Begging thy coworker – Labor market dualization and the slow-down of wage growth in Europe

Lukas Lehner[1], Paul Ramskogler[2] and Aleksandra Riedl[3]

Abstract

Does the structure of labor markets – and the possibility to employ temporary workers – affect aggregate wage growth? We incorporate labor market dualization into the standard Phillips curve model and show its strong effect on wage growth in 30 European countries for the period 2004-2017. To aggregate wages by job contract type and control for changes in the workforce composition, we rely on individual-level EU-SILC data. This allows us, for the first time to show that there is a negative effect of the incidence of involuntary temporary employees on aggregate wage growth. This effect is particularly pronounced in countries, where wage bargaining institutions are weak. Finally, our findings shed further light on the reasons for the secular slow-down of wage growth after the global financial crisis.

[1]Institute for New Economic Thinking at the Oxford Martin School and Department of Social Policy and Intervention, University of Oxford, Oxford, United Kingdom; E-Mail: lukas.lehner@spi.ox.ac.uk.

[2]Principal economist, Oesterreichische Nationalbank, Otto-Wagner-Platz 3, Vienna, Austria; E-Mail: paul.ramskogler@oenb.at. The views expressed in this paper are exclusively those of the authors and do not necessarily reflect those of the Oesterreichische Nationalbank (OeNB) or the Eurosystem.

[3]Principal economist, Oesterreichische Nationalbank, Otto-Wagner-Platz 3, Vienna, Austria; E-Mail: aleksandra.riedl@oenb.at.

1 Introduction

Temporary employment has become a pervasive feature in European labor markets. The reason is simple: Temporary employment is more flexible in terms of labor cost adjustments than permanent employment. Further, it is well established that temporary employment comes with a wage penalty (Kahn 2016; Pavlopoulos 2013). For many employers, temporary employment is, thus, a cheaper source of labor. Yet, the flexibility of temporary contracts often disproportionately benefits employers instead of workers (Hyman 2018), resulting in substantial levels of *involuntary* temporary workers. Involuntary temporary employment has behavioral implications central to our analysis. Notably, *involuntary* temporary employment, by definition, forms part of the labor supply for permanent employment and thus may foster competition between different segments of workers.

We propose a mechanism through which the presence of involuntary temporary employees dampens the bargaining power and wage growth of permanent workers. This "competition effect" is not captured by the unemployment rate. To empirically identify a potential competition effect, we draw on a sample of 30 European countries in the period 2004-2017. Given the large country heterogeneity with respect to the incidence of involuntary temporary employment in Europe, the effect is expected to be mainly driven by differences *across countries*. To what extent temporary employment can influence the bargaining power of workers likely depends on a country's institutional framework. Therefore, we expect the institutional framework to reinforce or dampen the impact of temporary employment on wage growth.

While cross-country variation of temporary employment might predominate, the within-country variation linked to business cycle dynamics should not be neglected. The incidence of temporary workers increases in the early stages of a recovery (i.e., when the unemployment rate starts to decline) and falls swiftly in the downturn. Hence, temporary employees can create an additional source

of slack in labor markets, which necessitates examining potential competition between temporary and permanent workers that occur *over the time dimension*. At the same time, fluctuations in temporary employment also affect aggregate wages by changing the share of workers who incur a wage penalty due to their temporary contract. For instance, temporary workers are typically the first to be laid off during a recession, which mechanically increases average wages through a pure *composition effect*. To adjust for a changing composition of employment, we use worker-level data to construct an adjusted wage growth variable that allows us to focus on competition effects only.

Building on the insights of a relatively recent strand of literature (Bellani and Bosio 2019; Damiani et al. 2018), we thus explore how labor market dualities have affected wage growth in Europe since 2004. We do so by investigating the impact of involuntary temporary employment on wage growth in a Phillips curve model and by exploring the role of institutions. We then examine whether involuntary temporary employment helps to understand the Phillips curve flattening in the recovery period after the 2008 Global Financial Crisis (GFC).

2 Labor market dualization and the competition effect

Involuntary temporary employment is pervasive in European economies (ILO 2016) with an increasing share of workers experiencing temporary employment (Latner 2022). Driving this trend of labor market dualization are structural changes, such as the service sector's growth (Marx 2011) and deregulation policies (Polavieja 2006; Emmenegger et al. 2012; Thelen 2014; Biegert 2014). Shares vary across countries (Figure 1), averaging 5.5% in 2017 compared to a 7.4% average unemployment rate. Does its prevalence impact wage-setting?

2.1 The relationship between temporary and permanent workers

We introduce the *competition effect* to understand the relationship between temporary and permanent workers and investigate its macroeconomic consequences. Drawing on industrial relations scholarship, we hypothesize that the presence of involuntary temporary workers restrains wage growth due to elevated job insecurity for permanent workers, which weakens their bargaining position. Indeed, temporary employment contributes to a rise in perceived job insecurity (Kuroki 2012, p. 564), which has been suggested to explain wage restraint (Katz et al. 1999). Our hypothesis is supported by Damiani et al. (2018), who show that reductions in employment protection for temporary workers can reduce overall wage shares. Bellani and Bosio (2019) find that, at the occupational level, wages of permanent employees are negatively affected by the incidence of overall temporary employees (i.e., voluntary and involuntary). Ramskogler (2021) indicates that overall temporary employment has a negative effect on aggregate (unadjusted) wage growth in Europe.

Exacerbating the *competition effect*, employers may foster discord between workers to prevent the emergence of a unified labor bloc (Bellani and Bosio 2019). For instance, temporary agency workers are used to mitigate wage pressures (Houseman et al. 2003; Drenik et al. 2023), and reforms in temporary employment have worsened conditions for permanent employees (Dolado et al. 2002), in particular for those with lower and middle incomes (Weisstanner 2020). Empirically, evidence of competition between permanent and temporary employees has been found (Voinea 2018). In line with earlier work (Piore 1979; Western and Healy 1999), we suggest that different segments of workers and their interaction with labor market institutions affect the wage-setting process over and above standard macroeconomic factors.

The competition between temporary and permanent workers could invert the established insider-outsider logic (Lindbeck and Snower 1988, 2002), which in its early work on dual labor markets challenged human capital theory (Doeringer and

Piore 1971; Rosen 1972; Reich et al. 1973; Piore 1983; Dickens and Lang 1985). Applied to temporary work contracts, the insider-outsider theory suggests that larger hiring and firing transaction costs for insiders create two labor market segments. Insiders enjoy relatively higher economic security than outsiders and can extract rents to the detriment of outsiders by securing higher wages. This results in the wage penalty that is well established: under equal conditions, temporary workers receive smaller paychecks than permanent workers (Kahn 2016; Pavlopoulos 2013). Employers have the incentive to replace permanent employees with temporary ones if the transaction costs associated with hiring and firing permanent employees are lower than the wage penalty (Koutentakis 2008).

As such, the wage penalty can obscure the empirical analysis of the *competition effect*. Changes in the share of temporary workers who suffer from the wage penalty mechanically affect aggregate wages. This results in a *composition effect* on wage growth, which we correct for.

2.2 The role of labor market institutions

The competition effect hypothesized interacts with labor institutions. Olson (1971) proposed that significant but non-encompassing collective interests are detrimental at the societal level. The implications for wage determination are widely discussed (Calmfors et al. 1988; Soskice 1990). In the insider-outsider model, it is easier for insiders to protect their rents at moderate levels of worker organization. At high levels, there are fewer outsiders to bear externalization costs, while at low levels, insiders face stronger competitive pressures.

The simplest measure of the inclusiveness of trade unions is their membership density (Lange 1984). According to Olson's theory, we expect a negligible competition effect in countries with moderately encompassing membership. We expect a large effect in countries with low membership, as insiders lack sufficient power to protect themselves. In contrast, countries with encompassing membership are

expected to experience no competition effect, as outsider interests are likely to be internalized.[1] Only the Nordics, Belgium, Malta, and Cyprus still have high membership rates above 40% of the labor force (Appendix Figure A.1). Determining the cut-off between low and medium trade union density (TUD) is less obvious. The distribution of membership rates suggests a cut-off at 20%, which we follow but test for robustness using different cut-off values.

While TUD seems a suitable measure to capture how encompassing unions are, we also use collective bargaining coverage (CBC) for robustness. We assign countries again into three groups: The high group with above 85% coverage comprises mainly countries with an automatic extension of CBC including France, Spain, Belgium, Austria, Finland, and Sweden, while the low group with less than 35% coverage comprises exclusively of Central Eastern European countries and the UK.

Another measure of robustness is wage bargaining coordination. The high group comprises countries with established norms about wage bargaining, predominantly Nordic and Continental European countries. The middle group includes countries that rely on procedural guidelines for coordination with no regularized patterns, such as Spain, Ireland, and Switzerland. The lowest group again contains traditionally Central Eastern European countries, the UK, and some Mediterranean countries.

We also analyze the impact of employment protection legislation (EPL). EPL refers to the level of protection provided to permanent workers against individual and collective dismissals. We expect the effect of EPL to be ambiguous: Stricter EPL may enhance workers' bargaining power but also incentivize hiring temporary workers to avoid dismissal costs, thus intensifying competition between temporary and permanent workers. Furthermore, workers subject to more stringent EPL have more to lose if their permanent contract is substituted with a

[1] We demonstrate in the empirical analysis that the competition effect is stronger in countries with weak institutions and that this relationship does not result from weak trade unions causing higher shares of temporary employment.

temporary one, putting permanent workers in a *golden cage*. We categorize countries into high and low EPL groups. Appendix Table E.2 displays the descriptive statistics and country groupings.

2.3 The post-crisis Phillips curve flattening

After the GFC, wage growth fell short of expectations based on the established relationship between unemployment and wages (Kahn 1980; Blanchflower and Oswald 1994). Early signs of a flattened Phillips curve emerged post-GFC (Anderton and Boele 2015), with disinflation starting around 2012 driven by wages (Ciccarelli and Osbat 2017; Moretti et al. 2019). To explain the wage growth slowdown, conventional measures of labor market slack were adjusted for hidden slack, including discouraged workers and involuntary working time reductions, which had increased during the recession (Hurley and Partini 2017).

Bell and Blanchflower (2019) suggest a labor under-utilization index, which enhances the fit of the Phillips curve for Europe (Bell and Blanchflower 2021) and the US (Blanchflower et al. 2022). This view is supported with regard to part-time workers' composition effects (OECD 2018), involuntary part-time workers (Hong et al. 2018; IMF 2017), and the gap in hours worked and in non-employment (Zhang 2019), though the effect's magnitude remains debated (Nickel et al. 2019).

Involuntary temporary employment constitutes a specific form of labor under-utilization, commonly used by firms to absorb labor market fluctuations (Draeger and Marx 2017; Hijzen et al. 2017). Temporary workers have lower job stability (Hirsch 2016; Autor and Houseman 2010; Gebel and Giesecke 2011), which suggests that they are more likely to be laid off during unfavorable economic conditions (Costain et al. 2010). Consequently, temporary employment declines faster than permanent employment during economic downturns. An increase in temporary jobs does not provide the same employment opportunities for job seekers and may result in elevated uncertainty among permanent workers as no functional equivalent jobs, and thus outside options for job switchers, open up.

If newly created jobs predominantly offer temporary contracts, the reduction in the unemployment rate may thus have a smaller effect on wage growth.

Given the negative correlation between temporary employment and unemployment, fluctuations in temporary employment may balance out the effect of unemployment changes (Appendix Figure A.2). Notably, the incidence of involuntary temporary employment reached a historical peak during the 2013-2017 recovery. This warrants investigating whether the high prevalence of temporary workers has contributed to the Phillips curve flattening. Involuntary temporary workers, desiring permanent contracts, represent part of the labor supply for permanent employment and constitute a form of hidden slack. Therefore, any job created based on temporary contracts should reduce the impact of unemployment rate reductions on wage growth, resulting in a flatter Phillips curve.

3 The empirical approach

Macroeconomic research as discussed in our theory section has relied primarily on country-level data. As available aggregated wage data do not distinguish between permanent and temporary employees, macroeconomic approaches were unable to disentangle competition from composition effects. The distinction is fundamental since variation in our main independent variable – the incidence of involuntary temporary employment – mechanically affects wages as an inherent component of the employment composition. Hence, an observed negative relationship between temporary workers and wage growth may be the result of changes in the composition of workers with different wage levels. We therefore correct for this composition effect to identify the *competition effect*. In contrast to macroeconomic approaches, industrial relations research has distinguished between wages of temporary and permanent employees by using individual-level data to investigate heterogeneous effects on employment and wages at the meso- or micro-level. We contribute by bringing both strands together. This allows us

to account for changes in the share of temporary employees to assess whether competition effects influence macroeconomic outcomes.

More specifically, we rely on worker-level data to construct a country-year panel for wage growth of only permanent employees. If a competition effect exists, temporary workers have a negative impact on the wage growth of permanent employees. As permanent workers make up around 90% of Europe's labor force, wage growth of permanent employees is very likely to be close to overall wage developments. Nevertheless, the use of worker-level data allows us to construct a wage growth series for *all* employees in a country, while netting out potential composition effects. Hence, we also estimate the sensitivity of *overall* aggregate wage growth with respect to the prevalence of temporary work in Europe.

3.1 Adjusting wage growth for a changing employment composition

To construct our dependent variable, wage growth, we rely on EU-SILC, a representative population survey containing the longest-running cross-national dataset available with annual information on employment and wages.[2] It allows us to distinguish employees on temporary contracts from permanent ones, which is crucial for our research question. Although the primary focus of EU-SILC lies in collecting representative data on income rather than on the labor market status, the share of temporary employees in total employees in EU-SILC (11.7%) is quite comparable to the respective figure in the Labor Force Survey (13.9%).[3] We discuss the data and aggregation of country-level time series in Appendix B. To confirm the validity of our aggregation, we compare our time series to Eurostat's officially published EU-SILC country-level data (Figure B.1-B.2) and to the OECD's time series on wages based on national accounts as well as on survey

[2]The EU-LFS does not contain the wage level. The EU-SES is only conducted every four years.

[3]The reported figures represent the weighted average of the share of temporary employees in total employees of all European countries in our sample in the observation period 2004-2017. Note also that the share of temporary employment according to EU-SILC seems to follow a quite similar pattern over time compared to the respective series from the EU-LFS. This is reflected by a relatively high correlation coefficient of 0.88 between both series.

and admin data (Figure B.3).

In addition to the *unadjusted* aggregate wage growth variable of all employees, we calculate the wage growth of permanent workers based on the information about employees' contract type. Figure 2 illustrates wage dynamics in Europe for both contract groups separately. What stands out immediately is that wage growth has slowed down since the onset of the GFC, a stylized fact discussed in our theory section. Interestingly, this applies to both groups but seems to be more pronounced in the group of temporary workers. It might be related to the strong *relative* demand for temporary employees before the onset of the crisis (Appendix Figure A.2), which could have accelerated wage growth for temporary workers compared to permanent workers. Likewise, the weakened relative demand during 2008-2014 might explain the observed slower wage growth of temporary workers, while the economic recovery gaining traction from 2015 has fuelled demand for temporary labor, thereby lifting their wages.

To obtain the wage growth of a pseudo-workforce with a constant employment composition over time, we employ *inverse probability weighting (IPW)* (Rosenbaum and Rubin 1983; DiNardo et al. 1996; Fortin et al. 2011). First, we use a logit model to predict the probability of each observation of being in temporary employment per year and country, pairing the base year t (2004 or earliest available) with each of the following years $t+n$: $\ln \frac{p}{1-p} = \beta_0 + \sum_{t=1}^{m} \beta_t x_t$ where x_t is employment contract that we control for.[4] We estimate the re-weighting factors for each year and country separately. Second, we adjust the weights for each observation so that the re-weighted sample has the employment composition with regard to the first year available. For the base year, we keep the original weight $g_1 = g$, whereas for control individuals, we use the predicted probability $p(x)$ to receive the adjusted survey weights $g_{1+n} = g\frac{p(x)}{1-p(x)}$.[5] Finally, we aggregate the

[4]To adjust for changes in employment shares based on other observable characteristics, we repeat the same procedure using gender, migration background, educational attainment, and work experience as additional controls in the logit model (Figure B.1).

[5]It is not possible to fully rebalance continuous covariates with a semiparametric method, but we can eliminate a large part of the variation in individual worker characteristics over time with our re-weighting

worker-level data at the country-year level to obtain our adjusted measure for aggregate wage growth that is based on a counterfactual employment composition constant over time with regard to employment contracts.

Figure 3 presents the adjusted wage growth variable for each country (averaged over the whole sampling period) and the employment composition effect. The latter purely represents a mechanical effect from the changing share of temporary workers over time. Since temporary workers suffer a wage penalty compared to permanent workers, an increasing share of temporary workers lowers the aggregate average wage given a constant penalty. Adjusted wage growth represents the counterfactual rate of wage growth if the share of temporary workers would have remained constant over time. The size of the composition effect is very heterogeneous at the country-level and sizeable in some countries, in particular Denmark, Serbia and the UK. However, interestingly, it does not play a large role for Europe as a whole. Some countries are characterized by substantial wage differences between temporary and permanent workers and have experienced a strong increase in temporary work. However, even in those cases, temporary workers as a share of all employees have only changed by a few percentage points over several years, resulting in a minor impact of employment composition changes on wages. For robustness, we adjust wage growth additionally for employment composition changes by gender, migration background, educational attainment, and work experience, which warrants slightly larger effects (Appendix Figure C.1).

Although the difference between adjusted and unadjusted wage growth is quite small overall, it must be stressed that only by adjusting can we identify the underlying mechanism that impacts wage growth. Without the adjustment for employment composition, we would not know whether composition or competition is driving our results.

procedure.

3.2 Estimating factors of wage growth

The most widely used empirical model to study the determinants of wage growth is the wage Phillips curve. The traditional wage Phillips curve relates nominal wage growth to labor market slack. Additional determinants typically considered are (expected) inflation and labor productivity growth (Nickel et al. 2019). We use such an augmented Phillips curve model to study the impact of dualization on nominal wage growth in Europe. We estimate a standard reduced form equation in a panel data framework of the form:

$$\dot{W}_{i,t} = \alpha_1 + \alpha_2 \mathrm{U}_{i,t} + \alpha_3 \mathrm{Prod.}_{i,t} + \alpha_4 \mathrm{Infl.}_{i,t} + \alpha_5 \mathrm{Involv.\ Temp}_{i,t} + \mu_i + \tau_t + \epsilon_{i,t} \quad (1)$$

As outlined in the section above, our dependent variable is nominal wage growth obtained from EU-SILC. As a benchmark, we first study the dynamics of the unadjusted aggregate wage growth to represent the workhorse Phillips curve model. In the second step, we analyze the nominal wage growth of permanent workers only, and we finally implement our main dependent variable, which is nominal wage growth net of composition effects ($\dot{W}_{i,t}$). While most studies estimating wage Phillips curves use quarterly data[6], we have to stick to an annual frequency (as in the original contribution by Phillips (1958) or more recently by Kiss and Van Herck (2019)) as the computation of our dependent variable is only feasible based on yearly data. Our sample includes 30 European countries (i) and ranges from $t = 2004, ..., 2017$, which leaves us with roughly 340 observations.[7] We intentionally choose a static representation as we do not observe any persistence in wage dynamics (likely due to the annual frequency of our sample). Moreover, as the time-invariant country effects (μ_i) are correlated with the regression variables, we employ the fixed-effects estimator (FE), where unobserv-

[6] Examples are Bonam et al. (2021), Nickel et al. (2019) and Bulligan and Viviano (2017)

[7] Data for some countries are only available after 2004. We drop 19 observations when there was a break in the time series of wages according to Eurostat (due to a change of source or survey methodology).

able country effects are assumed to be fixed (and not random). We compute standard errors clustered at the country-level in all specifications to control for potential serial correlation in the error term within each country.

As a baseline, we use the conventional labor market slack indicator, which is the headline unemployment rate $U_{i,t}$, but we also consider several other measures of slack for robustness. Further, we control for the impact of labor productivity ($Prod_{i,t}$) on wages, which we measure as the growth rate of real output per employment, as well as for inflation ($\pi_{i,t}$). Studies using quarterly wage growth data often employ (one quarter) lagged inflation implying backward-looking expectations (Ramskogler 2021; Nickel et al. 2019; IMF 2017). Given the annual frequency of our data, we assume a contemporaneous effect from inflation (measured as the annual change in the harmonized index of consumer prices) on nominal wage growth.[8]

Finally, and most importantly, we add to our Phillips curve specification a variable to identify the competition effect. So far, studies exploring the impact of dualized labor markets on wages have considered *overall* temporary employment (Ramskogler 2021; Bellani and Bosio 2019). However, the limitation is that not all temporary workers look for a permanent contract. We identify the competition effect, by focusing on *involuntary* temporary employees as a share of the active working-age population (Invol. $Temp_{i,t}$). This segment of disadvantaged workers prefers a permanent contract over their temporary one, which we expect to cause the competition effect. A detailed description of the measurement of all variables and their sources is included in Appendix Table E.1.

[8]We also consider a survey-based measure capturing forward-looking inflation expectations provided by the European Commission (expected inflation). As this variable is not available for two of our countries (Switzerland and Norway) and does not improve the explanatory power, we stick to realized consumer price inflation.

4 Results

In the first part of this section, we present estimation results concerning the identification of the competition effect and its relevance for the macro-economy (Tables 1 and 2). In the second part, we test whether the magnitude of the competition effect depends on labor market institutions (Table 3). Finally, we explore whether the rise in involuntary temporary employment can explain the flattening of the Philips curve in Europe during the recovery period after the GFC (Table 4).

4.1 Identifying the competition effect at the macroeconomic level

We present the workhorse Phillips curve specification augmented by involuntary temporary employment in column (1) of Table 1. The coefficient estimates have the expected signs and are statistically significant. An increase in labor productivity growth has a positive effect as it raises the demand for labor, which in turn puts upward pressure on wage growth. We also observe a positive impact from inflation with a regression coefficient standing around 1.[9] By contrast and as expected, an increase in the unemployment rate reduces nominal wage growth. Yet, our variable of main interest – $Invol.Temp_t$ – is also negatively associated with nominal wage growth and is statistically significant. A rise in the share of involuntary temporary employees by one percentage point leads to a decrease in nominal wage growth by almost 1.0 percentage points. As we have considered the *unadjusted* growth rate of wages so far, the coefficient estimate captures both potential composition *and* competition effects. However, before we alter the dependent variable to isolate the competition effect, we include time dummies in our model to control for common shocks that might have affected wage

[9]This finding likely is linked to the annual context of our estimations and corresponds to the results by Kiss and Van Herck (2019). While it is not very common in the literature to use quarterly data, Rusinova et al. (2015) show that if four lags of inflation are considered in quarterly estimations the aggregate effect again accumulates to close to 0.9.

dynamics equally across countries over time, such as the GFC. In fact, a test of joint significance shows that the time dummies have high explanatory power. Apart from that, their inclusion reduces coefficient estimates of all variables except $Invol.\ Temp_t$, as we can see in column (2). This is particularly true for inflation, which even becomes statistically insignificant.[10] As time dummies are significant in all the following model specifications, we included them to avoid biased estimates (Baltagi 2005).

We now alter our dependent variable in column (3) by considering the nominal wage growth of employees with permanent contracts only. This allows us to estimate the competition effect, as we isolate the part of wage growth that cannot be affected by changes in relative weights between temporary and permanent workers. Compared to column (2), all coefficient estimates remain broadly the same. This result has two main implications. First, it strongly supports our thesis that the incidence of a dualized labor market has negative spillover effects on the dynamics of wages of employees with permanent contracts. This is consistent with Bellani and Bosio (2019) who find that the density of temporary contracts within occupation- and age-specific groups negatively affects average wages for permanent workers belonging to the same group. In addition to their findings, our results show that competition effects are also relevant in a macroeconomic context, where other important wage growth determinants like the unemployment rate are accounted for. The second important implication is that *composition* effects seem to be negligible in Europe in the period 2004-2017. The relatively low contribution of employment composition to the adjusted wage growth variable across countries presented in Figure 3 was already a first indication that composition effects may be rather small. The results presented in this section confirm this presumption. In column (4) we show that the sensitivity of wage growth with respect to the unemployment rate decreases when the Phillips

[10] Obviously, price dynamics across countries have followed a very similar pattern over time. A possible common factor that could have determined prices across countries is certainly the oil price, which is known as an important driver of consumer price dynamics.

curve is specified without controlling for temporary employment.

Unlike in previous literature (Ramskogler 2021; Bellani and Bosio 2019), our empirical setting allows us to focus on *involuntary* (rather than on *overall*) temporary employment to measure the degree of labor market dualization. In order to reveal whether this is indeed the relevant measure in our context, we add the share of *voluntary* temporary employees and report the results in column (5). Comparing the coefficients of both indicators reveals that it is *involuntary* temporary employees who are driving the wage growth of permanent workers, while the impact of workers, who have voluntarily chosen to have a temporary contract ($Vol.\ Temp_t$) is insignificant. Hence, the crucial aspect in measuring dualization is to quantify those employees who would prefer to be employed on a permanent basis. Note also that the magnitude of the coefficient estimate (and its statistical significance) would drop substantially if we were to consider overall temporary employment (instead of $Invol.\ Temp_t$). Our results, thus, strongly suggest to consider – whenever feasible – *involuntary* rather than *overall* temporary employment to proxy labor market dualization.

To investigate the impact of involuntary temporary employment on overall aggregate wage growth, we re-estimate specification (2) by employing *adjusted* wage growth, i.e., wage growth net of composition effects. The results are depicted in column (1) of Table 2 and show almost unchanged coefficient estimates (compared to model (2) in Table 1). This is consistent with our previous observation, namely that composition effects are empirically only of minor importance. Further, our results resemble Ramskogler (2021), who finds a significant negative effect from temporary employment on *unadjusted* wage growth in Europe. In addition to his findings, we can confirm that the underlying mechanism behind the observed negative relationship arises from a *competition* rather than a *composition* effect.[11]

Before turning to the issue of reverse causality, we provide two interesting

[11] As a robustness check we exclude one country at a time from the sample and show that the result in specification (1) in Table 2 is not driven by one particular country (Appendix Table D.1).

extensions of this result. First, we assess the *economic* significance of dualized labor markets by re-estimating specification (1) based on standardized variables. As reported in column (2), involuntary temporary employment turns out to be the most relevant determinant for wage growth followed by the unemployment rate.[12] However, taking into account the uncertainty surrounding the parameter estimates, both variables are equally meaningful in explaining nominal wage growth.[13] Hence, involuntary temporary employment has been at least as important as the unemployment rate in shaping nominal wage dynamics in Europe.

While in specification (1) we control for composition effects with respect to the type of employment contract, other possible aspects of composition could affect wage growth as well. This might be the case if some demographic groups have more bargaining power (e.g., prime-age native-born males) or a higher marginal productivity than others. The composition of who is selected into temporary jobs may change over the business cycle. Hence, we explore an extended set of variables at the worker-level to construct an adjusted wage growth variable that – in addition to the contract type – controls for changes in the composition of workers' gender, migration background, educational attainment and work experience. As highlighted in column (3), this does not alter the observed results with respect to the competition effect. However, the impact of productivity on wage growth becomes insignificant. This is most probably due to the fact that productivity is largely captured at the worker-level by having netted out changes in the share of skilled and experienced workers.

We now turn to the issue of a potential simultaneity bias arising from reverse causality between nominal wage growth and labor market slack. Usually, reverse causality is approached by inserting the slack variable in its one-period lagged form into the Phillips curve model (Ramskogler 2021; Byrne and Zekaite 2020; Nickel et al. 2019). While this is certainly a valid approach when using

[12] An increase in the rate of involuntary temporary employment by one standard deviation leads to a drop in nominal (composition adjusted) wage growth by half a standard deviation.

[13] A test on parameter equality is not rejected.

quarterly data, it is not feasible in our case given the annual frequency of the data. Fortunately, in the case of reverse causality, the fixed-effect estimate of the impact of unemployment on wage growth would be downward biased rather than upward, as higher wage growth should cause higher labor market slack (IMF 2017; Wooldridge 2009). The same logic applies to the dualization measure. If wage growth accelerates, it is presumable that employers increasingly demand temporary employees as they are cheaper and associated with lower firing costs. Hence, it is very likely that our findings concerning the importance of temporary employment for wage growth are not mistaken even in the presence of reverse causality.

An alternative approach to account for a potential simultaneity bias is to use instrumental variable techniques. As exogenous instruments are not at hand, neither for unemployment nor for temporary employment, we use internal instruments, i.e., time lags of the variables in the model. In particular, we employ the difference GMM estimator[14] (Arellano and Bond 1991; Blundell and Bond 1998) and treat both variables as endogenous (by using the lagged levels of the variables as instruments). As displayed in column (4), involuntary temporary employment and unemployment have the expected negative signs and are statistically significant. However, compared to the fixed effect estimation in column (1), we observe an increase in the coefficient estimate for both variables. Obviously, controlling for simultaneity has an effect on the estimates in the direction that we expected. A very similar result can be found in Bellani and Bosio (2019). Finally, in column (5) we add inflation to the set of endogenous variables and show that this alteration does not have any significant influence on the estimation outcome.

[14]Our dependent variable is not persistent. This is why we choose a static representation and the difference rather than the system GMM estimator.

4.2 The effect of institutions

As highlighted in the theory section, the magnitude of the competition effect may depend on a country's labor market institutions. We take account of these considerations in Table 3, where we interact involuntary temporary employment with different institutional variables. We consider wage growth of permanent workers as the dependent variable in all specifications. In addition to interaction effects, we have to control for the direct effect that institutions might exert on wage growth. This rules out a potential omitted variable bias that might arise if weak trade unions were to cause higher shares of temporary employment due to their inability to prevent substitution of good jobs with bad jobs.

Following our country grouping based on trade union density, we report group-specific differences in the competition effect in column (1). As expected, we find the competition effect to be only significant and large in countries with low trade union density. Moreover, we can conclude that the competition effect does not arise because weak trade unions cause higher shares of involuntary temporary employees, as we have controlled for the direct impact of institutions. Rather, the observed effect in countries with weak institutions results from the fact that permanent employees cannot use union power to protect themselves from negative wage pressures caused by temporary employment. Trade union density (TUD_t) has the overall positive effect on wage growth that is usually expected (Kahn 1979; Stansbury and Summers 2020).

Analogously, our findings are confirmed when investigating different proxies for the encompassingness of wage bargains such as collective bargaining coverage (CBC) as in specification (2) or wage bargaining coordination (Coord) as in specification (3). In all three cases, it is the lowest institutional level at which the competition effect is most pronounced.[15] Our results, thus, support the

[15]Moreover, we find a negative impact from CBC and Coord on wage growth, which corresponds to common expectations (Soskice 1990; Hancke and Soskice 2003). This happens as higher levels of centralization and coordination help to prevent wages from taking an inflationary turn (i.e., internalizing negative externalities). Coordination is expected to be the most relevant factor (Soskice 1990), which is confirmed by our findings.

hypothesis that competition effects from labor market dualization heavily depend on domestic labor market institutions.

Further, we want to stress the fact that the competition effect is higher in countries with high employment protection legislation (EPL) as shown in specification (4). This likely is the result of a "golden cage effect." In countries with more stringent EPL, the expected loss associated with a permanent job being replaced with a temporary one is greater – the more stringent EPL, the more secure the job that would be lost. Assume that a decision to quit is the function of the discounted expected stream of income a person receives from a job. This depends on the wage and the probability of keeping a job over time. Higher EPL increases the probability of continued employment and thus can correspond to lower wages.

In the last specification of Table 3, we want to highlight that irrespective of the fact that the magnitude of the competition effect varies across country groups, it is significant in determining *weighted* aggregate wage growth in Europe. In fact, the competition effect remains highly significant and increases in magnitude when we put more weight[16] on countries that are larger as we demonstrate in column (5). This is consistent with the observation that low TUD countries expose a particularly strong competition effect as the countries belonging to this group (comprising 14 countries) make up more than 75% of overall employment in Europe and drive the aggregate weighted effect.

Finally, empirically analyzing differences across country groups always involves choosing the "right" threshold that divides countries into the respective groups. In the theory section, we have outlined our reasoning for the clustering of countries, which resulted in a varying number of countries across groups. Moreover, in the case of TUD and Coord an overproportional high share of countries are clustered in the first group (i.e., countries with the weakest institutions). This categorization might work against finding a statistically significant effect for

[16]The relative weight of each country is based on the number of employed persons in 2005.

the medium and high groups. As a robustness check, we consider an alternative clustering procedure that groups the countries more evenly by using terciles of the institutional variables. We report our results in Appendix Table D.2.

In columns (1) to (4), we show that our results hold when the number of countries does not vary across groups. In column (5) of Table C.2 we base our country grouping on a joint set of institutional variables to form three equally-sized clusters. Concretely, we perform a principal component analysis (PCA), which considers the correlation of the institutional variables in order to get to the core of what they measure. The PCA reduces the multidimensionality of the institutional variables by identifying their common grounds (components). We consider the first resulting component, which explains 75% of the overall variation of TUD, Coord and CBC.[17] Using terciles of the constructed index to form the grouping again confirms our main finding. The magnitude of the competition effect decreases with the strength of institutions. Lastly, in column (6) we employ an index for union strength developed by Metten (2021) who uses a more sophisticated theoretically informed PCA to identify determinants of trade union strength. Employing this index again supports our hypothesis that the competition effect is large in countries where insiders do not have sufficient power to shelter themselves from competitive pressure.[18]

4.3 The Phillips curve flattening

So far we have shown that competition effects play a statistically significant role in explaining aggregate nominal wage growth and that they interact with the institutional dimension. Does this help to understand the observed flattening of the Phillips curve in Europe after the GFC? In order to tackle this question, we

[17] We have not considered EPL in constructing the index, as EPL does not load the first component of the PCA in the same direction as the remaining three institutional variables. Hence, EPL does not seem to capture the encompassingness of wage bargaining but other underlying institutional factors. Recall that the competition effect is more pronounced for countries with high EPL.

[18] Note, that the index is not available for Malta. Moreover, due to several missing values at the beginning and at the end of the individual time series, we have not imputed missing values and therefore did not include the index as an additional regressor into the model.

extend the Phillips curve framework by allowing for a different unemployment parameter after the crisis. This allows us to test the Phillips curve flattening and to study possible interaction effects with temporary employment. We employ adjusted wage growth in all specifications to rule out possible composition effects and to obtain results that reflect wage dynamics of both temporary and permanent employees. To investigate post-crisis differences, we first interact unemployment as well as involuntary temporary employment with a post-crisis dummy that equals 1 for the period 2013-2017 and 0 for the preceding period.[19] Second, following the hidden slack literature, we construct a labor market slack measure by summing up unemployed and involuntary temporary employees ($Slack_t$) to study their joint impact on wage growth before and after the crises.[20]

The corresponding results are summarized in Table 4. The first column shows a model that allows for a crisis interaction term on the unemployment rate without considering temporary employment. The slope parameter of the unemployment rate is statistically different across the two time periods and points to a decreased sensitivity of wage dynamics to unemployment of more than 50% since the post-crisis period. While a decrease in the unemployment rate boosted wage growth by 0.56 percentage points before 2013, this sensitivity declined to 0.18 percentage points[21] in the post-crisis period. Our results, thus, support the empirical findings in the literature that indicate a lower explanatory power of labor market slack measures in the post-crisis period (Byrne and Zekaite 2020).

In column (2), we add temporary employment into the model and allow for different slope parameters on this variable as well. Two things stand out. First, the sensitivity of nominal wage growth with respect to involuntary temporary employment remains largely unchanged. Even though, we observe an increase in the impact of temporary employment after 2012, it is not statistically significant.

[19] We have tested other thresholds as well. It turned out that the break in slope parameters is most pronounced when the post-crisis period is defined from 2013 onward.

[20] Both Unemp_t and Invol. Temp_t are measured as a share of the active working-age population. Hence, $Slack_t$ represents the share of unemployed and involuntary temporary employees in the active working-age population.

[21] The slope parameter of unemployment after 2012 is obtained as follows: -0.56 + 0.38 = -0.18.

Second, adding labor market dualization into the model does not help to understand the flattening of the Phillips curve as the slope parameter of $U_t * post\text{-}crisis$ remains unchanged. Interestingly though, employing the variable that summarizes unemployment and temporary employment (i.e., $Slack_t$) leads to a different conclusion as can be seen in column (3). The flattening is still observable since the slope parameter on $Slack_t * post\text{-}crisis$ is positive, but it is smaller and statistically not significant.

Given the thus far inconclusive results concerning the role of temporary employment for the Phillips curve flattening, we follow the literature on hidden slack by considering a broader measure of the unemployment rate as well as involuntary part-time employment (as another source of potential hidden slack) and re-estimate the first three specifications accordingly. We extend the headline unemployment rate by additionally considering discouraged as well as marginally attached workers (U-5). Moreover, we account for employees who work part-time but do so involuntarily. Note however, that unlike by Bell and Blanchflower (2019), we are not able to account for labor underutilization based on desired hours of work due to data availability. Instead, we have to stick to headcounts to capture the degree of underemployment. The flattening disappears when adding involuntary temporary employment next to the broader unemployment measure (columns (4) to (6)). The same holds true when investigating overall slack as defined above.[22]

Finally, in the remaining three specifications, we employ the cyclical components of our independent labor market variables. In specifications (7) and (8), we rely on the concept of the non-accelerating wage rate of unemployment (NAWRU) and consider the unemployment gap arising between the headline unemployment rate (U-3) and the NAWRU. In model (8), we add the cyclical component of involuntary temporary employment, which we compute by applying an HP filter.[23]

[22] That is, summing up the broader unemployment rate measure U-5 and involuntary temporary employment.

[23] In order to avoid the end-point problem of the HP filter (Orphanides and van Norden 2002), we consider the most recent data, which are available until 2021 for all countries in our sample. Following Ravn and Uhlig

For the final model, we use the same filtering technique to de-trend the time series of labor market slack ($Slack_t$). The results of the last three models are quite similar to the ones obtained when considering the narrow definition of the unemployment rate (U-3). Adding labor market dualization does not explain the flattening of the Phillips curve as can be seen from a comparison of columns (7) and (8), but dampens the flattening in specification (9), where unemployment is considered jointly with involuntary temporary employment.

Overall, the presented results concerning the interaction between dual labor markets and the flattening of the Phillips curve are not robust. In our view though, the findings point to a potential role of involuntary temporary employment in the hidden slack debate. One reason for the inconclusive results might be the fact that we have a relatively short time period. Adding more observations might eventually result in more robust findings, especially if temporary employment were to increase further in Europe, thereby spreading over more occupations and sectors. Moreover, becoming more granular concerning the slack variable (e.g., by considering the variable created by Bell and Blanchflower (2019)) could help to improve estimation efficiency for future research.

5 Conclusion

In this paper, we have demonstrated that there is a competition effect between involuntary temporary and permanent workers in Europe. This means that the higher the incidence of temporary workers who are involuntarily on a temporary contract, the lower the growth rate of wages. Further, we have shown that this is a behavioral effect, which is not driven by an increase in low-wage temporary employees suppressing the rate of wage growth. To the contrary, the effect is also clearly present when investigating (i) the rate of wage growth of permanent employees alone and when employing (ii) an adjusted aggregate wage growth

(2002), we set the smoothing parameter to 6.25. As the filtering technique does not allow gaps within the time series, we impute four observations in AT (2004,2005), MT (2004) and ES (2005). However, we do not use these observations for estimating our models.

variable that nets out potential composition effects caused by fluctuations in the share of temporary employment. Moreover, we have illustrated that involuntary temporary employment has been at least as important as the unemployment rate in shaping nominal wage dynamics in Europe. Hence, the competition effect is not only statistically but also economically significant.

On top of this finding, the cross-country nature of our analysis also allowed us to investigate the role of different institutional settings. We hereby have shown that the competition effect is significantly more pronounced when wage bargaining institutions are weak, which is consistent with standard assumptions of industrial relations theory. Crucially, however, our findings are very robust when we put more weight on countries that are larger (in terms of employment), thus ruling out that it is only small countries that drive the results.

Finally, we have presented some tentative evidence that the competition effect might help to understand the strange flattening of the Phillips curve in Europe in the period 2012-2017. In fact, we have shown that a broader slack variable that also accounts for the incidence of involuntary temporary employees can explain the flattening of the Phillips curve to some extent. However, our findings in this regard are the least (statistically) significant and thus leave ample room for further research.

References

Anderton, R. and Boele, B. (2015). Downward wage rigidities in the euro area. Discussion Paper 9, University of Nottingham.

Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte carlo evidence and an application to employment equation. *The Review of Economic Studies*, 58(2):277–297.

Autor, D. H. and Houseman, S. N. (2010). Do Temporary-Help Jobs Improve Labor Market Outcomes for Low-Skilled Workers? Evidence from is undefined"Work First". *American Economic Journal: Applied Economics*, 2(3):96–128.

Baltagi, B. H. (2005). *Econometric Analysis of Panel Data*, volume 3rd ed. John Wiley & Sons, Ltd.

Bell, D. N. F. and Blanchflower, D. G. (2021). Underemployment in the United States and Europe. *Industrial and Labour Relations Review*, 74(1):56–94.

Bell, David, N. F. and Blanchflower, David, G. (2019). The lack of wage growth and the falling NAIRU. *National Institute Economic Review*, (245):R40–R54.

Bellani, D. and Bosio, G. (2019). Knocking' on heaven's door? Reframing the debate on temporary employment and wages: evidence from Europe. *Socio-Economic Review*, (0):1–39.

Biegert, T. (2014). On the outside looking in? Transitions out of non-employment in the united kingdom and germany. *Journal of European social policy*, 24(1):3–18.

Blanchflower, D. G., Bryson, A., and Spurling, J. (2022). The wage curve after the great recession. *NBER Working Paper Series*.

Blanchflower, D. G. and Oswald, A. J. (1994). *The wage curve*. MIT Press, Cambridge, Mass ; London.

Blundell, R. and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1):115–143.

Bonam, D., de Han, J., and van Limbergen, D. (2021). Time-varying wage Phillips curves in the euro area with a new measure for labour market slack. *Economic Modelling*, (96):157–171.

Bulligan, G. and Viviano, E. (2017). Has the wage Phillips curve changed in the euro area. *IZA Journal of Labor Policy*, (6):R40–R54.

Byrne, D. and Zekaite, Z. (2020). Non-linearity in the wage Phillips curve: Euro area analysis. *Economics Letters*, 186(C).

Calmfors, L., Driffill, J., Honkapohja, S., and Giavazzi, F. (1988). Bargaining structure, corporatism and macroeconomic performance. *Economic policy*, 3(6):14–61.

Ciccarelli, M. and Osbat, C. (2017). Low inflation in the euro area: Causes and consequences. *ECB – Occasional Paper Series*, (181).

Costain, J. S., Jimeno, J. F., and Thomas, C. (2010). Employment fluctuations in a dual labor market. *Banco de Espana Working Paper*, (1013).

Damiani, M., Pompei, F., and Ricci, A. (2018). Labour shares, employment protection and unions in European economies. *Socio-Economic Review*.

Dickens, W. T. and Lang, K. (1985). A Test of Dual Labor Market Theory. *The American Economic Review*, 75(4):792–805.

DiNardo, J., Fortin, N. M., and Lemieux, T. (1996). Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach. *Econometrica*, 64(5):1001–1044.

Doeringer and Piore, M. J. (1971). *Internal Labor Markets and Manpower Analysis*. Routledge, New York.

Dolado, J. J., García-Serrano, C., and Jimeno, J. F. (2002). Drawing lessons from the boom of temporary jobs in Spain. *The Economic journal (London)*, 112(480):F270–F295.

Draeger, V. and Marx, P. (2017). Do firms demand temporary workers when they face workload fluctuation? Cross-country firm-level evidence. *ILR Review*, 70(4):942–975.

Drenik, A., Jäger, S., Plotkin, P., and Schoefer, B. (2023). Paying Outsourced Labor: Direct Evidence from Linked Temp Agency-Worker-Client Data. *The Review of Economics and Statistics*, 105(1):206–216.

Emmenegger, P., Häusermann, S., Palier, B., and Seeleib-Kaiser, M. (2012). *The Age of Dualization: The Changing Face of Inequality in Deindustrializing Societies*. International Policy Exchange Series. Oxford University Press, New York.

Fortin, N., Lemieux, T., and Firpo, S. (2011). Chapter 1 - Decomposition methods in economics. volume 4 of *Handbook of Labor Economics*, pages 1 – 102. Elsevier.

Gebel, M. and Giesecke, J. (2011). Labor market flexibility and inequality: The changing skill-based temporary employment and unemployment risks in Europe. *Social Forces*, (1).

Hancke, B. and Soskice, D. (2003). Wage-setting and inflation targets in emu. *Oxford review of economic policy*, 19(1):149–160.

Hijzen, A., Mondauto, L., and Scarpetta, S. (2017). The impact of employment protection on temporary employment: Evidence from a regression discontinuity design. *Labour Economics*, 46:64–76.

Hirsch, B. (2016). Dual labor markets at work: The impact of employers' use of temporary agency work on regular workers' job stability. *Industrial and Labour Relations Review*, 69.

Hong, G. H., Koczan, Z., Lian, W., and Nabar, M. (2018). More slack than meets the eye? Recent wage dynamics in advanced economies. *IMF - Working Paper Series*, (50).

Houseman, S. N., Kalleberg, A. L., and Erickcek, G. A. (2003). The role of temporary agency employment in tight labor markets. *Industrial & labor relations review*, 57(1):105–127.

Hurley, J. and Partini, V. (2017). Estimating labour market slack in the European Union. *Euorfound - Research Report*.

Hyman, L. (2018). *TEMPS – How American Work, American Business, and the American Dream Became Temporary*. Viking, New York.

ILO (2016). *Non-standard employment around the world - Understanding challenges, shaping prospects*. International Labour Office, Geneva.

IMF (2017). Recent wage dynamics in advnace economies: Drivers and Implitations. *World Economic Outlook - Chapter 2*, (2).

Kahn, L. M. (1979). Union Strength and Wage Inflation. *Industrial Relations: A Journal of Economy and Society*, 18(2):144–155.

Kahn, L. M. (1980). Bargaining power, search theory and the phillips curve. *Cambridge journal of economics*, 4(3):233–244.

Kahn, L. M. (2016). The structure of the permanent job wage premium: Evidence from Europe. *Industrial Relations: A Journal of Economy and Society*, 55(1):149–178.

Katz, L. F., Krueger, A. B., Burtless, G., and Dickens, W. T. (1999). The high-pressure u.s. labor market of the 1990s. *Brookings papers on economic activity*, 1999(1):1–87.

Kiss, A. and Van Herck, K. (2019). Short-term and long-term determinants of moderate wage growth in the EU. *IZA Policy Paper*, (144).

Koutentakis, F. (2008). The effect of temporary contracts on job security of permanent workers. *Economics Letters*, 101(3):220–222.

Kuroki, M. (2012). The deregulation of temporary employment and workers' perceptions of job insecurity. *Industrial & labor relations review*, 65(3):560–577.

Lange, P. (1984). *Union democracy and liberal corporatism : exit, voice and wage regulation in postwar Europe*. Cornell studies in international affairs. Western societies papers. Center for International Studies, Cornell University, Ithaca, N.Y.

Latner, J. P. (2022). Temporary employment in Europe: Stagnating rates and rising risks. *European Societies*, 24(4):383–408.

Lindbeck, A. and Snower, D. (2002). The insider-outsider theory: A survey. Discussion Paper 534, IZA, Bonn.

Lindbeck, A. and Snower, D. J. (1988). Long-term unemployment and macroeconomic policy. *The American economic review*, 78(2):38–43.

Marx, P. (2011). The unequal incidence of non-standard employment across occupational groups: An empirical analysis of post-industrial labour markets in Germany and Europe. Discussion Paper 53521, IZA, Bonn.

Metten, A. (2021). Rethinking trade union density: A new index for measuring union strength. *Industrial Relations Journal*, 52(6):528–549.

Moretti, L., Onorante, L., and Saber, S. Z. (2019). Phillips curves in the euro area. *Working Paper Series*, (2295).

Nickel, C., Bobeica, E., Gerrit, K., Lis, E., and Porqueddu, M. (2019). Understanding low wage growth in the euro area and European countries. *ECB – Occasional Paper Series*, (232).

OECD (2018). Decoupling of wages from productivity: what implications for public policies. *OECD Economic Outlook*, (2).

Olson, M. (1971). *The logic of collective action; public goods and the theory of groups*. Harvard economic studies ; v. 124. Harvard University Press, Cambridge, Mass.

Orphanides, A. and van Norden, S. (2002). The unreliability of output-gap estimates in real time. *The Review of Economics and Statistics*, 84(4):569–583.

Pavlopoulos, D. (2013). Starting your career with a fixed-term job: Stepping-stone or "dead end"? *Review of Social Economy*, 71(4):474–501.

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom 1861-1957. *Economica, New Series*, (25):485–503.

Piore, M. J., editor (1979). *Unemployment and Inflation: Institutionalist and Structuralist Views*. M. E. Sharpe, White Plains, N.Y.

Piore, M. J. (1983). Labor Market Segmentation: To What Paradigm Does It Belong? *The American Economic Review*, 73(2):249–253.

Polavieja, J. (2006). The incidence of temporary employment in advanced economies: Why is spain different? *European Sociological Review*, 22(1):61–78.

Ramskogler, P. (2021). Labour market hierarchies and the macro-economy – do labour market dualities affect wage growth in Europe? *Structural Change and Economic Dynamics*, 56:154–165.

Ravn, M. O. and Uhlig, H. (2002). On adjusting the Hodrick-Prescott filter for the frequency of observations. *The Review of Economics and Statistics*, 84(2):371–375.

Reich, M., Gordon, D. M., and Edwards, R. C. (1973). A Theory of Labor Market Segmentation. *The American Economic Review*, 63(2):359–365.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal*, 9(1):86–136.

Rosen, S. (1972). Learning and Experience in the Labor Market. *The Journal of Human Resources*, 7(3):326–342.

Rosenbaum, P. R. and Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1):41–55.

Rusinova, D., Lipativ, V., and Heinz, F. (2015). How flexible are real wages in EU countries? A panel investigation. *Journal of Macroeconomics*, 43:140–154.

Soskice, D. (1990). Wage determination: The changing role of institutions in advanced industrialized countries. *Oxford review of economic policy*, 6(4):36–61.

Stansbury, A. and Summers, L. H. (2020). The declining worker power hypothesis: An explanation for the recent evolution of the american economy. *Brookings papers on economic activity*, 2020(1):1–77.

Thelen, K. A. (2014). *Varieties of liberalization and the new politics of social solidarity*. Cambridge studies in comparative politics. Cambridge; New York.

Voinea, L. (2018). Explaining the post-crisis Philips curve: Cumulated wage gap matters for inflation. *CEPS Working Document*, (2018/05).

Weisstanner, D. (2020). Insiders under pressure: Flexible employment and wage inequality. *Journal of Social Policy*, pages 1–20.

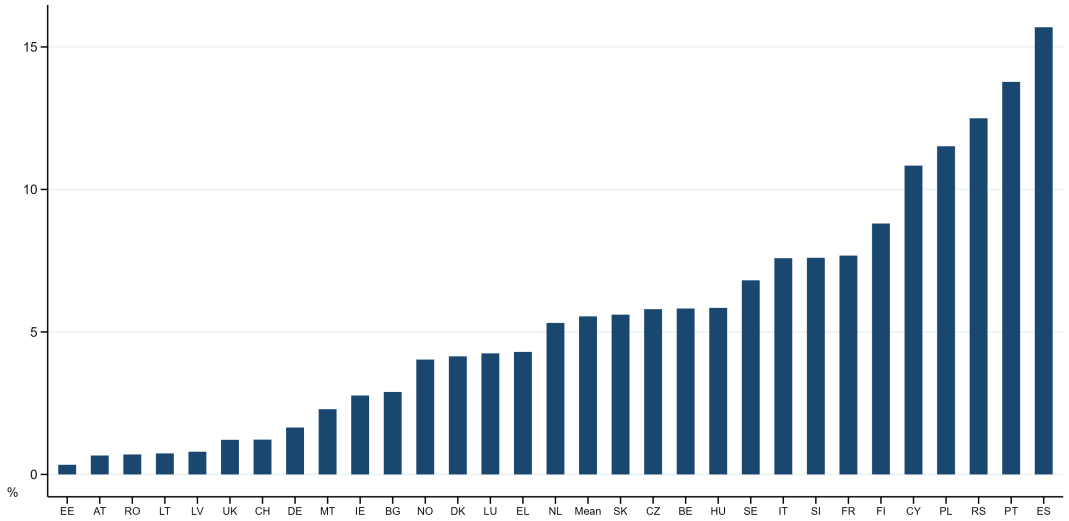
Western, B. and Healy, K. (1999). Explaining the OECD Wage Slowdown Recession or Labour Decline? *European Sociological Review*, 15(3):233–249.

Wooldridge, J. M. (2009). *Introductory Econometrics: A Modern Approach*. South-Western.

Zhang, Y. S. (2019). European wage dynamics and spillovers. *IMF Working Paper*, (2019/156).

Figures and Tables

Figure 1: Involuntary temporary employment in Europe, 2017



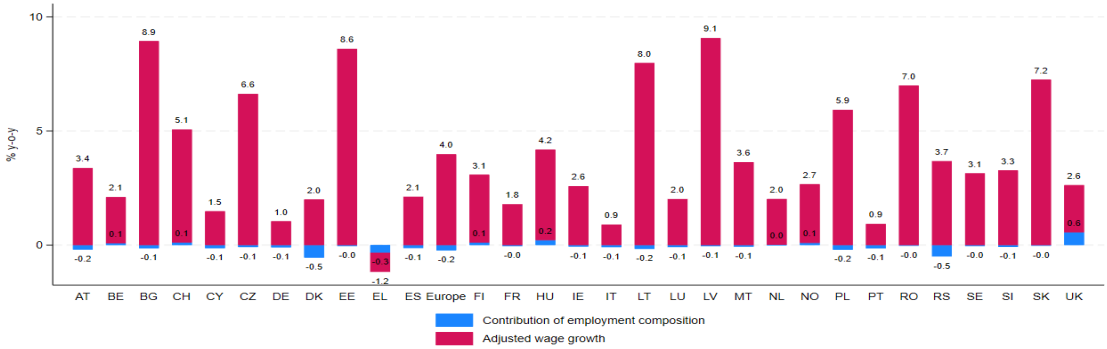
Note: Mean is an unweighted average of all countries shown. Involuntary temporary workers as a share of the labor force aged 15 to 74. Involuntary includes temporary workers unable to find permanent employment. Other reasons include education or training, probation, and no permanent job wanted.
Source: Eurostat/EU-LFS: lfsa_etgar and lfsa_agan.

Figure 2: Wage growth permanent and temporary workers

Note: Average annual change in nominal wages as a weighted average for European countries.

Source: EU-SILC.

Figure 3: Wage growth 2004-2017 divided in contribution of employment composition and adjusted wage growth



Note: Wage growth is adjusted for a changing employment composition by contract. Wage growth refers to the average annual change in nominal wages 2003-2017. Europe refers to the simple average of all countries shown.

Source: Authors' computations based on EU-SILC.

Table 1: Identifying the competition effect

	all workers, unadjusted		permanent contract workers		
Dep. var.: wage growth	work-horse PC	incl. time dummies	competition effect	excl. Temp	incl. vol. Temp
	(1)	(2)	(3)	(4)	(5)
$Prod_t$	0.57***	0.33**	0.34**	0.33**	0.34**
	(3.43)	(2.21)	(2.46)	(2.24)	(2.46)
$Infl_t$	0.90***	0.55	0.49	0.54	0.46
	(3.00)	(1.18)	(1.06)	(1.20)	(0.97)
U_t	-0.66***	-0.51***	-0.49**	-0.44**	-0.51**
	(-3.91)	(-2.90)	(-2.64)	(-2.09)	(-2.61)
$Invol.Temp_t$	-0.96**	-0.92***	-0.98***		-1.04***
	(-2.66)	(-2.82)	(-3.21)		(-3.17)
$Vol.Temp_t$					-0.34
					(-1.18)
Cons	11.88***	11.19***	11.35***	5.56**	13.28***
	(5.31)	(3.82)	(3.91)	(2.58)	(3.13)
Model	FE	FE	FE	FE	FE
TimeD	excl.	incl.	incl.	incl.	incl.
N	344	344	344	344	344

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis and are based on cluster-robust standard errors by country.

Table 2: The impact of the competition effect on *adjusted* wage growth

Dep. var.: *adjusted wage growth*	adjusted by contract	standardized coefficients	adjusted by all controls	reverse causality	
	(1)	(2)	(3)	(4)	(5)
$Prod_t$	0.33**	0.14**	0.29	0.35**	0.35***
	(2.26)	(2.26)	(1.58)	(2.51)	(2.61)
$Infl_t$	0.54	0.16	0.53	0.47	0.44
	(1.16)	(1.16)	(1.13)	(1.08)	(0.85)
U_t	-0.50***	-0.33***	-0.58***	-0.57***	-0.65***
	(-2.78)	(-2.78)	(-3.47)	(-3.59)	(-4.18)
$Invol.\ Temp_t$	-0.95***	-0.54***	-0.89**	-1.67**	-1.87**
	(-2.92)	(-2.92)	(-2.74)	(-2.06)	(-2.29)
Cons	11.34***	-0.01	11.68***	15.88***	17.73***
	(3.91)	(-0.09)	(3.94)	(3.24)	(3.59)
Model	FE	FE	FE	GMM	GMM
Ar1				-2.81	-2.78
Ar2				-0.72	-0.71
Hansen				12.83	14.74
Hansen p-val				0.80	0.97
TimeD	incl.	incl.	incl.	incl.	incl.
N	344	344	343	344	344

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis and are based on cluster-robust standard errors by country. Specification (3) includes the wage growth variable adjusted by contract type, gender, migration, education and work experience. Specifications (4) and (5) are estimated by first difference GMM (using orthogonal deviations). We use the Stata command xtabond2 and employ the second level lag (up to 11 lags) of the endogenous variables as instruments. As the cross-section dimension is rather small (i.e., 30 countries), we use standard IV instruments rather than GMM-type instruments in order to limit the instrument count (by using the collapse option Roodman (2009)). Specification (4) treats only U_t and $Invol.\ Temp_t$ as endogenous, while specification (5) assumes that all variables are endogenous except $Prod_t$.

Table 3: The competition effect and the role of institutions

Dep. var.: *wage growth of perm. workers*	Inst: TUD (1)	Inst: CBC (2)	Inst: Coord. (3)	Inst: EPL (4)	weighted sample (5)
$Prod_t$	0.17	0.29	0.28*	0.04	0.04
	(0.89)	(1.46)	(1.83)	(0.25)	(0.15)
$Infl_t$	0.59	0.44	0.50	-0.20	-0.25
	(1.53)	(0.98)	(1.17)	(-0.55)	(-0.38)
U_t	-0.60**	-0.61***	-0.58***	-0.31**	-0.45**
	(-2.44)	(-3.17)	(-3.06)	(-2.09)	(-2.08)
$Invol.\ Temp_t$					-1.13***
					(-3.39)
$...low\ Inst$	-1.40***	-1.39**	-1.47***		
	(-4.89)	(-2.44)	(-3.64)		
$...med.\ Inst$	0.36	-0.20	-0.76		
	(0.32)	(-0.50)	(-1.25)		
$...high\ Inst$	-0.11	-0.81	-0.29		
	(-0.35)	(-1.40)	(-1.05)		
$Invol.\ Temp_t$					
$...low\ EPL$				-0.74**	
				(-2.52)	
$...high\ EPL$				-1.15**	
				(-2.11)	
TUD_t	0.43***				
	(3.49)				
CBC_t		-0.09*			
		(-1.95)			
$Coord_t$			-1.24*		
			(-1.86)		
EPL_t				-0.75	
				(-0.53)	
Cons	-2.33	15.64***	14.80***	12.99***	14.33***
	(-0.55)	(4.54)	(3.67)	(3.50)	(3.91)
Model	FE	FE	FE	FE	FE
TimeD	incl.	incl.	incl.	incl.	incl.
N	300	302	344	278	344

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis and are based on cluster-robust standard errors by country. The institutional variables are: employment protection legislation (EPL), trade union density (TUD), collective bargaining coverage (CBC) and coordination of wage setting (Coord). As the CBC time series have a lot of gaps, we impute missing values with lagged available values. Column (5) represents estimates from a weighted regression. The relative weight of each country is based on its number of employed persons in 2005.

Table 4: Phillips curve flattening: the role of dualization; Dep. variable: adjusted wage growth

	headline U			broad U & invol. part-time			de-trended labor market var.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Prod_t$	0.34	0.34	0.35	0.36	0.34	0.35	0.29	0.26	0.33*
	(1.53)	(1.66)	(1.67)	(1.56)	(1.58)	(1.58)	(1.50)	(1.46)	(1.77)
$Infl_t$	0.99**	0.98**	0.92**	1.06**	1.04**	0.99**	0.81**	0.70*	0.44
	(2.65)	(2.51)	(2.52)	(2.70)	(2.62)	(2.66)	(2.22)	(1.93)	(1.16)
U_t	-0.56**	-0.58**		-0.44*	-0.50***		-1.04***	-1.06***	
	(-2.17)	(-2.63)		(-2.03)	(-2.79)		(-2.81)	(-3.07)	
$U_t * post\text{-}crisis$	0.38*	0.38**		0.30*	0.26		1.06***	1.05***	
	(1.80)	(2.14)		(1.76)	(1.61)		(2.87)	(3.04)	
$Invol.\ Temp_t$		-0.92**			-0.95**			-1.80***	
		(-2.34)			(-2.29)			(-3.51)	
$Invol.\ Temp_t * post\text{-}crisis$		-0.10			-0.08			1.19	
		(-0.90)			(-0.59)			(1.28)	
$Slack_t$			-0.56**			-0.51**			-2.28***
			(-2.46)			(-2.49)			(-4.08)
$Slack_t * post\text{-}crisis$			0.17			0.14			1.49*
			(1.47)			(1.21)			(1.78)
$Invol.\ Part._t$				-0.08	0.40	0.36			
				(-0.19)	(0.78)	(0.72)			
Cons	2.38	8.55***	6.38**	2.76	8.42***	6.17**	1.39	1.72	1.85
	(1.59)	(3.16)	(2.75)	(1.58)	(3.17)	(2.49)	(1.24)	(1.50)	(1.55)
Model	FE	FE	FE	FE	FE	FE	FE	FE	FE
TimeD	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
N	285	285	285	285	285	285	285	285	285

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis and are based on cluster-robust standard errors by country. $Slack_t$ is measured as the sum of the respective unemployment rate and involuntary temporary employment in models (3) and (6). Models (7) to (9) use the cyclical components of the employed labor market variables, i.e., U_t is based on the NAWRU (OECD) and $Invol.\ Temp_t$ and $Slack_t$ are based on an HP filter, where $Slack_t$ is defined as the sum of the headline unemployment rate and involuntary temporary employment.