has been shown that due to the progressive elimination of cross-border restrictions on trade, import competition has contributed to containing wage demands (OECD, 2012). However, the empirical evidence so far has not been conclusive, and this area of research has not been able to fully reproduce LS dynamics. For instance, Guerriero and Sen (2012) find a positive effect of international trade on LS, and there is no evidence that wages are related to imports from emerging economies. In addition, sectors not exposed to import shocks (such as non-traded sectors) have also recorded a reduction in LS, as argued by Autor et al. (2017).

Technological change is another driving force that has been considered. Starting from the early 1980s, technological change, as capital-augmenting and capital-deepening, has contributed to the decline in LS, as shown by Bentolila and Saint Paul (2003) and later confirmed by Bassanini and Manfredi (2012). In particular, ICT have replaced workers involved in routine tasks, and these substitution effects, which have accompanied skill-biased technical changes, have penalised the position of low-educated workers (Arpaia et al., 2009; European Commission, 2007). Behind these changes, as signaled by Karabarbounis and Nieman (2014), there are also decreases in the relative price of investment goods, likely due to the fast decline of equipment prices of *ICT* technologies that have induced firms to shift away from labour and toward capital.

However, the role of relative capital price reduction in the decline of LS only obtains when the capital–labour elasticity of substitution is greater than unity, whereas empirical literature suggests much lower values and does not confirm that capital and labour are gross substitutes, as surveyed by Chirinko (2008) and Lawrence (2015). In addition, Autor et al. (2017) emphasize the crucial role of the interaction of technology and market conditions, showing that only market concentration and

reallocation in 'superstar' firms that command a growing market share and show declining LS may explain the aggregate effects of the reduction in the price of capital goods.

As for automation, Acemoglu and Restrepo (2016), highlight that it tends to reduce employment and the share of labour in national income. However, the creation of a more complex version of existing tasks, especially those labour-intensive where labour tends to have a comparative advantage, may have the opposite effect on LS. Interestingly, recent research (Barkai, 2016) also addresses the role of concentration and increasing mark-ups to explain the contemporaneous decline in both labour and capital shares caused by a larger amount of output being distributed as profit.

In a third line of research, deterioration of labour power is represented as an additional important driver of LS. Checchi and Garcia Peñalosa (2010) investigate this relationship for 16 OECD countries between 1960 and 2000 and find no robust evidence for union density, minimum wage, and unemployment benefits having a positive influence on LS; the only exception being coordination bargaining, which boosts income accruing to labour. They also find that EPL tends to lower the wage pressure exerted by unions, but they do not explore the role of EPLT or the potentially different impact of institutions across industries. This is probably because they are analysing a period in which the rise of flexible labour arrangements was still a marginal phenomenon. Other authors emphasize that the striking technological changes affecting ICT-related goods have also improved the quality of monitoring worker effort (Bental and Demougin, 2010) and reduced the endogenous bargaining power of (unskilled) labour. Capital-embodied technological acceleration has lowered firms' incentives to create new unskilled jobs and reduced the LS, while the presence of labour market regulation has amplified these effects, thus leading to a 'technology–policy interaction' (Hornstein et al., 2007). Furthermore, recent work by the OECD (2012), which supports the thesis of technical progress as one of the most important determinants of factor shares, recognizes the influence of the increasing diffusion of temporary contracts on LS. The adoption of these contracts modifies "the nature of employment relations in a way that makes it more difficult for trade unions to recruit members" (OECD 2012, p.135) and represents a structural factor that drives the evolution of collective bargaining and contributes to explaining LS trends. Surprisingly, when the same OECD report analyses the quantitative impact of determinants of LS between 1990 and 2007, it only considers employment protection for regular workers and does not take into account temporary jobs and the policies that regulate them. By contrast, we think that these factors cannot be overlooked in European economies, where the main change observed in the last decades is the progressive decline in trade union power and the parallel reduction of employment protection legislation for temporary jobs. We will consider this in the rest of the paper.

2.2 Conceptual framework of the empirical analysis

To analyse potential determinants of *LS*, we rely on the model proposed by Bentolila and Saint Paul (2003) and then we add our own working hypotheses concerning the role played by temporary workers. By definition, labour share (LS_i) on value added of industry i is $LS_i = W_iL_i/P_iY_i$, where W_i is the wage rate paid to labour input L_i , Y_i is value added, and P_i is its price. The authors show that under constant returns to scale, labour-augmenting technical progress $Y_i = F(K_i, B_iL_i)$, and competitive markets, there is a one-to-one relationship between LS_i and the capital-output ratio ($k_i = K_i/Y_i$), the so-called SK schedule $LS_i = g(k_i)$.

Thus, there exists a unique function g to explain LS_i based on observable capital–output ratios, which in turn depend on factor prices and labour-augmenting technical progress B. This implies that variations of LS_i across sectors and countries may be due to different values of the capital–output ratios and different elasticities of substitution between factors. A positive slope of the SK schedule means that the elasticity of substitution between factors (σ) is lower than one (factor complementarity); vice-versa, for $|\sigma| \geq 1$, firms substitute capital for labour and the SK curve in the (*k, LS*) plane is downward-sloping[ii].

Three types of variables are responsible for shifts *of* and movements *off* the *g ()* function.

First, the *SK* schedule is stable only if the pattern of technical progress is labour-augmenting. Conversely, for capital-augmenting technical progress, $Y_i = F(A_iK_i, B_iL_i)$, changes in A_i shifts the SK curve. In the particular case of the CES function LS is given by $LS_i = 1 - a(A_i k_i)^{\gamma}$. Notice that LS_i is still monotonic in k_i, but technical changes of A_i reinforce the effects of capital intensity k_i, and A_i and k_i have effects on LS_i of the same sign. A different case is attained if technical change is neither labour- nor capital-augmenting, as obtainable from production function $Y_i = K_i f(l_i, A_i)$, where $(l_i = B_iL_i/K_i)$. This implies that LS_i may be positively affected by k_i, (factor complementarity) but negatively affected by A_i; for instance, technological progress may reduce the marginal product of labour, i.e., A_i *is* 'labour-harming', as Bentolila and Saint Paul (2003) find empirically for some industries.

Second, movement *off* the *g ()* function are also conceivable. In environments featuring product and labour market imperfections, there is a wedge between the real wage rate and productivity and all institutional variables that influence this wedge cause changes of LS_i and departures from the *SK* curve. Under imperfect competition in the product market, profit-maximising firms charge their price as a mark-up on the marginal cost of labour, and thus LS_i is conditioned by firms' market power. A rise in the mark-up exerts downward pressure on LS_i and counter-cyclical variation in the price mark-up causes pro-cyclical shifts in the LS, as documented by Rotemberg and Woodford (1999). Very often in empirical analyses the importance of mark-up is signalled by product market

regulation (PMR), the idea being that a reduction in its strictness causes erosion of monopolistic positions and a consequent increase in LS. Note that lifting entry barriers, consistent with the hypothesis of markets with homogenous firms and workers (Blanchard and Giavazzi, 2003), should cause higher firm competition, a rise in labour demand, and an upwards shift of the SK schedule. However, so far there is evidence that lower entry barriers result in the entrance of firms whose workers frequently have lower bargaining power than the workers in the incumbent firms, thus causing a reduction in LS_i, as empirically found by Böckerman and Maliranta (2012). In addition, if liberalisation is combined with privatisation, as observed in the case of state-owned enterprises in network industries (Azmat et al., 2012), there may be a shift in bargaining power away from workers (OECD, 2012), likely due to a change in the managerial objective function to being more focused on profits than employment targets. As a result, privatisation, inducing labour–demand curve shifts inward, determines smaller wage shares.

A second source of departures from the SK curve is due to collective bargaining. The bargaining practices of European countries are either 'right to manage' or 'efficient bargaining' regimes (Layard et al., 2005; European Commission, 2007). Under the first regime, firms and unions bargain over wages and then firms set employment unilaterally, taking wages as given. Under this regime, labour demand, obtained from the profit maximization condition, requires equality between the marginal product (or the marginal revenue of labour) and the real wage. This means that wage pushes cause changes in the capital output ratio and movement along the SK curve, rather than away from it.

Conversely, in the efficient bargaining model unions cause departures from the SK schedule where they negotiate with firms over both wages and employment. In such cases the wage rate differs from the marginal product of labour and unions drive a wedge between these two variables. In this contracting process, wages and employment, obtained as solutions of a Nash bargaining game, are given by the contract curve; i.e., the loci of points where unions' indifference curves and firms' isoprofit curves are tangent, and the relationship between *LS* and the capital-output ratio is off the SK schedule. The contract curve is upward-sloping and starts from the intersection of the labour demand curve and the reservation wage. A rise in the reservation wage implies that everywhere the new contract curve lies above the old one (Mc Donald and Solow, 1984). A rise in union bargaining power raises both the real wage and employment, and thus LS_i.

Empirically, we expect that density of workers organizations, legal extension mechanisms of contracts (bargaining coverage), and unemployment benefits are the main indicators among the web of rules that concur to define the whole bargaining setting and influence workers' bargaining power and the reservation wage.

Concerning employment protection legislation, so far the literature on LS has mainly looked into the effects of protection of permanent workers. Bentolila and Saint Paul (2003) have argued that this protection enhances labour adjustment costs (due to hiring and firing) and that increases in these costs boost the wedge between the real wage and productivity, thus reducing LS.

We also hypothesize that employment protection legislation of temporary contracts (EPLT) plays a role in affecting workers' bargaining power. First of all, there is evidence that "some unions are more concerned about longer serving members, and agree to contracts with steep returns to seniority" (Booth et al., 2002). This implies that the Nash bargaining model is conceivable for permanent workers but is not applicable to temporary workers, who are "an extreme case of outsiders, who receive a low wage compared to permanent workers" (Booth et al., 2002). Indeed, "Temporary workers are much less likely to be union members than those on open-ended contracts, because their organisation and representation in collective bargaining remain very difficult" (OECD 2012, p.135). In this context, bargaining only takes place between permanent workers and firms, whereas temporary workers have no bargaining power and only obtain a reservation wage. Thus, for lower values of EPLT (and an increase in the number of temporary workers), the value of the average aggregate bargaining power of workers declines, and thus also LS declines.

In addition, literature on employment protection legislation has shown that the steady state effects of reforms that introduce marginal flexibility, such as liberalisation of temporary contracts, may be perverse because they induce high turnover in fixed-duration jobs, leading to higher, not lower, unemployment (Blanchard and Landier, 2002). Eventually, employment dynamics also reveal that these institutional reforms exert only a transitional 'honeymoon effect' on job creation (Boeri and Garibaldi, 2007). Indeed, employment increases reveal no lasting effect because the stock of insiders hired on permanent contracts is phased out by natural turnover. Then, fixed-term employees replace open-ended contracts, and firms gradually adjust the stock of permanent workers downwards. In the long run, average employment in the rigid regime equals that in the flexible regime, the only difference being that the latter is more volatile and the composition of temporary/regular workers changes (Boeri and Garibaldi, 2007). We also expect that if temporary workers are paid less than permanent workers, i.e., at their reservation wage as discussed above, a second channel emerges through which the liberalisation of temporary jobs affects LS. A wage reduction in fact causes movements along the SK schedule and changes in LS depending on the elasticity of substitution between labour and capital. Strong substitutability between labour and capital ($|\sigma| \geq 1$) leads the wage reduction to positively affect LS because lower compensation is largely offset by an increase in employment (labour replaces capital), being the output constant. By

contrast, complementarity between labour and capital ($|\sigma| < 1$) causes a wage reduction to depress the labour share, due to the very weak increase in employment (labour is a complement of capital).

To summarise the discussion above, we augment in qualitative terms the model formulated by Bentolila and Saint-Paul (2003) with our own working hypotheses, which relies on the Boeri and Garibaldi model (2007) that focuses on liberalisation of temporary jobs in two-tier regimes, and on the hypotheses of different wage settings for permanent and temporary workers. Therefore, we estimate a sector–country SK schedule and expect that liberalisation of temporary jobs (easing of EPLT) contributes to labour share movements through two channels. The first one influences the movements *off* the SK schedule because it weakens unions' bargaining power; this means that the higher the share of temporary workers, the lower the cohort of regular workers to whom efficient bargaining applies. The second channel involves a reduction in the wages of temporary workers that necessarily induces movements *along* the SK schedule and changes in LS, depending on the elasticity of substitution between capital and labour.

As in Bentolila and Saint-Paul (2003), we control for other factors causing shifts, such as non-labour-augmenting technological progress, and movements *off* the SK schedule, such as the stringency of protection for regular workers, union density, bargaining coverage, unemployment benefits, and product market regulation.

3. Estimation strategy

We verify the hypotheses discussed above by firstly estimating the impact on *LS* of country-level employment protection legislation for temporary workers (EPLT) and other controls. According to Bentolila and Saint-Paul (2003), we start from a general multiplicative form representing an augmented SK schedule:

$$LS_{i,j,t} = g\left(A_{i,j,t}\, k_{i,j,t}\right) h(LMI_{i,t} X_{i,j,t}) \qquad (1)$$

where j=1, …9 industries; i=1,…12 countries; t=1996, …2013 years; *LS* is the labour share, and *g* includes well known elements of the SK schedule, that is, the capital–output ratio (*k*) and capital-augmenting technological progress (*A*); *X* contains sector–country-level control variables, and *LMI* represents the country-level labour market institutions.

Following the literature inaugurated by Rajan and Zingales (1998) in financial economics and applied to labour analysis by Haltiwanger et al. (2008), Bassanini et al. (2009), and Cingano et al. (2010), we adopt a difference-in-difference method to study the influence of country-level institutions on sector–country-level LS. This method maintains a country perspective but also takes into account the remarkable cross-sector technological differences. In other words, we estimate the impact of the degree of EPLT stringency on cross-industry LS differences, considering whether the

impact is greater in industries in which, in the absence of regulation, the propensity to employ temporary workers is higher. Analogously, we control for the role of employment protection of regular workers (*EPLR*), assuming that the effect of liberalisation of regular jobs is more important in industries where the intrinsic, natural net turnover rate (or job reallocation rate) is higher.

We take logs of equation (1) and make explicit terms in the *g* and *h* functions, thus obtaining the following specification:

$$\ln(LS_{i,j,t}) = \beta_0 + \beta_1 \ln(k_{i,j,t}) + \beta_2 \ln(TFP_{i,j,t}) + \beta_3 \ln(\text{TWS\_Bench}_j * EPLT_{i,t-1}) + \beta_4 \ln(\text{TO}_{\text{Bench}_j} * EPLR_{i,t-1}) + \beta_5 \ln(\text{TO}_{\text{Bench}_j} * Oth.LMIs_{i,t-1}) + \beta_6 \ln(PMR_{i,j,t-1}) + \beta_7 \ln(EMPE_{i,j,t}) + D_{i,t} + D_j + \varepsilon_{i,j,t} \quad (2)$$

where k_i and *TFP* are capital–output ratio and total factor productivity, respectively; *EPLT* and *EPLR* are employment protection legislation indicators for temporary and regular workers, *Oth.LMIs* includes other labour market institutions: union density (*UD*), bargaining coverage rate (*BC*), and unemployment benefits (*UB*); *PMR* is an indicator for sector–country-level product market regulation; *EMPE* is the percentage of employees in total employment, which is a necessary control when the outcome variable is the labour share not adjusted by self-employment income; $D_{i,t}$ and D_j are country-by-time dummies and sector dummies respectively, and $\varepsilon_{i,j,t}$ are the idiosyncratic shocks. It is worth noting that we cannot use sector–country fixed effects in this specification (as in the case of panel data) because that method would eliminate all the industry-by-country variation, making the identification of the effect of interest (β_3, β_4, and β_5 coefficients) rely only on the (limited) time variation of the institutional variables. In addition, $D_{i,t}$ and D_j are supposed to capture all country-by-time (business cycles and other institutional effects) and sectoral confounding factors; since these dummies control for any country and sectoral variance, the main effect of EPL and sectoral benchmarks is absorbed (Bassanini et al., 2009).[iii] All variables describing labour market institutions are lagged one year, as they take time to exert effects and enter as interaction terms because they are multiplied by sectoral benchmarks. In the case of EPLT, the sectoral benchmark is an intrinsic (frictionless) propensity to employ temporary workers (*TWS_Bench*), whereas for EPLR and *Oth.LMIs* the sectoral benchmark is an intrinsic (frictionless) job turnover rate (*TO_Bench*).[iv]

The coefficient β_3 tells us that changes (difference) in the difference in LS between any two industries in any country at any point in time can be expressed as a function of EPLT, whose effect is greater the greater the difference in the two industries' intrinsic propensity to employ temporary workers. Similarly, the β_4 and β_5 coefficients capture the effects of EPLR and *Oth.LMIs* (union density, bargaining coverage, and unemployment benefits) on the difference in LS between

industries within a given country, and these effects will be greater the greater the difference in industries' intrinsic job turnover rate. This intrinsic job turnover rate describes the within-sector job reallocation, and in the specific case of EPLR it proxies the adjustment costs used by Bentolila and Saint-Paul (2003).[v] To sum up, the basic idea is that the impact of labour market institutions will be more binding in sectors showing a higher intensity of the phenomenon they regulate.

Normally, in the difference-in-difference specification, the sectoral benchmark represents a frictionless job turnover rate (in our case, also a frictionless propensity to employ temporary workers) and is derived from the most flexible market economy available; i.e., US or UK (Haltiwanger et al., 2008; Bassanini et al., 2009). Some authors convincingly raised criticisms because within-sector heterogeneity across countries undermines the validity and representativeness of the choice of the benchmark country for the other countries included in the sample (Cingano et al. 2010, p.130 and footnote 4). Others, such as Ciccone and Papaioannou (2016), have shown that the presence of idiosyncratic shocks in the benchmark country causes noticeable measurement errors that induce biases in the coefficients of interest (in our case, β_3, β_4 and β_5) For this reason, following Cingano et al. (2010) and Ciccone and Papaioannou (2016), we calculated an average benchmark measure, not reflecting idiosyncratic factors specific to a country and based on the following estimates:

$$TWS_{i,j,t} = \gamma(D_j * EPL_{j,t-1}) + D_j + D_{i,t} + \varepsilon_{i,j,t} \qquad (3)$$

$$TO_{i,j,t} = \gamma(D_j * EPL_{j,t-1}) + D_j + D_{i,t} + \varepsilon_{i,j,t} \qquad (4)$$

where *i, j*, and *t* are the same countries, industries, and time period already reported in equations (1) and (2); *TWS* and *TO* are sector–country measures of the actual share of temporary workers (propensity to employ temporary workers) and actual job turnover rate (job reallocation); the interaction term $\gamma(D_j * EPL_{j,t-1})$ accounts for the marginal effect of overall employment protection legislation[vi] on *TWS* and *TO* in each industry *j*, and $D_{i,t}$ accounts for country-by-time dummies. The variables of interest in equations (3) and (4) are the sectoral fixed effects $\widehat{D_j}$, which capture the extent of the industry propensity to employ temporary workers, or industry job reallocation in a country not subject to firing and hiring restrictions. In other words, $\widehat{D_j}$ represent our intrinsic (frictionless) TWS_Bench_j and TO_Bench_j in Equation (2), assumed to be exogenous because they have been purged from the effects of protection legislation.

As for $TO_{i,j,t}$, the dependent variable of Equation (4), we follow Cingano et al., (2010) and Davies and Haltiwanger (1990) and calculate a job turnover measure that proxies the sector–country-level job reallocation:

$$TO_{i,j,t} = 2\frac{|e_{i,j,t} - e_{i,j,t-1}|}{e_{i,j,t} + e_{i,j,t-1}} \quad (5)$$

where *e* are employees and *i, j*, and *t,* countries, sector and time, respectively.

Equation (2) is estimated by OLS with boostrapped standard errors in order to correct potential sampling errors deriving from using regressors estimated in the first stage (TWS_Bench_j and TO_Bench_j from equations (3) and (4)).

A number of econometric concerns affect equation (2). Bassanini and Manfredi (2012) highlight the strong endogeneity of both *k* and *TFP.*[vii] Another critical concern is the omission of sector–country fixed effects, which has been done to preserve the cross-sector variability of the impact of institutions on LS. For these reasons, the drivers of LS are very often analysed within a dynamic framework in which difference equations and GMM estimators help to deal with endogeneity and unobserved heterogeneity issues (Bentolila and Saint-Paul, 2003; Bassanini and Manfredi, 2012). Introducing institutional indicators with limited year-by-year variability in such dynamic framework makes little sense in econometric terms. Indeed, Bentolila and Saint-Paul (2003) use a sector-country-time varying variable such as the net growth rate of the number of employees to approximate the labour adjustment costs, which in turn reflects the influence of firing and hiring restrictions.

In our case, as previously discussed, the variables that somehow capture the enforcement of EPLT and EPLR are the actual share of sector–country temporary workers ($TWS_{i,j,t}$) and the actual job turnover rate ($TO_{i,j,t}$), both with a good year-by-year variability. By regressing LS on TWS and TO we are able to study the direct impact of changes in the propensity to employ temporary workers and the propensity for job reallocation; hence we perform a robustness check on results obtained from equation (2).

More formally, in the second step of the empirical analysis we estimate the following equations:

$$\ln(LS_{i,j,t}) = \beta_0 + \beta_1 \ln(k_{i,j,t}) + \beta_2 \ln(TFP_{i,j,t}) + \beta_3 (TWS_{i,j,t}) + \beta_4 \ln(TO_{i,j,t}) + \beta_5 \ln(PMR_{i,j,t-1}) + \beta_6 \ln(EMPE_{i,j,t}) + D_{i,t} + \varepsilon_{i,j,t} \quad (6)$$

$$\Delta\ln(LS_{i,j,t}) = \beta_{0t} + \beta_1 \Delta\ln(k_{i,j,t}) + \beta_2 \Delta\ln(TFP_{i,j,t}) + \beta_3 \Delta\ln(TWS_{i,j,t}) + \beta_4 \Delta\ln(TO_{i,j,t}) + \beta_5 \Delta\ln(PMR_{i,j,t}) + \beta_6 \Delta \ln(EMPE_{i,j,t}) + \beta_7 \ln(LS_{i,j,t-1}) + \beta_8 \ln(KO_{i,j,t-1}) + \beta_9 \ln(TFP_{i,j,t-1}) + \beta_{10} \ln(TWS_{i,j,t-1}) + \beta_{11} \ln(TO_{i,j,t-1}) + \beta_{12} \ln(PMR_{i,j,t-1}) + \beta_{13} \ln(EMPE_{i,j,t-1}) + \varepsilon_{i,j,t} \quad (7)$$

where all variables are sector-country-time varying and have the same meaning as discussed above.[viii] Equation 6 is estimated using standard fixed effects estimator and GMM-SYS. The former

method only deals with unobserved heterogeneity across sector-countries, while the second one allows us to also take into account endogeneity.

Equation (7) shows a dynamic structure and allows us to investigate potential long-run effects of the variables of interest (*TWS* and *TO*). Since the time span in our sample is rather limited, 18 years, an autoregressive distributed lag process (ARDL) should be applied with caution, and thus we consider this analysis as a supplementary robustness check of previous estimates.[ix] In any case, a dynamic specification is coherent with our conceptual framework and the prediction of long-run effects of labour reforms discussed in section 2, according to which a negative impact of TWS on LS might emerge.

To test this conjecture, we applied an ARDL (1,1) with an error-correction transformation and estimated Equation (7) by means of the dynamic fixed-effect estimator (DFE) and common correlated mean group estimator (CCE), the latter developed by Pesaran (2006). Both estimators allow us to calculate the speed of adjustment of LS in the long run, the β_7 coefficient of equation (11), and the long-run coefficients of TWS $\left(-\frac{\beta_{10}}{\beta_7}\right)$ and TO $\left(-\frac{\beta_{11}}{\beta_7}\right)$. However, DFE restricts both short-run (from β_1 *to* β_6) and long-run coefficients to be equal across all panels, while CCE deals with cross-sectional dependence and time-variant unobservables that have heterogeneous impacts across panels. We follow Stock and Watson (2002) and Chudik and Pesaran (2015) to combine the ARDL model with CCE. In other words, CCE takes into account both time-invariant and time-variant heterogeneity across panels, for example, time-variant unobservable common factors between the error terms and covariates that cause endogeneity. In our case, it is plausible to conjecture that potential dependence across sectors within the same country is driven by all institutional factors that are omitted in this specification. As we show (see Table A.5), the Pesaran cross-sectional dependence (CD) test does not reject this assumption.

4. Data, descriptive statistics, and estimation results

4.1 Data sources and variables used in the empirical analysis

Our empirical investigation relies on several databases: 1) EU KLEMS (September 2017 release) for the labour share (LS), the capital-output ratio, and the total factor productivity index (TFP); 2) OECD indexes for employment protection and product market regulation; 3) ICTWSS database (Visser, 2016) for measures of union density and bargaining coverage; 4) EUROSTAT for series of employment and unemployment benefits (see Appendix, Table A1).

Our dependent variable is the labour share that measures the fraction of sector–country value added accruing to labour. This measure underestimates labour share because it excludes income

generated from self-employment, which is mixed income (from property and labour), and whose attribution to either labour or capital is questionable. We also prefer performing our estimates using unadjusted labour shares (i.e., without self-employment) to prevent confounding effects, since employment protection legislation covers only employees. In any case, we offer in both descriptive statistics and econometric analysis a comparison for adjusted (including self-employment labour income) and unadjusted labour shares to evaluate the relative importance of self-employment in different countries and to perform robustness checks. We also use the ratio of employees to total employment (EUROSTAT data) as a control for estimates of the unadjusted labour share.

Following Bentolila and Saint-Paul (2003), we define capital–output as the ratio of nominal capital stock on nominal value added in national currency and use TFP as an index (2010=100).[x]
As for our key OECD indicators, EPLT describes the conditions under which workers can be hired on fixed-term or temporary work agency contracts. These conditions usually concern the type of job and activity in which these contracts are allowed, their maximum duration, and the conditions for their renewal or termination. EPLR defines the rules under which individual dismissals are possible (provisions for notice periods, involvement of third parties such as courts and works councils, specification of severance payments). ELPT and EPLR indicators range from 0 to 6, with higher scores representing stricter regulation (OECD, 2013). PMR is a regulatory impact indicator that defines the potential costs of anticompetitive regulation in network industries (gas, electricity, and water supply, transport, and communications) in all sectors of the economy that use the output of the sectors above as intermediate inputs in their production process. It is a sector–country–time-varying variable with scale normalized to 0–1, from least to most restrictive (Égert and Wanner, 2016). The source and meaning of the remaining control variables are reported in the Appendix (Table A.1).

Data limitations concerning both the appropriateness of the LS measure in certain sectors (we excluded public administration and personal and social services) and the availability of an updated breakdown of sectors for TFP, capital–output ratio, and temporary workers led us to select 12 EU countries,[xi] 9 sectors of the market economy, [xii] and the period from 1996 to 2013. We obtain an unbalanced panel of 108 groups and 1,854 observations, at most.

4.2 Summary statistics and preliminary investigation

In the advanced economies, the share of labour income began to fall in the 1980s, and has not recovered substantially since. However, the decline in the labour share slowed down from 1996 onward, as evidenced by previous studies (from 1970 to 2005, Arpaia, 2009; from 1970 to 2009, Bassanini and Manfredi, 2012). This trend is reflected in our summary statistics, which also add

information for the years of the great global crisis and the subsequent sluggish recovery. In order to appreciate the main differences between before and during the crisis, we split our sample period into two sub-periods, 1996–2007 and 2007–2013. Some relevant points emerge, as shown in Table 1 and Table A.2:

- in most countries LS presents a sluggish or declining trend over the period 1996–2007 and a slight increase in the years 2007–2013;
- almost all the countries that experienced LS decline between 1996 and 2007 also recorded a sizable increase in the share of temporary workers; in addition, the slight increase in LS in the following years was associated with a lower adoption of temporary contracts and a slight slowdown of TFP;
- the change in the weight of various sectors only partly explains labour share movements, whereas changes in the labour share within sectors play a dominant role;
- significant easing of EPLT was recorded in half of the twelve countries, whereas EPLR was largely stable. In the majority of countries, legal protection of temporary workers was less stringent than that offered to regular workers (Belgium, France, and Spain are exceptions).

More detailed information from cross-country and cross-sector comparisons is available in Figure 1 and Tables 1 and A.2.

First, from the aggregate values of the twelve countries in our sample (last row of Table 1), we observe that both the unadjusted and the adjusted labour share slightly declined between 1996 and 2007 (from 46.06% to 44.87% and from 61.79% to 59.45% respectively). In particular, 7 out of 12 countries experienced a LS decline over the 1996–2007 period, namely Austria, Belgium, Finland, France, Germany, the Netherlands, and Sweden (see also Figure 1).

Second, all the countries experiencing a LS decline between 1996 and 2007, with the exception of Finland, show a sizeable increase in the share of temporary workers.[xiii] Two cases in point are Germany and the Netherlands. The first recorded a contraction in LS of nearly 10 percentage points and a 4 percentage points increase in the share of temporary workers. The second saw a LS reduction of almost 5 percentage points and an increase in the share of temporary workers of more than 8 percentage points.

Third, between 2007 and 2013 the unadjusted LS marginally regained ground (reaching the value of 46.94%). This confirms, as found by the OECD (2015, p. 4), that the longer-term downward trend of LS paused or slightly reversed with the global crisis, mainly because during recessions wages tend to be less volatile than profits and because of the protective role of labour market institutions.[xiv] However, the adjusted LS did not resume its 1996 level and both the

propensity to hire temporary workers and the TFP index slowed down or came to a halt, corresponding to a slight increase in LS observed in most of the countries.

Cross-sectoral differences are also important. Table A.2 shows that both unadjusted and adjusted labour share were above the sample average in manufacturing, construction, trade, hotels and restaurants, transport and communications. With the exception of agriculture and mining, the within-sector variability of LS described by the coefficient of variation (*Cv*) is lower than the within-country variability (Table 1). This finding suggests that sector-specific characteristics are relevant and justify the sector-country approach of our empirical analysis.

The ample differentials by sector lead us to verify if the changes in the unadjusted labour share reflect the growing importance of sectors with a very low fraction of income accruing to labour. Figure 5 charts the results from a standard shift and share analysis (see Lawrence 2015). We observe that changes in the sectoral composition have had a negative but very marginal impact on the overall LS variation, compared to the large within-industry changes. The negative within-industry changes in LS that we observe between 1996 and 2007 for countries such as France, Belgium, Finland, the Netherlands, Germany, Austria, and Sweden could have been driven by non-labour-augmenting technological progress proxied by TFP, as suggested in other studies (OECD 2012; Bassanini and Manfredi, 2012). However, we cannot ignore that some of these countries, especially Germany, the Netherlands, Sweden, and Austria, also experienced an increase in the percentage of temporary workers over the same period. In addition, notice that temporary workers' gross hourly wages always remained much lower than those of regular workers in all countries and all sectors, as shown in Figure A.1 in the Appendix.[xv] Thus, shifts in the composition of employment (higher values of TWS) may have exerted downward pressure on average wages, contributing to explaining the "slow growth of nominal wages, which reinforces a longer trend of stagnant median wages" (IMF 2017c, p.xiii). This evidence encourages us to consider the extensive use of temporary employment as a potential driver of LS movements.

As shown in Table A.2, the observed temporary workers share (TWS) differs remarkably across sectors, and increased in 8 of the 12 countries (see Table 1). With the crisis the TWS slightly reduced in 6 countries. Table A.2 also shows the values of TWS_bench_1996–2013, which were estimated in Equation (3) as sectoral fixed effects and reflect the value of the frictionless use of temporary workers. As expected, they are much lower than the observed values of the TWS. Notice also that this frictionless, natural propensity to employ temporary workers differs across sectors and is higher in agriculture, mining, electricity and gas, construction, and hotels and restaurants. In all these sectors the impact of protection legislation for temporary workers (EPLT) is expected to be

more binding than elsewhere. A similar reasoning holds for frictionless job reallocation (TO_bench_1996–2013).

As for the dynamics of EPLR and EPLT, Figure 6 charts that the former varies very little over time, whereas more variability is observed for EPLT. This means that low and high EPLR countries (for instance, the UK for the first group and the Netherlands and Italy for the second) have kept statutory protection of regular jobs almost unchanged. By contrast, greater relaxation of temporary contract rules has been important in Germany (-2, see also Table A.4), where it was accompanied by a marked slowdown of LS, from 63.92% in 1996 to 54.93% in 2013, as shown in Table 1. In other countries, such as Sweden and the Netherlands (which also saw reductions in EPLT, of –0.33 and –0.44 respectively, see Table A.4), the softening of rules for temporary workers was accompanied by sizeable reductions in LS between 1996 and 2007. Also, notice that in Figure 6, for 9 out of 12 countries and almost all years, the strictness of EPLT is lower than that of EPLR, the exceptions being France, Belgium, and Spain.[xvi] In any case, our analysis concentrates on the heterogeneous impact of EPLT across sectors. For instance, Figure A.2 in the Appendix shows that if the relaxation of EPLT is equal within a country, the share of temporary contracts grows more in sectors with a higher natural propensity to employ flexible labour (construction) compared to sectors with a lower propensity (manufacturing). This especially holds for countries with remarkable asymmetries in protection levels (that is, high EPLR and low EPLT) such as Germany and the Netherlands, which also experienced a remarkable decline in sectoral labour share (see Figure A.2).

Employment protection legislation is not the only institutional determinant of labour share movements. Between 1996 and 2013, as reported in Table A.4 in the Appendix, union density, bargaining coverage, and product market regulation noticeably weakened in most of the countries. In particular, the union membership rate fell from 44.92% in 1996 to 33.29% in 2013. As expected, with the crisis the average amount of unemployment benefit necessarily increased (on average +3.3%). All these possible confounding factors have been taken into account in the following econometric analysis.

4.3 Main results of econometric analysis

To test the robustness of results before and during shocks caused by the great recession, we first regress the unadjusted labour share as specified in equation (2) for the period 1996–2007. Table 2 lists the results. The first column reports estimates of a baseline specification in which EPLT is interacted with the intrinsic propensity to employ temporary workers (*TWS_Bench)* according to the difference-in-difference approach. The baseline specification also includes standard determinants of LS such as TFP, capital–output ratio, and EMPE, the ratio of employees to total employment (this

ratio is a useful control when the dependent variable is the unadjusted labour share). In addition, we inserted dummies to capture specific factors at country-by-time and sector level. As mentioned in section 3, these dummies capture all variance at country and sector level; hence they replace the main effects of the interaction terms of interest. The results we obtain (column 1) tell us that the stringency of protection of temporary workers positively affects LS.

This main finding is confirmed controlling for other variables; i.e., EPLR interacted with the intrinsic turnover rate of industries (TO_bench) (column 2), and adding product market regulation (PMR) (column 3). On the whole, these difference in difference estimates suggest that LS tends to be lower (or to move slowly) in industries with a greater propensity to use temporary contracts, the less stringent the level of EPLT. To provide a more detailed explanation, let us consider the coefficient ln(EPLT*TWS_bench) in column 3, which is 0.329%. This means that a 1% increase in the EPLT in a given country raises the difference in LS between two industries by 0.329% multiplied by the percentage difference in the natural propensity to employ temporary workers (that is, the TWS_bench value). For instance, let us examine the case of construction and manufacturing; i.e., two sectors with intrinsically high (4.33) and low (1.09) propensities to employ temporary workers, respectively (see Table A.2 in the Appendix). The natural propensity to employ temporary workers in construction is 297% larger than in manufacturing. Now let us take the case of the Netherlands: from Table A.4 we know that EPLT in this country in 1996 was 46% higher than in 2007 (it fell from 1.38 to 0.94). Therefore, the overall impact of ln(EPLT*TWS_bench) on the construction–manufacturing labour share gap in the Netherlands between 1996 and 2007 was about 45%, all other variables being constant.[xvii] The actual construction–manufacturing LS gap in the Netherlands changed from 22 percentage points in 1996 (77%–55%) to 10 percentage points in 2007 (59%–49%); hence, it fell by 12 percentage points. Had the EPLT not fallen from 1.38 to 0.94, the construction–manufacturing labour share gap would have reduced by only 6.6 percentage points, due to the positive influence of the higher EPLT stringency level. Put differently, the easing of EPLT in the Netherlands caused a reduction in the favourable LS position of construction as compared to manufacturing.

The results in Table 2 also show that the impact of TFP is always negative and statistically significant, confirming the finding of other studies (OECD, 2012). For the capital–output ratio (k) we obtain a positive outcome, as found for some industries by Bentolila and Saint-Paul (2003) and for the country-level analysis by Checchi and Garcia-Peñalosa (2010). A potential explanation is given by the prevalence of sectors where production function is characterized by capital–skill complementarity and an elasticity of substitution between capital and labour less than 1, as also documented for the most important EU countries by Berger and Wolff (2017). Interestingly, these

technological characteristics are coherent with our key result for EPLT. If a weak EPLT allows the share of temporary workers to increase and these workers are paid less than regular workers (see Figure A.1), we have an average reduction in wages that negatively affects LS when the elasticity of substitution is less than 1 (Arrow 1961, p.244). In addition, the opposing roles of TFP (negative) and *k (*positive) are likely due to the fact that our TFP index does not capture the capital-augmenting technological progress but simply a 'labour-harming' technological progress that reduces the marginal productivity of labour, as suggested by Bentolila and Saint Paul (2003).[xviii]

We also find that a high degree of product market regulation has a positive effect on LS. Notice that the OECD indicator PMR also covers privatisation programmes, measured as a shift toward pro-competitive policies, whose likely effects are restructuring processes and staff reduction, as Azmat et al. (2012) find for the network industries. Our estimates may be the result of different deregulation programmes that include both privatisation process and increases in the degree of product market competition in private sectors, with likely differential effects on labour market outcomes.[xix]

In additional specifications we introduce, alternatively, three variables that influence negotiations between workers and employees; i.e., union density (*UD*) (column 4), bargaining coverage (*BC*) (column 5), and unemployment benefits (*UB*) (column 6). As already discussed in section 3, similarly to *EPLR*, these variables are interacted with the intrinsic turnover rate of industries (*TO_bench*), the basic idea being that these institutions are more binding the higher the intrinsic propensity to reallocate jobs within industries. In these estimates (columns 4-6), *EPLT* and the other three labour market indicators are not statistically significant.

These preliminary results at least partially suggest that reforms to liberalise the use of temporary workers and reduce EPLT may be perverse: when firms are allowed to hire workers on fixed-term contracts they pay lower wages because these workers are less represented by unions, and because there is more frequent need to recruit and hire new temporary workers with minimal training. Since these reforms do not have counterbalancing effects in terms of job creation, as also demonstrated by Boeri and Garibaldi (2007), they might play a negative role in LS.

Additional estimates for the years 1996–2013 confirm the significant and positive role of EPLT, and the role of other proxies for trade union power is now positively signed and significant at the 1% level (see Table 3). This means that for the sample period that covers the great recession there is clear evidence that EPLT positively affects LS and its impact is included within a narrow range, as clearly shown by the comparison of results in columns 1–6. The role of unionization, bargaining coverage, and unemployment benefits is also positive and significant, suggesting that all forms of employment protection have been effective in counteracting the LS decline. The dummy variable

for the crisis shows a positive sign in almost all specifications but is not significant, likely because labour institutions already capture its influence on positive LS movements during this period. This is coherent with the preliminary evidence reported in Table A.3 in the Appendix, where we observe that contraction of labour compensation has been less intense than that of valued added in European countries with high degrees of workers' protection.

4.4 Robustness checks

Our previous findings on the role of EPLT in LS have been validated by various robustness checks. First of all, we take into account concerns regarding the measurement of LS. Even though we explained that labour market institutions mainly affect dependent workers, we acknowledge that most empirical investigation use measures of LS adjusted for self-employment (OECD, 2012). Indeed, in our case also, relevant differences emerge when self-employment is included (Tables 1 and A.2). For this reason, we replicate the estimates for the adjusted labour share and the obtained results confirm that more stringent EPLT is even more strongly positively associated with LS when we include self-employment (Table 4).[xx] Furthermore, the positive role of unionization, collective bargaining coverage, and unemployment benefits for the sample covering the great recession are confirmed by the total employment estimates (Table 5).

Other robustness checks are performed, in more general terms, to take into account unobserved heterogeneity, endogeneity, and potential long-run effects of temporary employment on LS. As explained in section 3, we cannot combine panel data estimators and the difference-in-difference approach without washing away the variability of interest. In addition, it makes little sense to use the EPL indicators in dynamic specifications due to their limited year-by-year variability (see Figure 6). We thus perform estimates for the role of the share of temporary contracts (TWS), which shows much more time variability than EPLT. With this strategy we also directly test the role of actual adoption of these contracts, instead of the regulatory framework that governs their adoption. Analogously, instead of estimating the role of EPLR we directly insert job turnover rates (TO), which are affected by adjustments costs, i.e., those costs affected by hiring and firing norms captured by the EPLR indicator (Bentolila and Saint Pau, 2003; Cingano et al., 2010).

Table 6 shows the results of equation (6), where fixed effects (FE) and GMM-SYS estimations are performed. Despite the different estimation methods and the presence of sector–country fixed effects, almost all control variables already used in the diff-in-diff specification show the expected signs.[xxi] This means that these new specifications are coherent with those in Tables 2–5. Our variable of interest (TWS) shows the expected sign but is not significantly different from zero in the FE specification (columns 1–3), which changes to be strongly significant with the expected sign

once we control for its endogeneity and capital endogeneity in the GMM-SYS model (column 4).[xxii] Eventually, an increase in job turnover rate that captures adjustments costs negatively affects LS, conforming with the results of Bentolila and Saint-Paul (2003), even though in our estimates the coefficient shows a weak significance and turns out to not be significant in the last estimations.[xxiii]

As a final check, we distinguish between long-term dynamics and short-run effects by using an error correction model. The upper part of Table 7 shows the long-run relationships and the lower part the short-run dynamics. Note that two different sets of estimates are performed. The dynamic fixed-effect estimates (*DFE)* control for the presence of unobserved factors that may lead to spurious correlation, but restrict short-run and long-run coefficients to being equal across all panels. Conversely, the common correlation effects mean group estimator (CCE) also corrects for cross-sectional dependence and time-variant heterogeneity across panels, which plausibly affect our estimates, as confirmed by Pesaran's cross-sectional dependent test reported in the Appendix (see Table A.5). Indeed, as discussed in section 3, labour market reforms affect sectors in the same country differently depending on different sectoral propensities to employ temporary workers or to reallocate jobs. By omitting a specification that controls for this fact, we plausibly have time-variant unobservables with heterogeneous impacts across panel members that cause identification problems for the coefficient of interest. Therefore, CCE allows taking this problem into account in a dynamic panel data framework.

In both models the error correction mechanism is lower than one and significant; hence it makes sense to explore long-run relationships. The DFE results show that a negative long-run relationship between LS and the share of temporary workers is obtained in the specification that also includes turnover rates (column 3). Analogously, with the CCE procedure a negative coefficient of temporary workers (of similar magnitude) is obtained in the full model (column 6).[xxiv] In no estimates significant results are obtained for turnover rates.

To sum up, a negative impact of a higher share of temporary workers on LS emerges at least in some specifications in Tables 6 and 7. This finding also partially supports our conjecture, based on Boeri and Garibaldi's model (2007), that in the long run the increasing liberalisation of temporary work does not positively affect employment levels. Consequently, if temporary workers' rewards are systematically lower than those of regular workers, a higher share of temporary workers negatively and persistently affects LS in the long run.

4. Conclusions

The impact of labour market reforms that lower protection of temporary contracts has been documented in a number of works, but their effect on income distribution is still an open question.

We have analysed this issue and our results may be summarized as follows. First, based on our descriptive statistics we suggest that the sluggish or declining movement of the labour share recorded in most countries between 1996 and 2007 is mainly due to moderation of labour compensation within sectors and, in addition to other determinants highlighted in the literature, is also associated with increased adoption of temporary contracts.

Second, our estimates focussing on periods of different length (1996–2007 and 1996–2013) show that legislative innovations that favour the extensive use of temporary contracts negatively affect LS, likely because they lower employees' average compensations. Conversely, legislative restrictions on adoption of temporary contracts enhance LS. This effect is even stronger than that reported for the 1996-2007 period, if we turn to the extended period that includes the great recession (1996–2013). Over this extended period, other labour market institutions also exert a positive impact on LS, thus underlining their role as 'shelter of last resort' in protecting labour income during periods of exceptional negative shocks. These findings are validated by controlling for the employment protection of regular workers, wage-setting characteristics, product market regulation, total factor productivity, and capital–output ratio. In addition, various robustness checks that also evaluate the direct impact (and the long-run influence) of the share of temporary workers on labour share corroborate the main results.

Our interpretation is that liberalisation of temporary jobs has favoured the access of additional workers to the labour market, but has not had a permanent effect on job creation. Liberalisation of temporary jobs has been recorded in economies that are also characterised by a declining union presence and reduced wage demands. This means that the overall balance of employment and wage effects has been negative, as our estimates of the income share accruing to workers suggests. In a scenario of precarious working conditions, employees and their representatives have experienced a decline in bargaining power, leading them to moderate their demands and thus causing a reduction in LS.

Previous results pointing out that labour market institutions exert a negligible influence on LS did not consider separately the role of temporary job protection, as we did. This was probably because their sample periods included years in which this form of employment was less frequently adopted. By contrast, from the mid-1990s flexible labour arrangements have gained momentum, and our evidence fills an important gap. Furthermore, previous research did not include the years after the outbreak of the global crisis, and by considering the period 1996–2013 it emerges that not only temporary workers' protection but also other labour market institutions (protection for regular workers, union density, bargaining coverage, unemployment benefits) may play a positive role in

LS. Thus, introducing a temporal interval that includes the economic shocks caused by the recent crisis is a second important factor contributing to our results, in contrast to the previous literature.

Our conclusive considerations concern policy implications. In most advanced economies, redistribution of wealth from labour to property has occurred in the context of increasing income inequality.[xxv] Our work has shown that in a context of complementarity between capital and labour, likely driven by skill-biased technical changes, the progressive introduction of a low-cost labour force has negatively affected the labour share. Thus, we suggest that labour market reforms introduced to boost employment levels have failed in their primary aim and have likely contributed to the increase in income distribution inequality.

Finally, declining labour shares may have had side effects for aggregate demand. Indeed, changes in functional income distribution might influence the main components of aggregate demand and eventually, in a dynamic process, national income growth. Following the ILO (2013), it can be argued that the presumption that lower LS will have a beneficial effect on economic activity is misguided. For instance, the falling wage share may depress private consumption, because labour compensation is generally positively correlated with household consumption; although a substantial part of business profits contributes, through retained earnings, to generating future labour income. In addition, if falling real unit labour costs that ensure higher competitiveness in international markets boost export surpluses, higher profits do not necessarily ensure more productive investment, especially if financialisation diverts corporate economic resources away from the real economy.

In this context, the sluggish labour share calls for political intervention. The key message is that deregulation of temporary contracts may lead to only transitory employment gains while exerting persistent offsetting effects on income distribution. Opposing policies, more favourable to the labour share, could sustain demand and actually boost growth. Real wage increases and increased job quality and living standards must be components of an integrated strategy along the lines suggested (but not sufficiently implemented) in "A Restated Job Strategy", which in 2006 advocated, as crucial issues, the necessity to "improve labour force skills and competences through wide-ranging changes in education and training systems" (OECD 2006, p.24). However, in the last few years, several countries have taken the opposite direction.

Table 1: Summary statistics at country level (sector- and country-varying variables)

Country	Stats	Unadj. Labour Share			Adj. Labour Share			Capital/Output ratio			Temp. Work. Share			Turnover			TFP (2010=100)			EMPE		
		1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013
AUT	Mean	45.62	40.34	42.97	71.68	62.25	63.00	4.05	4.15	4.55	8.97	10.16	10.26	5.82	4.26	6.47	89.47	103.39	104.07	82.73	82.04	82.56
	Cv	*0.37*	*0.35*	*0.36*	*0.64*	*0.57*	*0.50*	*0.75*	*0.80*	*0.81*	*0.58*	*0.50*	*0.50*	*0.82*	*0.72*	*1.16*	*0.21*	*0.09*	*0.07*	*0.35*	*0.33*	*0.32*
BEL	Mean	46.59	45.00	52.51	60.68	54.92	56.67	5.04	5.14	5.87	5.12	8.18	7.48	8.23	5.33	6.52	91.09	101.16	97.82	75.97	79.38	87.42
	Cv	*0.39*	*0.31*	*0.18*	*0.24*	*0.15*	*0.16*	*0.56*	*0.55*	*0.50*	*0.38*	*0.40*	*0.52*	*0.88*	*0.87*	*1.31*	*0.09*	*0.06*	*0.07*	*0.34*	*0.29*	*0.14*
CZE	Mean	40.42	40.38	43.05	48.70	51.13	53.81	3.77	3.70	4.01	6.71	7.04	8.26	0.00	3.28	3.60	120.60	109.43	90.58	87.40	83.90	82.87
	Cv	*0.32*	*0.22*	*0.28*	*0.33*	*0.28*	*0.27*	*0.85*	*0.64*	*0.56*	*0.38*	*0.36*	*0.44*	*0.00*	*0.92*	*0.66*	*0.53*	*0.10*	*0.14*	*0.10*	*0.13*	*0.14*
DNK	Mean	45.84	49.75	48.24	55.47	59.95	56.20	3.78	4.35	4.09	11.40	8.59	8.55	6.93	6.13	3.15	107.58	107.44	98.01	87.35	89.42	89.64
	Cv	*0.51*	*0.48*	*0.46*	*0.46*	*0.47*	*0.45*	*0.75*	*0.94*	*0.89*	*0.60*	*0.49*	*0.51*	*0.83*	*1.31*	*1.06*	*0.23*	*0.11*	*0.15*	*0.21*	*0.17*	*0.15*
ESP	Mean	41.62	44.18	42.97	52.98	52.93	51.90	2.79	2.95	3.51	36.34	31.82	26.14	6.17	5.49	4.95	110.08	103.05	96.80	78.37	84.73	84.65
	Cv	*0.42*	*0.34*	*0.33*	*0.30*	*0.31*	*0.32*	*0.84*	*0.69*	*0.61*	*0.49*	*0.49*	*0.58*	*0.90*	*0.76*	*0.99*	*0.26*	*0.04*	*0.11*	*0.26*	*0.17*	*0.16*
FIN	Mean	48.96	45.57	51.14	69.26	61.87	65.75	3.25	2.98	3.29	15.66	13.03	12.23	11.52	6.27	2.41	83.39	101.67	98.04	80.38	82.49	82.99
	Cv	*0.42*	*0.35*	*0.38*	*0.38*	*0.36*	*0.35*	*0.88*	*0.98*	*0.89*	*0.47*	*0.27*	*0.33*	*1.14*	*0.70*	*1.15*	*0.22*	*0.12*	*0.11*	*0.28*	*0.24*	*0.21*
FRA	Mean	50.08	49.10	52.40	66.98	64.61	69.21	3.24	3.00	3.21	11.91	14.67	16.01	1.74	6.59	3.61	99.10	105.53	98.27	85.00	86.65	85.55
	Cv	*0.32*	*0.27*	*0.25*	*0.31*	*0.32*	*0.31*	*1.23*	*0.99*	*0.98*	*0.42*	*0.37*	*0.39*	*1.34*	*0.90*	*0.86*	*0.21*	*0.10*	*0.05*	*0.23*	*0.20*	*0.20*
DEU	Mean	63.92	53.86	54.93	83.75	70.32	69.74	3.62	3.29	3.25	10.77	14.70	11.58	5.64	3.71	4.57	88.73	104.16	100.00	84.35	84.47	85.80
	Cv	*0.47*	*0.35*	*0.32*	*0.38*	*0.33*	*0.30*	*0.80*	*0.87*	*0.87*	*0.47*	*0.31*	*0.17*	*0.88*	*0.64*	*0.75*	*0.31*	*0.10*	*0.07*	*0.22*	*0.19*	*0.17*
ITA	Mean	33.68	34.96	36.83	56.90	57.80	59.14	3.05	3.63	3.85	10.85	17.24	17.90	2.84	4.52	2.81	116.33	106.29	104.02	68.54	71.38	72.08
	Cv	*0.37*	*0.31*	*0.38*	*0.36*	*0.39*	*0.40*	*0.74*	*0.72*	*0.67*	*0.96*	*0.88*	*0.97*	*0.90*	*0.83*	*1.20*	*0.24*	*0.09*	*0.14*	*0.28*	*0.25*	*0.24*
NLD	Mean	45.09	40.59	44.24	63.86	56.25	61.03	2.75	2.61	2.88	12.76	21.08	21.82	5.19	11.07	9.90	100.31	102.90	97.48	81.78	83.73	83.21
	Cv	*0.50*	*0.43*	*0.44*	*0.50*	*0.46*	*0.47*	*0.78*	*0.82*	*0.80*	*0.60*	*0.41*	*0.51*	*0.91*	*1.73*	*0.74*	*18.40*	*0.08*	*0.06*	*0.23*	*0.19*	*0.20*
SWE	Mean	45.90	41.99	47.79	54.61	49.12	54.26	3.10	3.20	3.73	13.47	19.82	15.26	3.64	3.98	4.33	101.93	112.16	97.18	87.33	89.64	91.07
	Cv	*0.37*	*0.37*	*0.36*	*0.34*	*0.38*	*0.38*	*0.71*	*0.82*	*0.74*	*0.58*	*0.58*	*0.71*	*1.16*	*0.88*	*1.10*	*0.25*	*0.10*	*0.12*	*0.23*	*0.17*	*0.17*
UK	Mean	42.15	51.00	50.82	56.65	65.41	66.78	2.45	2.66	2.90	6.84	5.00	5.26	3.41	4.83	3.52	98.81	106.23	95.32	81.74	82.91	80.86
	Cv	*0.45*	*0.36*	*0.32*	*0.46*	*0.39*	*0.37*	*0.41*	*0.43*	*0.46*	*0.36*	*0.38*	*0.37*	*1.38*	*1.42*	*0.85*	*0.20*	*0.07*	*0.16*	*0.22*	*0.18*	*0.20*
Total	Mean	46.06	44.87	46.94	61.79	59.45	60.57	3.59	3.59	3.88	12.51	13.81	13.16	4.81	5.25	4.93	101.91	105.28	98.14	81.85	83.28	83.85
	Cv	*0.41*	*0.35*	*0.34*	*0.43*	*0.42*	*0.39*	*0.76*	*0.75*	*0.72*	*0.87*	*0.77*	*0.75*	*1.24*	*1.29*	*1.15*	*0.31*	*0.09*	*0.11*	*0.24*	*0.21*	*0.20*

Source: EUKLEMS and Eurostat. *Notes:* TFP is an index (due to missing data, for UK, NLD, and BEL, the respective 1998, 1999, and 2001 values of TFP replace the 1996 values);
Capital–output ratio is the nominal capital stock on the nominal value added at basic prices and national currency; all other values are expressed in percentages. Coefficient of variation (Cv)= standard deviation/mean.

Table 2: Employment protection of temporary contracts and unadjusted labour shares: Diff-in-diff estimates (1996–2007)

Dependent Variable	Unadjusted Labour Share					
Explanatory Variables	1	2	3	4	5	6
ln(EPLT*TWS_bench)	0.369***	0.351**	0.329**	0.430	0.129	0.587
	(0.079)	(0.173)	(0.150)	(0.442)	(0.894)	(1.014)
ln(Capital/output ratio)	0.132***	0.133***	0.117***	0.116***	0.117***	0.118***
	(0.018)	(0.025)	(0.015)	(0.017)	(0.018)	(0.019)
ln(TFP)	–0.861***	–0.860***	–0.794***	–0.795***	–0.794***	–0.825***
	(0.086)	(0.088)	(0.042)	(0.077)	(0.058)	(0.075)
ln(EMPE)	0.942***	0.941***	0.859***	0.857***	0.858***	0.864***
	(0.058)	(0.058)	(0.055)	(0.046)	(0.046)	(0.058)
ln(EPLR*TO_bench)		–0.075	0.04			
		(0.755)	(0.717)			
ln(PMR)			0.501***	0.502***	0.501***	0.503***
			(0.047)	(0.052)	(0.033)	(0.033)
ln(UD*TO_bench)				0.461		
				(1.867)		
ln(BC* TO_bench)					–0.800	
					(3.761)	
ln(UB* TO_bench)						0.937
						(4.196)
Country*Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
R_squared	0.639	0.639	0.731	0.731	0.731	0.724
Obs	1,207	1,207	1,207	1,207	1,207	1,045

*** significant at 1% level; ** significant at 5% level; *significant at 10% level. OLS with bootstrapped standard errors in parentheses.

Table 3: Employment protection of temporary contracts and labour shares: Diff-in-diff estimates (1996–2013)

Dependent Variable	Unadjusted Labour Share					
Explanatory Variables	1	2	3	4	5	6
ln(EPLT*TWS_bench)	0.347***	0.446***	0.409***	0.408***	0.409***	0.424***
	(0.049)	(0.052)	(0.046)	(0.052)	(0.044)	(0.071)
ln(k)	0.175***	0.161***	0.134***	0.135***	0.134***	0.137***
	(0.023)	(0.018)	(0.012)	(0.015)	(0.016)	(0.015)
ln(TFP)	–0.587***	–0.666***	–0.647***	–0.646***	–0.647***	–0.644***
	(0.066)	(0.086)	(0.037)	(0.064)	(0.049)	(0.059)
ln(EMPE)	0.763***	0.817***	0.752***	0.753***	0.752***	0.733***
	(0.031)	(0.039)	(0.033)	(0.039)	(0.037)	(0.039)
Crisis (1/0)	0.178	–0.135	0.004	0.062	0.004	0.036
	(0.128)	(0.097)	(0.104)	(0.116)	(0.088)	(0.092)
ln(EPLR* TO_bench)		0.531***	0.477***			
		(0.121)	(0.095)			
ln(PMR)			0.486***	0.487***	0.486***	0.490***
			(0.027)	(0.033)	(0.039)	(0.021)
ln(UD* TO_bench)				0.477***		
				(0.104)		
ln(BC* TO_bench)					0.475***	
					(0.108)	
ln(UB* TO_bench)						0.462***
						(0.083)
Country*Time dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
R_squared	0.587	0.602	0.69	0.69	0.69	0.684
Obs	1,854	1,854	1,854	1,854	1,854	1,692

*** significant at 1% level; ** significant at 5% level; *significant at 10% level. OLS with bootstrapped standard errors in parentheses.

Table 4: Employment protection of temporary contracts and adjusted labour shares: Diff-in-diff estimates (1996–2007)

Dependent Variable	Adjusted Labour Share					
Explanatory Variables	1	2	3	4	5	6
ln(EPLT*TWS_bench)	0.674***	0.538***	0.562***	0.827	0.48	0.999
	(0.050)	(0.199)	(0.180)	(0.626)	(0.876)	(0.903)
ln(Capital/output ratio)	0.128***	0.126***	0.118***	0.117***	0.118***	0.116***
	(0.022)	(0.021)	(0.022)	(0.016)	(0.019)	(0.022)
ln(TFP)	–0.930***	–0.932***	–0.883***	–0.884***	–0.883***	–0.928***
	(0.092)	(0.081)	(0.053)	(0.052)	(0.049)	(0.076)
ln(EPLR*TO_bench)		–0.568	–0.578			
		(0.550)	(0.800)			
ln(PMR)			0.489***	0.487***	0.489***	0.491***
			(0.042)	(0.041)	(0.037)	(0.050)
ln(UD* TO_bench)				0.532		
				(2.586)		
ln(BC* TO_bench)					–0.924	
					(3.755)	
ln(UB* TO_bench)						1.078
						(3.755)
Country*Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
R_squared	0.621	0.621	0.712	0.712	0.712	0.711
Obs	1,207	1,207	1,207	1,207	1,207	1,045

*** significant at 1% level; ** significant at 5% level; *significant at 10% level. OLS with bootstrapped standard errors in parentheses.

Table 5: Employment protection of temporary contracts and adjusted labour shares: Diff-in-diff estimates (1996–2013)

Dependent Variable	Adjusted Labour Share					
Explanatory Variables	1	2	3	4	5	6
ln(EPLT*TWS_bench)	0.778***	0.848***	0.866***	0.865***	0.868***	0.897***
	(0.067)	(0.051)	(0.049)	(0.050)	(0.049)	(0.054)
ln(Capital/output ratio)	0.195***	0.172***	0.150***	0.152***	0.154***	0.153***
	(0.027)	(0.023)	(0.018)	(0.021)	(0.016)	(0.020)
ln(TFP)	–0.682***	–0.767***	–0.765***	-0.763***	–0.762***	–0.778***
	(0.086)	(0.061)	(0.050)	(0.037)	(0.060)	(0.078)
Crisis (1/0)	0.336**	-0.082	0.06	0.138	0.06	0.096
	(0.155)	(0.181)	(0.154)	(0.174)	(0.183)	(0.140)
ln(EPLR* TO_bench)		0.673***	0.640***			
		(0.141)	(0.098)			
ln(PMR)			0.471***	0.473***	0.470***	0.474***
			(0.030)	(0.027)	(0.022)	(0.028)
ln(UD* TO_bench)				0.640***		
				(0.132)		
ln(BC* TO_bench)					0.642***	
					(0.109)	
ln(UB* TO_bench)						0.637***
						(0.099)
Country*Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
R_squared	0.56	0.584	0.667	0.667	0.667	0.663
Obs	1,854	1,854	1,854	1,854	1,854	1,692

*** significant at 1% level; ** significant at 5% level; *significant at 10% level. OLS with bootstrapped standard errors in parentheses.

Table 6: Temporary workers share, turnover, and unadjusted labour shares: Fixed Effects (FE) and GMM-SYS Estimators (1996–2013)

Dependent Variable	Unadjusted Labour Share					
	FE			GMM_SYS		
Explanatory Variables	1	2	3	1	2	3
ln(Temp.Work.Share)_TWS	–0.022		–0.019	–0.233***		–0.057
	(0.025)		(0.025)	(0.082)		(0.078)
ln(Turnover)_TO		–0.003*	–0.004**		–0.021*	–0.007
		(0.002)	(0.002)		(0.011)	(0.007)
ln(k)	0.458***	0.528***	0.463***	0.241**	0.298**	0.237**
	(0.065)	(0.073)	(0.065)	(0.118)	(0.147)	(0.092)
ln(TFP)	–0.206***	–0.161**	–0.202***	–0.383*	–0.569*	–0.430**
	(0.061)	(0.079)	(0.055)	(0.202)	(0.305)	(0.184)
ln(EMPE)	0.764***	0.693***	0.740***	0.625***	0.201	0.836***
	(0.120)	(0.117)	(0.118)	(0.208)	(0.289)	(0.171)
ln(PMR)	0.085	0.035	0.091*	0.229	0.563***	0.195
	(0.056)	(0.060)	(0.054)	(0.226)	(0.213)	(0.198)
Sector-Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Country*Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Instruments for differences eq.				k, TWS, and TO with lags		
Instruments for levels eq.				Δk, ΔTWS, and ΔTO		
Arellano-Bond AR(1) test_pvalue				0.021	0.014	0.015
Arellano-Bond AR(2) test_pvalue				0.676	0.540	0.584
Hansen test_pvalue				0.98	0.99	1.000
R_squared	0.589	0.542	0.593			
Groups	101	108	101	101	108	101
Obs	1,629	1,811	1,604	1,629	1,811	1,604

*** significant at 1% level; ** significant at 5% level; *significant at 10% level. Robust standard errors in parentheses.

Table 7: Temporary workers share, turnover, and unadjusted labour shares: Dynamic Fixed Effects (DFE) and Common Correlated Effects Mean Group Estimator (CCE) (1996–2013)

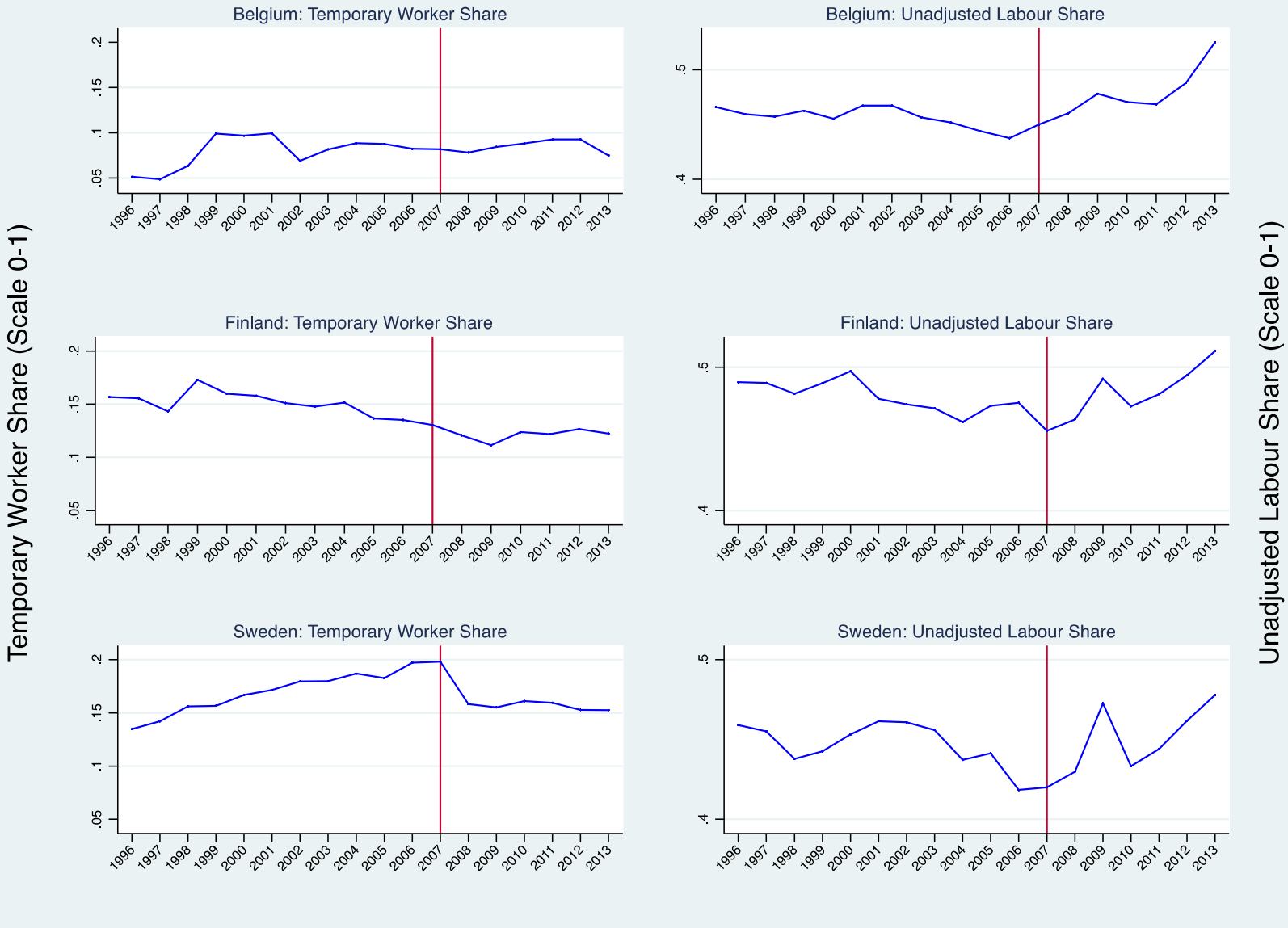
Dependent Variable	Unadjusted Labour Share					
	DFE			CCE		
Long-Run Coefficients	1	2	3	4	5	6
ln(TWS)	0.106		–0.166***	–0.068		–0.153*
	(0.070)		(0.062)	(0.053)		(0.090)
ln(Turnover)		–0.003	0.002		–0.007	–0.008
		(0.009)	(0.007)		(0.007)	(0.011)
ln(k)	0.386***	0.563***	0.527***	0.506***	0.583***	0.345**
	(0.105)	(0.086)	(0.080)	(0.112)	(0.133)	(0.177)
ln(TFP)	–0.165*	–0.272**	–0.322***	–0.157*	–0.124	0.173
	(0.092)	(0.118)	(0.094)	(0.090)	(0.125)	(0.169)
ln(EMPE)	0.643***	0.630***	0.837***	–0.058	0.140	–0.008
	(0.132)	(0.178)	(0.175)	(0.122)	(0.122)	(0.007)
ln(PMR)	0.05	0.151	0.165	–0.019	0.404***	0.071
	(0.073)	(0.113)	(0.101)	(0.149)	(0.153)	(0.178)
Short-Run Coefficients	1	2	3	4	5	6
Error Correction Mechanisms	–0.192***	0.159***	0.173***	–0.930***	–0.690***	–0.409***
	(0.054)	(0.040)	(0.046)	(0.128)	(0.090)	(0.075)
ln(TWS)	–0.018*		-0.024***	–0.066*		–0.074**
	(0.010)		(0.009)	(0.040)		(0.034)
ln(Turnover)	–0.192***	0.159***	0.173***		–0.001	–0.001
	(0.054)	(0.040)	(0.046)		–0.003	–0.003
ln(k)	0.646***	0.756***	0.699***	0.545***	0.558***	0.490***
	(0.078)	(0.069)	(0.082)	(0.090)	(0.104)	(0.093)
ln(TFP)	–0.038	–0.079	–0.102*	–0.347***	–0.160**	–0.027
	(0.053)	(0.061)	(0.059)	(0.074)	(0.069)	(0.054)
ln(EMPE)	0.343**	0.219*	0.413***	0.257**	0.353***	0.080
	(0.148)	(0.123)	(0.155)	(0.100)	(0.114)	(0.061)
ln(PMR)	–0.022	–0.021	–0.007	0.121	0.139	–0.035
	(0.018)	(0.022)	(0.018)	(0.077)	(0.128)	(0.064)
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Groups	95	107	82	95	107	82
Obs	1,565	1,732	1,358	1,565	1,732	1,358

Notes: DFE developed by Blackburne and Frank (2007); CCE developed by Pesaran (2006); cluster adjusted standard errors in parentheses.

Figure 1: Temporary Workers and Unadjusted Labour Share in Germany, The Netherlands, and Austria

Source: Eurostat; EUKLEMS.

Figure 2: Temporary Workers and Unadjusted Labour Share in Belgium, Finland, and Sweden

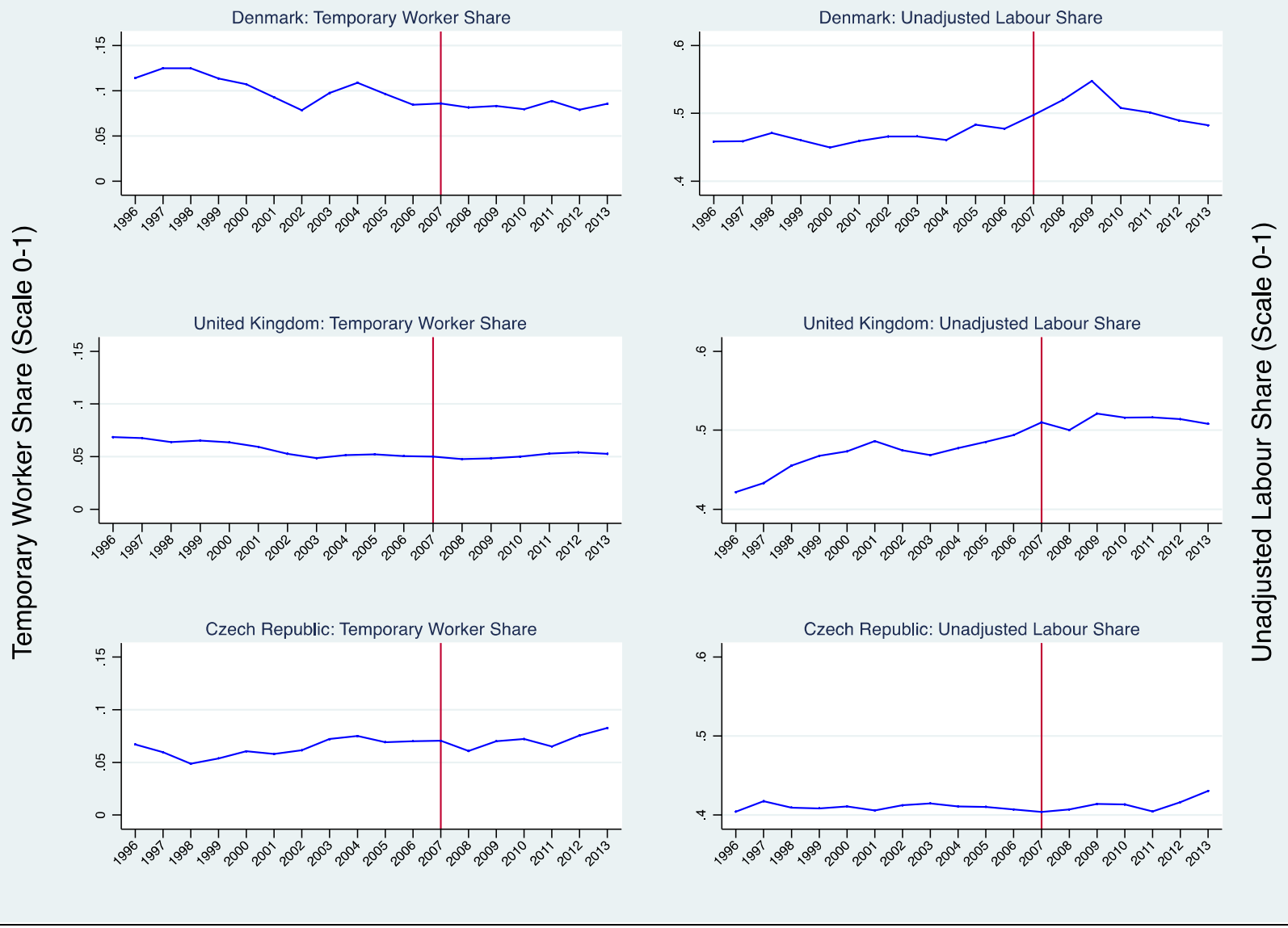


Source: Eurostat; EUKLEMS.

Figure 3: Temporary Workers and Unadjusted Labour Share in France, Italy, and Spain

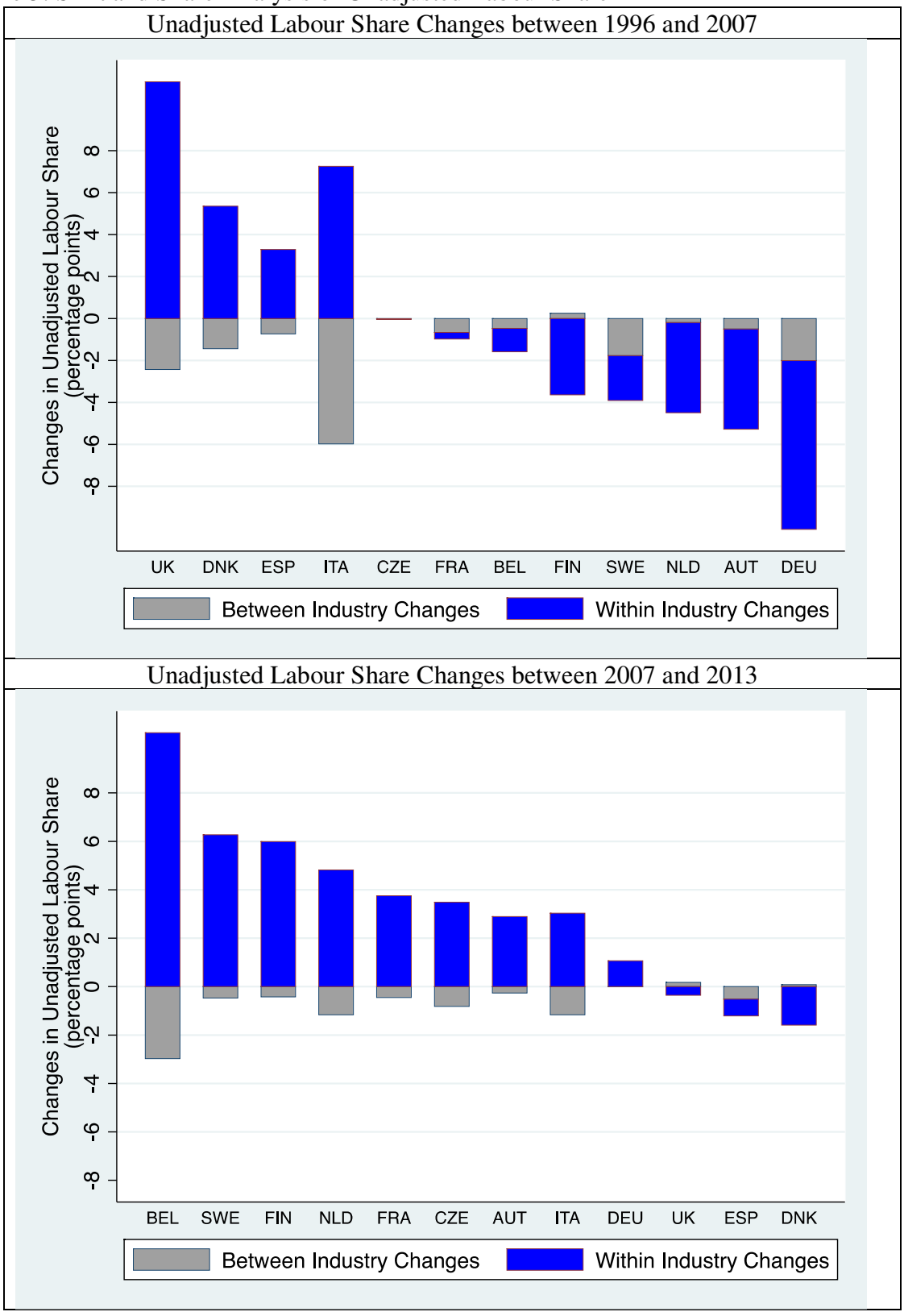
Source: Eurostat; EUKLEMS.

Figure 4: Temporary Workers and Unadjusted Labour Share in France, Italy, and Spain



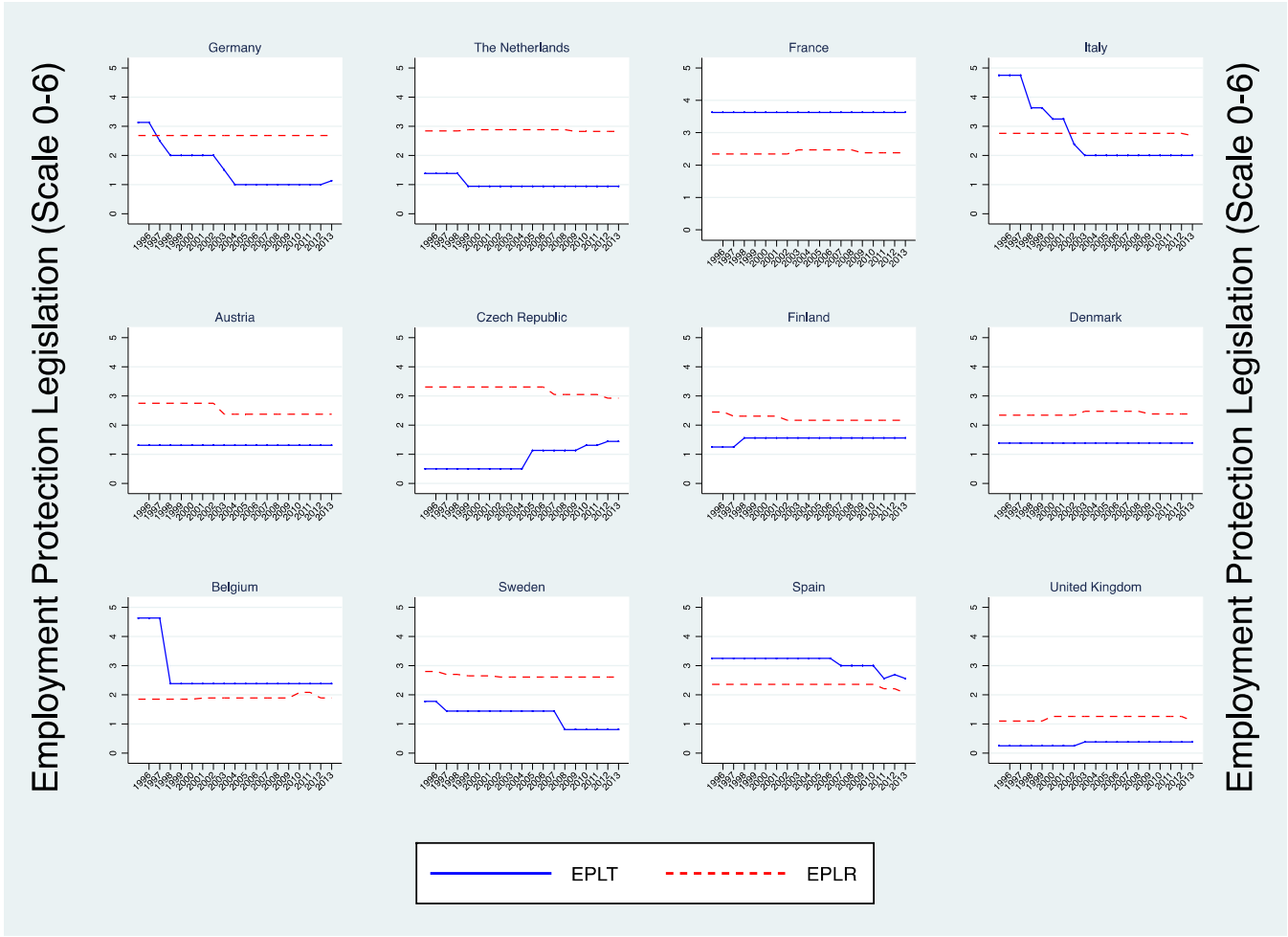
Source: Eurostat; EUKLEMS.

Figure 5: Shift and Share Analysis of Unadjusted Labour Share



Source: EUKLEMS.

Figure 6: Employment Protection Legislation (EPL) Indicators between 1996 and 2013



Source: OECD.

Table A.1 Description of variables

Unadj. Labour Share	Compensation of employees/ value added (sector–country-level data) Source: EU KLEMS database
Adj. Labour Share	Compensation of employees and self-employed /value added (sector–country-level data) Source: EU KLEMS database.
Capital/Output ratio (k)	Capital Stock to value added (sector–country-level data) Source: EU KLEMS database
TFP	Total Factor Productivity index, 2010=100, (sector–country-level data) Source: EU KLEMS database
Employees/Total Employment (EMPE)	Share of employees in total employment (sector–country-level data) Source: EU KLEMS database
Temp. Work. Share (TWS)	Share of temporary workers in total employees (sector–country-level data). Source: EUROSTAT database
TWS_benchmark	Frictionless sectoral temporary workers' share (sector-level data). Ciccone and Papaioannou (2010) methodology. Source: EUROSTAT database
Turnover (TO)	Net job turnover as proxy for job reallocation (sector–country-level data). Source: EUROSTAT database
TO_benchmark	Frictionless job reallocation (sector-level data). Ciccone and Papaioannou (2010) methodology. Source: EUROSTAT database
EPLT	Employment protection of temporary workers (fixed-term and temporary employment). The index includes information on the valid cases for which these types of contracts are legal, restrictions on the number of renewals, and their maximum cumulated duration (country-level data). Source: OECD
EPLR	Employment protection of regular workers against individual dismissal. The index refers to eight items which weigh three groups of restrictions: i) procedural inconvenience (such as notification procedures), ii) severance pay, and iii) difficulty of individual dismissals, definition of unfair dismissal, and related items (country-level data). Source: OECD
UD	Union density rates (the share of union members in the employed dependent labour force (country-level data). Source: ICTWSS database (Visser 2016)
BC	Share of employees covered by wage bargaining agreements (country-level data). Source: ICTWSS database (Visser 2016)
PMR	Regulation Impact Indicator: Regulations in service sectors and their impact on downstream industries (sector–country-level data). Source: OECD
UB	Unemployment benefits per participant to the labour market intervention, thousands of euros PPP (country-level data). Source: EUROSTAT database

Table A.2: Summary statistics at sector level (sector- and country-varying variables)

Sector	Stats	Unadj. Labour Share			Adj. Labour Share			Capital/Output ratio			TFP (2010=100)			Temp. Work. Share (TWS)			**TWS benc. 1996-2013**	Turnover (TO)			**TO benc. 1996-2013**
		1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013		1996	2007	2013	
Agriculture	Mean	21.44	27.99	30.20	84.37	89.89	81.01	4.28	5.16	5.62	73.21	100.02	102.94	23.46	24.44	23.59	**5.60**	6.69	5.77	9.80	**6.37**
	Cv	*0.50*	*0.38*	*0.31*	*0.46*	*0.41*	*0.41*	*0.40*	*0.49*	*0.41*	*0.18*	*0.13*	*0.12*	*0.61*	*0.65*	*0.74*		*0.72*	*0.82*	*1.00*	
Mining	Mean	42.66	35.24	37.67	40.72	35.24	39.54	4.06	3.72	4.18	111.34	108.09	88.61	15.01	14.57	8.67	**7.00**	3.02	13.43	10.54	**11.39**
	Cv	*0.53*	*0.63*	*0.54*	*0.55*	*0.65*	*0.53*	*0.69*	*0.66*	*0.49*	*0.34*	*0.16*	*0.24*	*0.53*	*0.94*	*0.57*		*1.60*	*1.13*	*0.71*	
Manufacturing	Mean	56.93	52.90	54.76	61.86	56.63	58.21	2.35	2.27	2.25	77.35	102.65	102.13	8.03	9.50	9.09	**1.09**	1.77	1.39	1.82	**2.71**
	Cv	*0.14*	*0.20*	*0.19*	*0.12*	*0.21*	*0.20*	*0.78*	*0.57*	*0.37*	*0.18*	*0.05*	*0.04*	*0.84*	*0.53*	*0.38*		*1.27*	*0.89*	*0.59*	
Electricity & Gas	Mean	34.93	32.30	32.79	32.09	32.67	33.84	6.03	6.09	6.34	109.71	107.92	91.22	6.20	10.33	9.79	**5.72**	4.26	7.81	6.59	**5.93**
	Cv	*0.37*	*0.19*	*0.23*	*0.28*	*0.19*	*0.23*	*0.35*	*0.29*	*0.35*	*0.15*	*0.10*	*0.12*	*0.54*	*0.47*	*0.42*		*1.28*	*0.72*	*0.50*	
Construction	Mean	60.93	56.45	58.74	81.02	77.47	80.54	1.43	1.93	1.69	123.65	107.74	96.60	13.73	13.62	12.97	**4.33**	3.32	3.35	4.04	**5.88**
	Cv	*0.19*	*0.17*	*0.18*	*0.20*	*0.18*	*0.22*	*0.75*	*1.21*	*1.04*	*0.16*	*0.07*	*0.06*	*1.10*	*0.91*	*0.56*		*1.02*	*0.91*	*1.13*	
Wholesale & Retail Trade	Mean	53.47	57.06	61.88	77.39	74.43	78.81	2.09	1.51	1.95	133.21	109.66	99.69	19.46	20.25	21.87	**1.53**	3.36	5.08	3.35	**1.69**
	Cv	*0.30*	*0.20*	*0.19*	*0.30*	*0.15*	*0.15*	*0.93*	*0.48*	*0.80*	*0.41*	*0.08*	*0.04*	*0.63*	*0.58*	*0.55*		*1.35*	*0.71*	*0.92*	
Hotels & Restaurants	Mean	54.42	55.38	58.70	69.75	67.35	70.53	1.15	1.23	1.83	83.23	102.93	100.97	10.79	12.27	11.85	**6.40**	3.59	3.19	2.10	**4.05**
	Cv	*0.19*	*0.15*	*0.13*	*0.10*	*0.12*	*0.12*	*0.42*	*0.45*	*1.24*	*0.22*	*0.05*	*0.03*	*0.86*	*0.51*	*0.43*		*2.27*	*0.69*	*1.28*	
Transports & Communic.	Mean	54.56	51.95	53.06	63.49	59.37	60.09	3.24	3.13	3.34	94.01	103.52	101.90	6.84	8.82	9.16	**0.40**	3.22	2.12	2.73	**2.47**
	Cv	*0.15*	*0.15*	*0.16*	*0.14*	*0.14*	*0.15*	*0.66*	*0.46*	*0.47*	*0.18*	*0.05*	*0.11*	*0.69*	*0.69*	*0.55*		*1.17*	*0.78*	*1.03*	
Finance & Profess. Activ.	Mean	32.25	34.54	35.24	40.08	42.04	43.02	7.53	7.29	7.89	111.49	105.02	99.56	9.81	10.54	8.48	**0.59**	11.46	5.11	3.62	**1.58**
	Cv	*0.17*	*0.20*	*0.18*	*0.17*	*0.15*	*0.14*	*0.34*	*0.30*	*0.22*	*0.12*	*0.06*	*0.03*	*0.71*	*0.53*	*0.47*		*2.97*	*0.48*	*0.72*	
Total	Mean	46.06	44.87	46.94	61.79	59.45	60.57	3.59	3.59	3.88	101.91	105.28	98.14	12.51	13.81	13.16	**3.78**	4.81	5.25	4.93	**4.27**
	Cv	*0.41*	*0.35*	*0.34*	*0.39*	*0.37*	*0.36*	*0.78*	*0.77*	*0.73*	*0.24*	*0.09*	*0.10*	*0.52*	*0.45*	*0.50*	***0.68***	*0.93*	*0.97*	*0.99*	***0.72***

Source: EUKLEMS and Eurostat. Notes: TFP is an index, all other values are expressed in percentages. TWS_benc and TO_benc are estimated exogenous benchmarks for temporary workers' share and turnover, according to Equations (3) and (4) (Cingano et al. 2010). Coefficient of variation (*Cv*)= standard deviation/mean.

Table A.3: Average annual growth of added value and compensation of employees (constant prices 2010)

Country	1996–2007		2007–2013	
	Added Value (var. %)	Labour Compensation (var. %)	Added Value (var. %)	Labour Compensation (var. %)
AUT	3.93	2.54	0.14	0.91
BEL	3.65	3.45	0.17	0.92
CZE	5.44	6.18	–0.02	0.70
DEU	2.15	5.82	0.15	0.14
DNK	3.31	8.64	–0.30	–1.66
ESP	4.85	2.40	–1.19	1.38
FIN	7.13	4.21	–0.82	0.41
FRA	3.60	0.63	0.04	1.14
ITA	2.10	2.66	–1.01	–0.38
NLD	4.45	3.92	–0.19	0.19
SWE	6.40	5.93	0.28	1.16
UK	4.04	5.53	–0.21	–0.17

Source: EUKLEMS.

Table A.4: Labour Market and Product Market Institution Indicators

Country	EPLT			EPLR			Union Density (UD)			Bargaining Coverage (BC)			Unemployment Benefits (UB; .000 Euros_ppp)			Prod. Market Regulation (PMR)		
	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013	1996	2007	2013
AUT	1.31	1.31	1.31	2.75	2.37	2.37	41.06	29.94	27.40	98.00	98.00	98.00	14.24	14.83	14.35	0.26	0.16	0.12
BEL	4.63	2.38	2.38	1.85	1.89	1.89	52.79	54.65	55.11	96.00	96.00	96.00	7.18	7.71	7.14	0.27	0.20	0.18
CZE	0.50	1.13	1.44	3.31	3.05	2.92	43.52	17.91	12.72	65.73	50.35	47.29	2.73	4.15	5.24	0.24	0.14	0.13
DNK	1.38	1.38	1.38	2.13	2.13	2.20	75.86	67.94	66.77	85.00	81.00	84.00	17.14	18.54	18.30	0.18	0.11	0.09
ESP	3.25	3.00	2.56	2.36	2.36	2.05	16.79	15.53	16.88	90.94	76.40	77.58	12.57	13.08	11.37	0.25	0.14	0.11
FIN	1.25	1.56	1.56	2.45	2.17	2.17	80.44	70.50	69.04	83.00	88.00	93.00	8.02	9.48	10.40	0.17	0.14	0.14
FRA	3.63	3.63	3.63	2.34	2.47	2.38	8.71	7.55	7.72	93.44	97.72	98.00	9.45	11.73	10.58	0.26	0.18	0.15
DEU	3.13	1.00	1.13	2.68	2.68	2.68	29.22	19.89	17.71	80.75	61.65	57.60	15.06	9.35	9.19	0.22	0.12	0.11
ITA	4.75	2.00	2.00	2.76	2.76	2.68	38.07	33.99	37.27	80.00	80.00	80.00	4.92	17.15	16.81	0.28	0.18	0.14
NLD	1.38	0.94	0.94	2.84	2.88	2.82	25.25	19.35	18.03	80.02	79.03	84.84	14.04	15.11	13.73	0.19	0.10	0.08
SWE	1.77	1.44	0.81	2.80	2.61	2.61	86.62	71.04	67.38	94.00	91.00	89.00	9.15	7.69	8.39	0.14	0.09	0.07
UK	0.25	0.38	0.38	1.10	1.26	1.10	34.43	27.35	25.67	36.00	34.60	29.50	4.41	3.87	2.88	0.14	0.07	0.06
Total	2.01	1.57	1.53	2.34	2.28	2.20	44.92	34.41	33.29	75.71	73.94	71.31	9.67	10.55	9.99	0.21	0.13	0.12

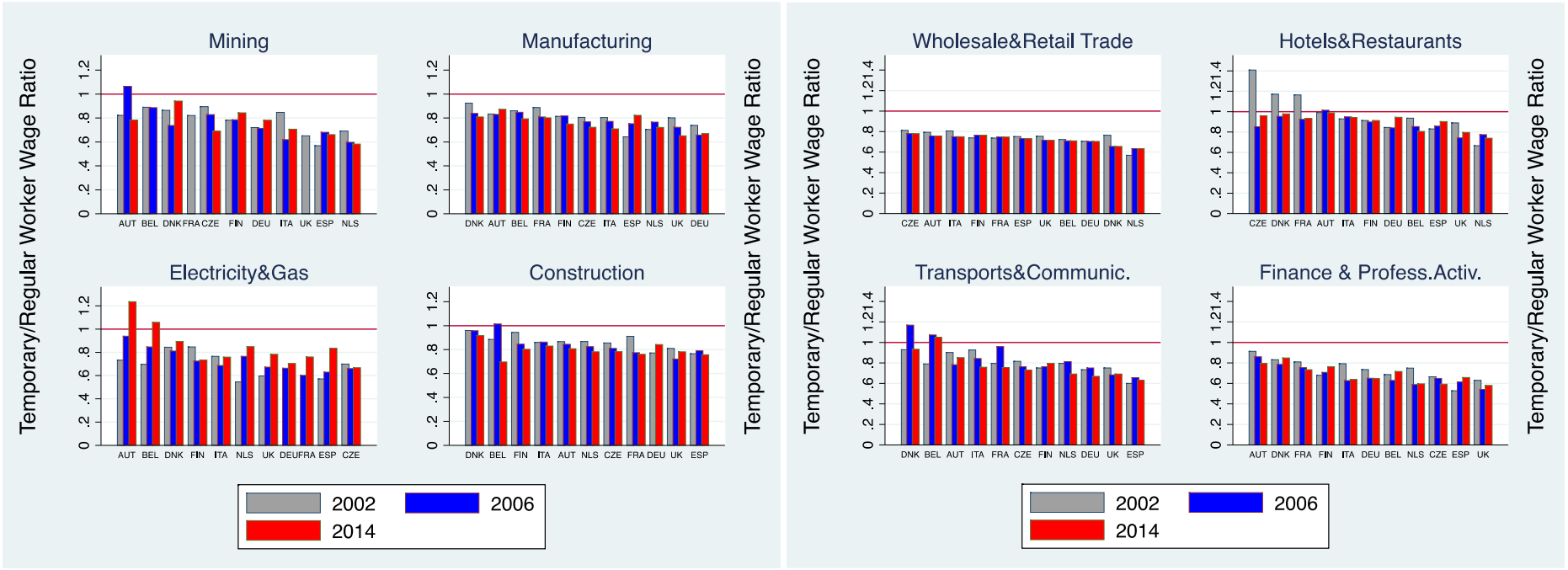
Source: OECD; Eurostat; ICTWSS (v. 5.1).

Table A.5: Pesaran's Tests: weak cross-sectional dependence and panel unit roots

Pesaran's Cross-Sectional Dependence Test		
	CD	p-value
ln(Unadjusted labour share)	32.879	0.000
ln(TWS)	19.410	0.000
ln(Turnover)	7.512	0.000
ln(k)	39.026	0.000
ln(TFP)	41.728	0.000
ln(EMPE)	3.428	0.000
ln(PMR)	235.716	0.000
Residuals	12.247	0.000

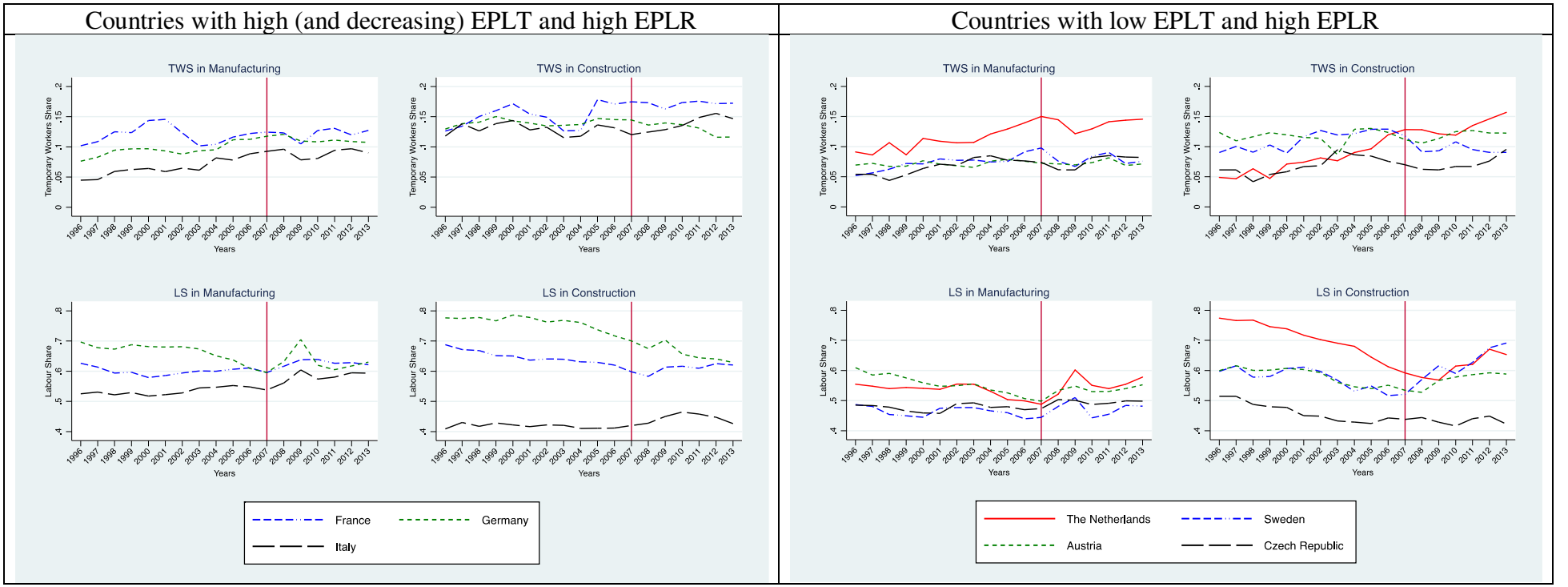
Note: Weak cross-sectional dependence (Pesaran 2015), H0: errors are weakly cross-sectional dependent.

Figure A.1: Gross hourly wage disparities between temporary and regular workers in sectors and countries



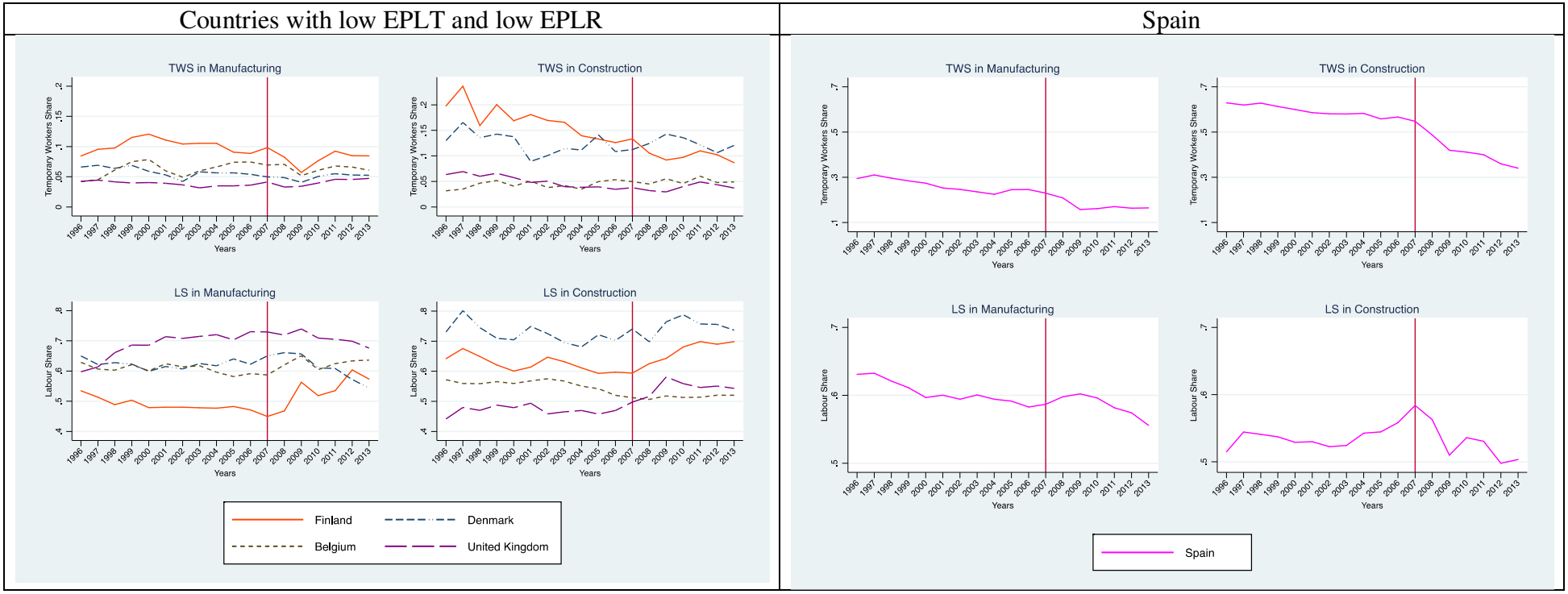
Source: Eurostat, Structure of Earnings Survey, years 2002, 2006, 2014.

Figure A.2: Temporary workers' share (TWS) and unadjusted labour share (LS) in manufacturing and construction



Source: Eurostat and EUKLEMS

Figure A.3: Temporary workers' share (TWS) and unadjusted labour share (LS) in manufacturing and construction



Source: Eurostat and EUKLEMS.

[i] To our knowledge only Deakin et al. (2014) analyse the influence of an ample set of policies regulating non-standard employment contracts on LS. They find that the stringency of these policies has a positive effect on LS in the short run. However, the authors do not take into account the role played by capital intensity and technological change.

[ii] According to Bentolila and Saint Paul (2003) changes of capital-output ratio affect labour share as follows, $dLS/dk = -(1+\sigma) / (k*\eta)$, where $\eta<0$ is the elasticity of labour demand with respect to wages. Therefore $dLS/dk>0$ if $\sigma<1$.

[iii] Country–time and sector dummies capture all other potential determinants of LS mentioned in the literature, such as unemployment rate, minimum wage, globalization and trade, and industry concentration. For reasons of appropriate identification in the difference-in-difference approach (i.e., the difficulty of choosing a reliable benchmark for country-level trade-openness, unemployment rate, and minimum wage) or data availability (minimum wage and industry concentration), we had to exclude these supplementary explanatory variables.

[iv] We use the interchangeable terms 'intrinsic', 'natural', and 'frictionless' to underline that the propensity to employ temporary workers or reallocate jobs does not depend on institutions but only on technological and other idiosyncratic industry characteristics.

[v] Two main reasons underlie the choice of using a different benchmark for EPLT than for EPLR and *Oth.LMIs*. First, EPLT focuses exclusively on the hiring restrictions of fixed-term and temporary work agency employment. Since TWS exactly measures the fraction of the labour force with these characteristics, it seems to be a more precise benchmark indicator than job turnover rate, which instead reassumes differences between job destruction and creation. Secondly, the job turnover rate basically captures the change in employment caused by job destruction and creation. However, many authors highlight that there can be co-presence of low job flows (low job turnover) and high worker flows (i.e., more than one worker joins and leaves the same job position in a given time span) if the share of temporary workers is sizeable (Bellmann et al. 2017). Therefore, the temporary worker share, which is a different phenomenon that EPLT is supposed to regulate is much more correlated with worker turnover.

[vi] This is a weighted mean of EPLR and EPLT: see OECD (2013).

[vii] For example, according to Acemoglu (2003), changes of the shares of income paid to each factor may influence the incentive to innovate (TFP) and to invest (k).

[viii] We keep product market regulation (PMR) due to sector–country-level availability and good variability across time. Other institutional variables are captured by country-by-time dummies.

[ix] Since we do not have long series, no stationarity test has been performed. However, the estimators we use in the error correction model are supposed to be consistent with either stationarity or non-stationarity (Pesaran, 2006).

[x] The capital stock data included in the 2017 EUKLEMS release are different from the previous ones and follow a statistical module where capital stocks are taken directly from Eurostat. TFP in EUKLEMS measures the portion of output growth not attributable to inputs and their measured quality. Hence, TFP proxies pure technological changes (not embodied in inputs), organizational improvements, measurement errors, and mark-ups (van Ark et al. 2008).

[xi] Austria, Belgium, the Czech Republic, Denmark, Spain, Finland, France, Germany, Italy, the Netherlands, Sweden, and the United Kingdom.

[xii] 1) Agriculture, 2) Mining and Quarrying, 3) Manufacturing, 4) Energy, 5) Construction, 6) Wholesale and Retail Trade, 7) Hotels and Restaurants, 8) Transport, Storage, and Communications, 9) Financial Intermediation, Real Estate, and Business Services.

[xiii] Italy is another exception, despite the strong increase in the percentage of temporary workers, both unadjusted and adjusted labour share rose by 1 percentage point between 1996 and 2007.

[xiv] We can better understand this LS reversal during the crisis by separately examining the movement of its components; i.e., added value and employee compensation. Table A.3 in the Appendix clearly shows that in almost all countries the average annual growth of employee compensation increased more (or declined less) than the added value.

[xv] Data used for Figure A.1 comes from the Eurostat-Structure of Earning Survey in which the reference years do not match exactly those reported in our descriptive statistics. We did our best to choose SES reference years closer to ours. SES is also used by EUKLEMS (2017, p.10) to estimate labour composition.

[xvi] A particular case in point is Spain, where the liberalisation of temporary contracts was adopted in 1984, and in the early 1990s, after a dramatic burst of temporary jobs, a series of countervailing EPL reforms was adopted to offset some of the undesirable consequences of the 1984 reform (Bentolila et al., 2012). In any case, in our sampled period we also observe a reduction in EPLT for this country (from 3.25 in 1996 to 2.56 in 2013, see also Table A.4).

[xvii] This overall impact results from 0.329*[(2.97*0.46)*100]=45%.

[xviii] As mentioned above, TFP in our specific case, might capture organizational changes and mark-up that favour only the firm's profit without affecting labour returns (Autor et al., 2017).

[xix] Future research on the role of the interaction between product and labour market regulation could be useful to test if these regulations are linked by a substitutability or a complementarity relationship (Amable et al., 2011).

[xx] This result probably reflects the high correlation normally found between self-employment and temporary workers in sectors where the propensity to employ flexible labour is higher (i.e., construction, hotel and restaurants, agriculture). Since in our specification the higher this propensity is the more EPLT positively influences LS, it is plausible that (EPLT*TWS_Bench) coefficients are greater in magnitude when the dependent variable is the labour share adjusted for the self-employment.

[xxi] We obtain positive and significant coefficients for capital–output ratio and negative and significant coefficients for TFP. These results are very stable and do not change even in specifications that only include *k* and TFP as explanatory variables of LS. Results of these regressions are available upon request.

[xxii] The Hansen and Arellano-Bond tests do not reject the hypothesis of the validity of instruments (see the bottom of Table 6) when we instrument difference and level equations with lags and differences, respectively, of *k,* TWS, and TO.

[xxiii] On the one hand this result reinforces our main outcome, i.e., excessive adjustment costs are bad for labour share but a strong liberalisation of temporary contracts is not the right solution; on the other hand it seems to contradict our previous results in Tables 3 and 5, where protection for regular workers (EPLR*TO_bench) also fosters the labour share. Further research is needed on this point, which however remains marginal in our case, where temporary workers are the main interest.

[xxiv] For the sake of readability, we omitted results for the cross-section averages of dependent and independent variables that add to the CCE estimates (Pesaran, 2006).

[xxv] Piketty's extensive work has analysed the long-run trends of capital share and income inequality. However, Piketty's work adopts a broader definition of capital, and capital and wealth are interchangeable terms. Our contribution follows the vast literature on LS and only considers capital as a factor of production.

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