

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

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Abstract

Does the structure of labor markets – and the possibility to employ temporary workers – affect aggregate wage growth? After the global financial crisis (GFC) a rich debate had ensued about the reasons for the delayed pick up of wage growth. However, structural labor market aspects remained strangely absent from this discussion. We contribute by incorporating labor market dualization into the standard Phillips Curve model to explain wage growth in 30 European countries in the period 2003-2017.

We find that the presence of temporary contracts in Europe's labor markets slows down aggregate wage growth due to the competition that temporary workers exert on permanent workers. This competition effect is most pronounced in countries, where trade union density is low. Moreover, we establish that labor market dualization has been at least as important in slowing wage growth since the GFC as unemployment, i.e. the observed flattening of the Phillips Curve.

JEL classification: J31, J42, J82

Keywords: Wage Growth, Labor Market Dualization, Involuntary Temporary Work; Phillips Curve; Competition effect

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1 Introduction

After the global financial crisis (GFC), wage growth in Europe remained surprisingly slow, even after labor markets had started to recover. A rich debate ensued that questioned the validity and nature of the relation between labor market slack and wage growth; i.e. the Phillips curve. Some explanations for the surprising slow-down in wage growth focused on improving the identification of slack (e.g. [Bell and Blanchflower, 2021](#)) while others recalled the old Keynesian argument of downward rigidity of nominal wages (e.g. [ECB, 2015](#)). The debate considerably deepened our understanding of current labor market dynamics. However, not much attention was paid to the implications from the interaction between different groups of workers.

In this paper, we set out to broaden the discussion by bringing the institutional dimension to the fore. A remarkable increase in labor market dualization has occurred over recent decades that most notably precipitated in a trend increase in the incidence of temporary workers. We argue that this development fundamentally altered the wage setting behaviour, thereby building on the insights of a relatively recent strand of literature (see e.g. [Bellani and Bosio, 2019](#); [Damiani et al., 2018](#)). For the first time, we are able to demonstrate that the increase in temporary employees does not only dampen wage growth at a macroeconomic level, but that it does so permanently by putting a drag on the growth of wages of permanent employees - what we refer to as a competition effect. This effect, however, is uneven across countries, altered by labor market institutions, in particular the inclusiveness of organized labor. While we cannot solve the post-GFC 'Phillips curve puzzle', we conclude that the institutional dimension plays a crucial role in understanding macroeconomic dynamics, such as wage growth. In fact, we demonstrate that the degree of labor market dualization via temporary workers is of comparable importance in dampening wage growth as the unemployed rate.

The paper is structured as follows. We briefly present the discussion after the GFC and synthesize its main results in a concise graphical model in section 2. Building on the findings from the macroeconomic debate, in section 3, we revisit institutional arguments from the labour market dualization literature and derive our main hypothesis. We discuss its

implications for the macroeconomic theory and incorporate our hypothesis in the graphical model developed in section 2. In section 4, we present the empirical model and set out how we isolate the impact of labor market dualization on wage growth, stripped off of potential composition effects resulting from a varying share of temporary employees. Finally – in section 5 – we will present our results. The final section concludes.

2 Is there a drag on wage growth in Europe?

Aren't wages *always* growing too slow from an employees' and too fast from an employers' point of view? The answer – following the macroeconomic literature – is no. In a business cycle perspective¹ wage growth can be considered to be slow if the current rate is lower than it usually has been at the given level of labor market slack; most commonly measured by the unemployment rate. This Phillips curve interpretation of labor markets typically also considers inflation and productivity as key determinants of wage growth, thereby linking the business cycle to the long run perspective of growth models. It is this view that dominates the macroeconomic debate.

After the GFC, wages were expected to grow much faster than they did. Projections for wages based on the historical relationship between wage growth and labor market slack started to systematically overshoot realised wage growth; thus diverging substantially from historical experiences. A flattening of the Phillips curve relationship (for high rates of unemployment) emerged as the most popular explanation for the period of depressed wage growth (2012-2017). Evidence of a flattening of the Phillips curve had already started to emerge early after the GFC (Anderton and Boele, 2015) and the period from 2012 on was identified as the starting point of disinflation driven by domestic factors such as wages (Ciccarelli and Oshat, 2017; Moretti et al., 2019).

Nickel et al. (2019) identifies wage growth as too slow and finds non-linearities of the Phillips

¹An alternative approach would be to take the long run view. In the steady state setting of all major growth models, wage growth can be considered to be slow when it is below the inflation rate plus productivity as in this case the functional distribution of incomes is not constant, thereby yielding systemic instability Gaechter et al. (2018). This however, is a completely different time dimension than investigated in this paper.

curve as one of the many explanations for the protracted reaction of wages to the labor market recovery. For a group of advanced economies this finding is supported by [Arsov and Evans \(2018\)](#) and it corroborates earlier findings by the [IMF \(2017\)](#). There are views countering this finding². In fact, most cross-country surveys find a flattening of the Phillips Curve while some country specific time series surveys do not. Yet, the discrepancies seem to be linked to the research set-up with some single country time series surveys failing to identify the flattening while most approaches covering Europe or the euro area as a panel identify a break in wage setting behavior.

If thus – overall – wage growth had experienced a negative shock after the GFC what was the underlying cause? Why was wage growth depressed after the GFC in Europe? There are two streams of literature that set out to explain this anomaly.

2.1 Potential explanations – Hidden slack and non-linearities

The first literature strand that sets out to explain the slow down in wage growth focuses on the correct identification of labor market slack. The major part of the debate concentrates on the question what labor market slack really is, or rather how it is best measured³, and whether the implication here is that the headline unemployment rate has lost its accuracy in capturing the supply-overhang of labor. Excess labor supply may be hidden for different reasons, such as discouraged workers stopping to search actively for jobs, interrupted employment spells, or involuntary reductions in working time materialising in short-time work or part-time work. Indeed, broader measures of labor-under-utilization, such as marginally attached workers, temporary workers and involuntary part-time employment have increased more

²For instance [Kiss and Van Herck \(2019\)](#) find the decline in wage growth to be primarily driven by standard factors and identify the flattening as being not statistically significant. The latter result, however, is quite obviously driven by the choice of their time frame that already starts in 2010. This might also apply to the findings of [Bonam et al. \(2021\)](#) and [Bulligan and Viviano \(2017\)](#) who both chose 2008 as starting date for their analysis. Both papers investigate large euro area member economies and note that the flattening turns out to be robust only in the case of Germany. [Bonam et al. \(2021\)](#) even identify a steepening for some countries using an alternative rather unconventional indicator (The alternate indicator they propose only checks for robustness and is based on an indicator that primarily appears to signal the shortage of technical competences ([McGrath and Beehan, 2018](#))). There is no clear case set out for why this should be a better proxy for labor market slack than more conventional indicators. [Bulligan and Viviano \(2017\)](#) (for the pre-2016 period) seem to support these findings for Italy and France.

³Another argument again focuses on the measure for inflation [Ball and Mazumder \(2020\)](#).

strongly during the recession than the unemployment rate as shown in [Hurley and Partini \(2017\)](#) at least relative to their pre-crisis trend ([ECB, 2017](#))⁴. In a key contribution [Bell and Blanchflower \(2019\)](#) derived an index for labor under-utilization for the UK that is constructed based on desired hours of work to capture the degree of underemployment. In a complimentary analysis, they demonstrate that this index improves the Phillips curve fit for Europe (and the US) ([Bell and Blanchflower, 2021](#)). The [OECD \(2018\)](#) supports this at least as regards composition effects of part-time workers. For advanced economies, [Hong et al. \(2018\)](#) find further evidence that involuntary part-time employment helps to explain wage developments, which is corroborated by the [IMF \(2017\)](#). Similarly, [Zhang \(2019\)](#) finds that broader cyclically adjusted measures for unemployment such as the hours gap or the non-employment gap improve the fit of the Phillips curve in the EU. Only the findings of [Nickel et al. \(2019\)](#) deviate somewhat. They also use broader measures of slack, such as extensions of the unemployment rate by different aggregates of involuntary part-time- and marginally attached workers. Indeed, their findings indicate that these broader measures are relevant for wage growth but they do not exceed the explanatory power of the headline unemployment rate in their estimations.

The second line of reasoning is motivated by the traditional Keynesian assumption of downward rigidity (but upward flexibility) of nominal wages (see e.g. [Dolado et al., 2003](#)). The main argument is that a recession warrants real wage cuts in order to clear the labor market; this is commonly understood as a situation in which the unemployment rate is brought down to its market clearing (or its natural or NAIRU) level. After the GFC, however, wage setters had been faced with a low-inflation environment. Chances to hide real devaluation of nominal wages behind inflation collapsed against the benchmark of a zero lower bound making it much harder to bring labor markets into equilibrium. In the debate particularly the ECB and the Deutsche Bundesbank have propagated this view ([ECB, 2015](#); [Bundesbank, 2016](#)) and for the euro area it has recently been supported by a DSGE modelling exercise ([Iwasaki et al.,](#)

⁴This result might be driven by the wide spread introduction of short-time working schemes after their initial success in Germany. The benefit of these schemes is to preserve employment during crisis but short-time work may also hamper GDP and job growth during the recovery ([Baller et al., 2018](#); [Hijzen and Martin, 2013](#)). It is possible that the resulting pick-up in involuntary part-time – really being nothing else but hidden excess supply – puts a drag on wage growth in the recovery.

2021). The non-linearity explanation is also supported by the findings in [Marotzke et al. \(2017\)](#) based on a survey of 25 European countries for 2010-2013. This corresponds to the findings of ECB researchers who attest limited wage flexibility for Europe ([Rusinova et al., 2015](#)). Indeed, in most Euro area countries only very few firms had reported (nominal) wage cuts during the height of the crisis ([Izquierdo et al., 2017](#)), a fact that lends some support to the hypothesis of non-linearities. The results of the ECB's wage dynamics network also point in the direction of nominal wage resistance during downward adjustments ([Izquierdo et al., 2017](#)). At the same time - the argument goes ([Ciccarelli and Osbat, 2017](#)) - excess capacities have built up and led to labor hoarding, thereby resulting in excess employment at the prevailing wage level. If this is the case, wage growth will exhibit a delayed reaction to a decline in unemployment during the recovery.

2.2 A graphical synthesis of the debate

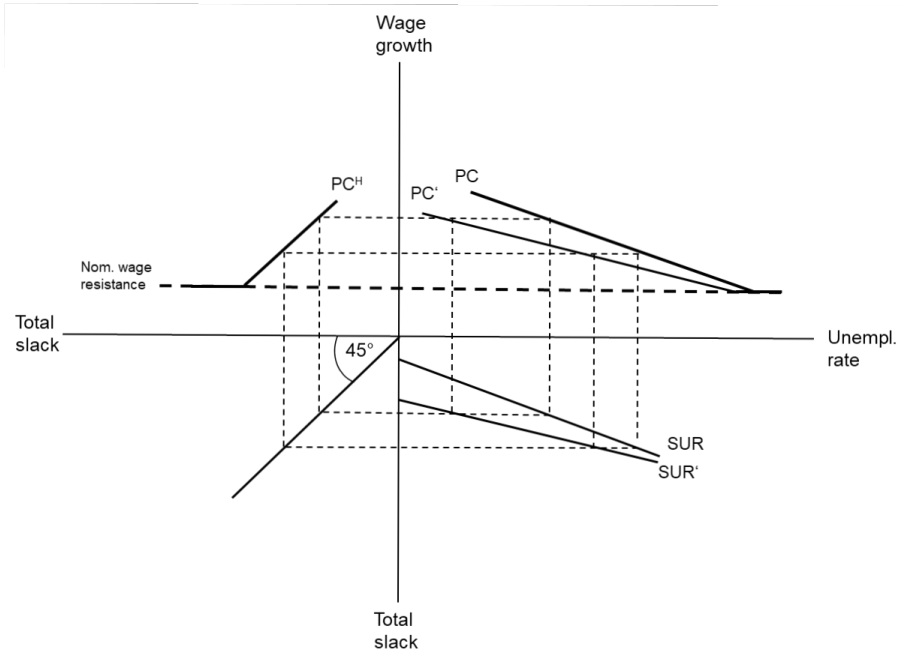
To sum up, there are two major hypothesis to explain the slow-down of wage growth after the GFC. First, there appears to be a non-linear element of the Phillips curve, that might be caused by downward wage rigidity. Second, it is not only the rate of unemployment alone that affects wage growth but slack has to be understood as a broader concept that does not necessarily correlate perfectly with the rate of unemployment.

We synthesized these findings in a graphical model in figure (1). Let us start in the upper left quadrant in which the relationship between total labor market slack and wage growth is depicted. Given the fact that total slack might entail hidden components next to the unemployment rate we will refer to the relationship in the upper left quadrant as the 'hidden' Phillips curve (PC^H). This hidden Phillips curve is linked to the 'traditional' Phillips curve via the relationship between the unemployment rate and the rate of total slack (SUR). The major theoretical argument linking the rate of unemployment to the rate of wage growth is that unemployment is the first best proxy for the availability of potential substitute workers. The higher the unemployment rate is the higher the likelihood becomes to quickly find another potential employee that can be able to fill in if any given employee leaves due to

a conflict over pay. This decreases the bargaining power of employees as it pulls the tooth out of the threat to quit. According to the 'hidden slack' approach broader measures of unemployment capture more accurately the amount of potential substitute-employees (or employees' working hours) than the unemployment rate alone. This makes it necessary to control for effects of people at the fringe of the labor market $MARG$.

Note that in this case the unemployment rate is defined as $u = U/(EMP + U)$ whereas the rate of total slack (TS) is defined as $TS = (U + MARG)/(EMP + U + MARG)$. Hereby it is important to note that the denominator of TS is (typically) larger than that of U implying that $\delta(TS)/\delta(U) < \delta(u)/\delta(U)$. Thus every reduction of the unemployment rate materializes only as a relatively smaller reduction of total slack. This is exactly the relationship that SUR captures and it allows us to project the PC^H into the unemployment wage growth space to derive a conventional Phillips curve relationship (PC). Both PC^H and PC are limited by nominal wage resistance, accounting for the non-linearity approach and indicated by the dashed line.

Figure 1: Synthesis of the main findings



During the post-2012 recovery suffering from depressed wage growth, total slack increased relative to unemployment as evidenced by the literature in section 2.1. In such a situation,

gradual reductions in the unemployment rate are accompanied by smaller reductions in total slack. This dynamic is captured in figure (1) by a partial clockwise rotation of the SUR to SUR' . Eventually, this results in a flattening of the PC (but not of the PC^H as long as slack is correctly defined).

3 Labor market structure and wage growth – Bringing in the institutional dimension

The basic premise of this paper is that the development on labor markets is influenced by more than meets the eye. Structural change and rolling reforms have fundamentally altered the nature of employment in many countries. One of the most remarkable effects is that a growing number of employees ceases to be on permanent full-time contracts (Gonzalez Vazquez et al., 2019). While the increasing importance of part-time labor has been accounted for in the literature on 'hidden slack' – most elaborately in the approaches by (Bell and Blanchflower, 2021) – this has not been the case for employees on temporary contracts.

However, there is a clear trend increase in the number of temporary workers and thus an increasing trend of labor market dualization (Figure 2 and e.g. ILO, 2016; Gonzalez Vazquez et al., 2019).⁵ While in principle this might reflect worker's preferences it is essential to understand that also the incidence of involuntary temporary workers exhibits a trend increase. This clearly shows the deepening of dualization that is going on separating workers in a disadvantaged and an advantaged group. This development has structural drivers, such as the rise of the service sector (Marx, 2011), as well as political origins rooted in liberalisation and deregulation policies that have driven the dualization of labor markets (Emmenegger et al., 2012; Thelen, 2014; Biegert, 2014).

Our major hypothesis is that the nature of the employment contract (permanent vs. tempo-

⁵Figure 2 shows the development of unemployment and *involuntary* temporary employment (both measured in % of the labor force) in Europe over the past two decades. The variables are weighted averages of 28 European countries. Due to the lack of data we excluded CH and RS in this illustration to draw a consistent picture of the development over time.

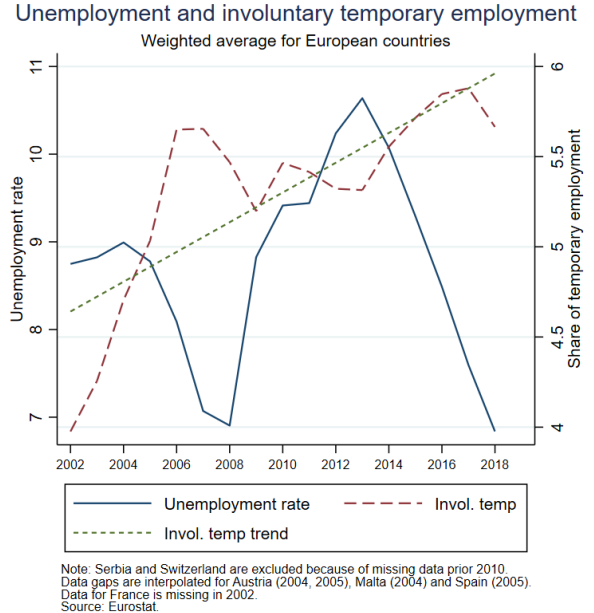
rary) has implications on the wage setting process. The wage penalty is well established: all conditions equal, a worker on a temporary contract typically receives a smaller pay cheque than a worker on a permanent contract (c.f. [Kahn, 2016](#); [Dias da Silva and Turrini, 2015](#); [Westhoff, 2020](#); [Pavlopoulos, 2013](#)). More ambivalent however is whether and if so how the prevalence of temporary workers affects permanent workers' wages. Do permanent workers profit from dualization by shifting flexibilization pressures on temporary workers to extract rents, or are permanent workers threatened by temporary workers as competition is undermining workers' bargaining power? The nature of this relationship between temporary and permanent workers may affect the overall impact of labor market dualization on wage growth. We will elaborate on this in the following.

3.1 Understanding the role of temporary employment

The most prominent model for understanding the relationship between temporary and permanent employees is based on the Insider-Outsider Theory. According to this approach, insiders use their favourable employment position to bargain higher wages and stable employment to the detriment of outsiders – unemployed or, in our context temporary employees. Outsiders reversely bear the brunt of cushioning labor market shocks, thereby allowing insiders to maintain high wages and stable employment ([Lindbeck and Snower, 2002, 1988](#)). Apparently, it is common

practice that temporary employment is used to cushion firms against labor market fluctuations ([Draeger and Marx, 2017](#); [Hijzen et al., 2017](#)). Indeed, [Hirsch \(2016\)](#) and [Gebel](#)

Figure 2: Labor market dualization in Europe



and Giesecke (2011) demonstrate that temporary agency workers have lower job stability than non-temporary workers suggesting that they are more likely to be laid-off during unfavourable economic conditions as the costs of separation tends to be smaller (Costain et al., 2010). For this reason – i.e. the higher transaction costs – insiders are in a more powerful bargaining position. This divides the workforce into separated groups - one with a relatively high level of socio-economic security, good protection, and material compensation, vis-a-vis one with a more fragile character (Häusermann et al., 2020). While the initial Insider-Outsider theory has defined insiders as workers and outsiders as unemployed, the dualization literature has included atypical employment in the definition of outsiders (c.f. Rueda, 2005; Schwander, 2019). The first group (permanent employees) hereby has the potential to extract rents that (implicitly) are financed via the more unfavourable outcome of the second group (temporary employees). This links Insider-Outsider Theory to the empirically observed wage penalty that we have discussed above (c.f. Kahn, 2016; Dias da Silva and Turrini, 2015; Westhoff, 2020; Pavlopoulos, 2013).

For the macroeconomic perspective this implies that the existence of a negative wage penalty for the large group of temporary employees – by itself – potentially yields transitory fluctuations in the rate of wage growth along fluctuations of the incidence of temporary employment. A case that is strengthened when blended together with the observation of a pro-cyclically fluctuating temporary workforce as seen in Figure 2. This might yield a composition effect caused by a varying share of temporary workers.

However, while the Insider-Outsider theory portrayed outsiders as vicarious agents for insiders to fulfill their rent-seeking motives, this view has become substantially more nuanced in recent contributions questioning the clear-cut insider-outsider distinction (Rehm, 2009; Rehm et al., 2012; Schwander and Häusermann, 2013; Busemeyer and Kemmerling, 2020). Rolling labor market reforms over the past decades have reduced employment protection and facilitated the hiring of temporary employment (Boeri, 2011), while at the same time trade unions have lost bargaining power. As observed in Dolado et al. (2002) reforms of temporary employment also created conditions for reforms that worsened the conditions of permanent

employees. Even if a significant number of two-tier labor market reforms actually increases asymmetries between temporary and permanent employees, the ultimate steady state concentrates employment at the lower end of the regulatory spectrum (Boeri, 2011). In a dynamic model Koutentakis (2008) demonstrates that the prevalence of temporary employment tends to suppress wages of permanent employees, once the transaction costs associated with firing permanent employees become lower than the wage penalty. This mechanism has become more likely with an increasing share of temporary workers. Moreover, employers may breed discord between different groups of workers to prevent unification of one organised labor bloc as discussed by Bellani and Bosio (2019). Competition dynamics between different groups of workers can emerge that bear the potential to turn the original insider-outsider logic upside down. All this implies that there might exist a *competition effect* allowing the prevalence of temporary employment to dampen wage growth of permanent employees. The effect may depend on the concrete institutional context and may be of macroeconomic relevance. We are going to test this hypothesis in section 5.

Indeed, Ramskogler (2021) indicates that temporary employment⁶ has a negative effect on aggregate (unadjusted) wage growth in Europe. This might be linked to the fact that temporary employees are employed in an increasing number of occupations and sectors (Polavieja, 2006). Also, competition between permanent and temporary employees appears to exist according to case studies (Voinea, 2018). Damiani et al. (2018) show that reductions in employment protection legislation for temporary workers tend to reduce general wage shares. This supports the more competitive interpretation of the relationship between permanent employees and temporary employees. In a key contribution Bellani and Bosio (2019) find that average hourly wages of permanent employees at the occupational level are negatively affected by the incidence of temporary employees. Notably, effects are not equal along the income distribution. Weisstanner (2020), for instance, shows that deregulating flexible employment has a negative effect on the wage share of the lower and middle income groups while having a positive effect on the top group. In this case, the aggregate effect will depend

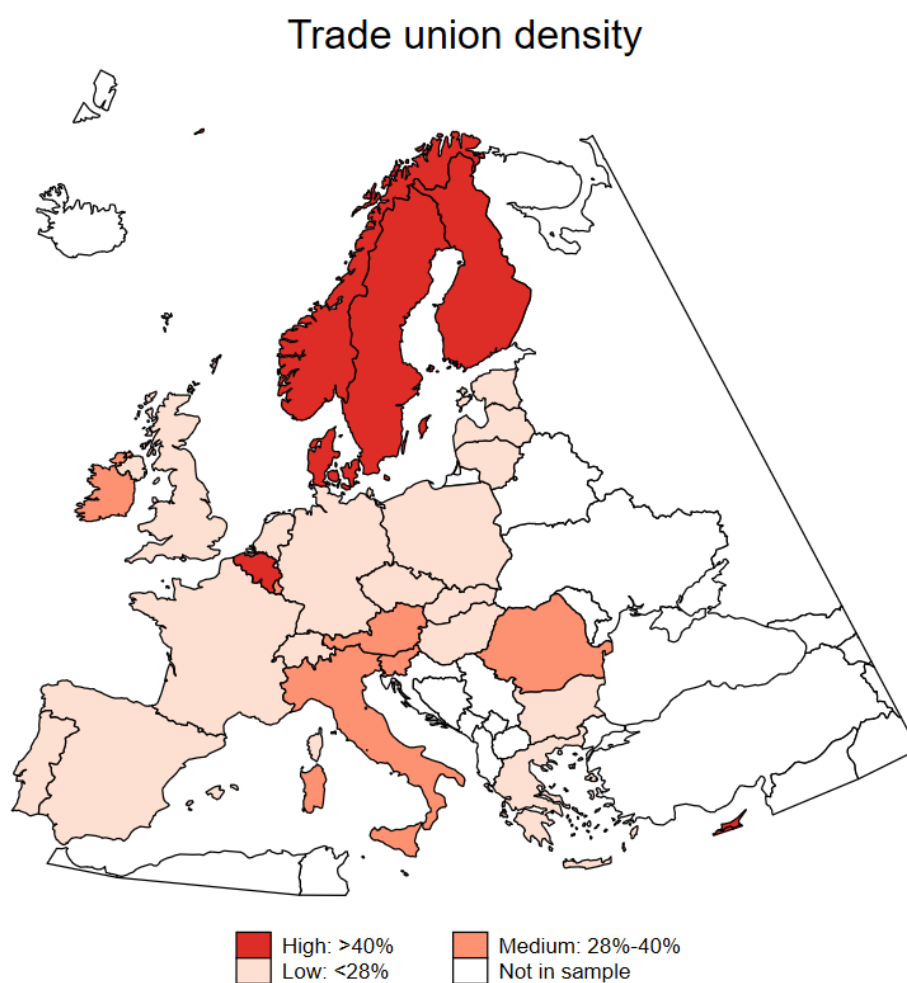
⁶Note that Ramskogler (2021) considers overall temporary employment, which includes both, voluntary and involuntary temporary workers. Due to the quarterly frequency of his empirical setup, a distinction between both groups was not feasible as data on a more granular level are only available on a yearly basis.

on which of the respective income groups dominates in the composition of the wage bill.

However, labor market institutions are likely to affect the relationship between insiders and outsiders. Whether insiders benefit from the existence of outsiders or are threatened by them may be related to the institutional configuration. The theory behind this rationale goes back to Mancur Olson’s hypothesis that collective interests might be harmful if they are significant but not encompassing on a societal level (Olson, 1971). This can be linked to the insider-outsider model: the number of insiders needs to be significant in order to be sufficiently powerful to have bargaining power and to have sizeable macroeconomic effects. If the number of insiders is very small there is not much bargaining power and external effects are unlikely to be very large. If the number of insiders is very large there are not many outsiders left that could bear the costs of externalization. Again overall external effects are likely to be small in this case.

While a large stream of literature starting in the 90ies (Calmfors et al., 1988; Soskice, 1990) centered around the implications of Olson’s theory for wage bargaining coordination the straightest measure for collective action actually is trade union density (Lange, 1984). In fact, trade union activities are also usually very closely related to the representation of insider interests. Following Olson’s hypothesis, countries with medium trade union density are most likely to be correctly captured by the insider-outsider model. Thus, in countries with medium trade union density insiders are likely to be most effectively sheltered from competition by outsiders. Empirically we thus expect the competition effect to be non-existent or small in countries with medium trade union density. In contrast, in countries with low trade union density, the competition effect will likely be largest because there is not sufficient power for insiders to shelter themselves. Finally, countries with a high degree of trade union density are likely to have no competition effect because the outsider interests are likely to be somewhat internalized, if and only if the degree of density is still sufficiently large there. Figure 3 presents our country groupings by the level of trade union density.

Figure 3: Trade union density in Europe



Note: Annual average 2003-2018.
Source: OECD/ICTWSS.

3.2 Theoretical implications

The key take away of the discussion in the literature is that temporary workers are expected to have an effect on overall wages. However, it remains unclear whether the effect on wages is due to competition or only accrues out of a fluctuating work force suffering from a wage penalty (employment composition). This differentiation is crucial to understand the forces responsible for the slow-down of wage growth in Europe.

We explore the implications of the dualization literature in the simple graphical model developed above. It is crucial to understand that hidden slack is associated with the

economic environment. Thus, looser attached labor market segments such as involuntary part-time or marginally attached workers, which constitute hidden slack, do have a systematic relation to the unemployment rate. Put bluntly, the extent of labor market slack answers the question: How big is the reserve army of labor?

In contrast – if and only if a competition effect exist – the incidence of temporary workers answers the question: To what degree are workers united? By its very nature it thus helps to measure a qualitative aspect of the labor market. This is also reflected by the fact that a clear correlation between the incidence of temporary employment and unemployment does *not* exist⁷. The incidence of temporary employment is, thus, an exogenous variable in the wage growth labor market slack space. As a result changes to the incidence of temporary employment affect the intercept of the Phillips curve. The observed trend increase in temporary employment – signifying increasing competition between employees – thus materializes as a shift of the Phillips curve towards the origin. In figure 4, temporary employment shifts the PC^H and accordingly the PC towards PC' . Consequently, any given rates of unemployment and of total slack result in a smaller rate of wage growth.

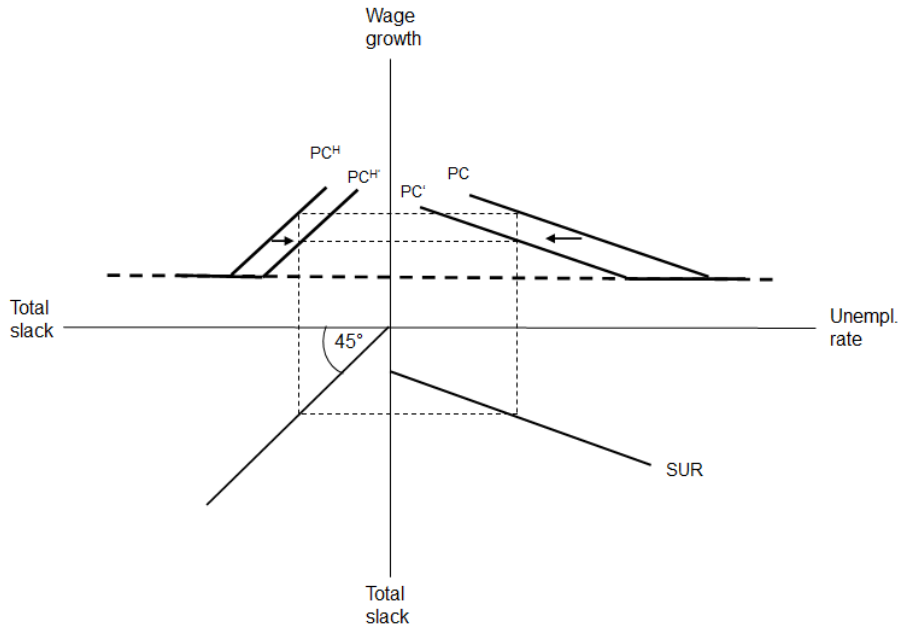
In the counterfactual – if no competition effect exists – the dynamic is different: the change in the incidence of temporary employment only affects wages by changing the employment composition and will be *transitory*. Since distorting noise in the wage growth unemployment space is driven by composition effects, wage growth will return to normal levels once the transition to a new steady state level of temporary employment is completed. The established Phillips curve relation will once again be observable. There will be no change to the Phillips curve in the graphical model. In figure 4, SUR would be constant even for changes in the incidence of temporary employment due to their exogeneity. Thus, dualization does not affect the relation between PC^H and PC .

Let us reformulate this as a concrete empirically tractable hypothesis: an increase in the

⁷The incidence of temporary workers increases during an early economic recovery as employers are more willing to hire less protected workers under heightened uncertainty. As the business cycle matures and unemployment approximates a full employment level, the incidence of temporary employment starts to decline with more and more temporary workers being able to secure permanent positions. Once a recession hits, the remaining temporary workers are laid-off first and their share in the labor force drops further. Alongside these business cycle dynamics, temporary employment has increased over time (see Figure 2).

incidence of temporary workers reduces wage growth via a *competition effect*. This effect may be large enough to be significant at the macroeconomic level. We expect this effect to be particularly pronounced in the context of weak trade union power. Thus, the competition effect may contribute to existing theoretical explanations of wage setting. By testing this hypothesis within a Phillips Curve framework at the macro-economic level, we will be able to identify whether the competition effect has an impact on aggregate wage growth. Most notably, it will also allow us to assess the relative importance of dualized labor markets in shaping European wage dynamics as compared to the unemployment rate, which is the most conventional labor market slack indicator used to proxy the bargaining power of workers.

Figure 4: Dualities and the Phillips curve



4 The empirical approach

Has thus, the increase in labor market dualization really shifted the Phillips curve towards the origin? There is empirical evidence that temporary employees have a dampening effect on aggregate wage growth (Ramskogler, 2021). However, this doesn't answer our question. Say for instance, temporary workers earn on average a lower wage than permanent workers (wage penalty). If their employment share increases from one year to the other,

it mechanically reduces the average wage per worker in a country, thus lowering aggregate wage growth. Hence, a negative relationship between temporary workers and wage growth might be the cause of a changing composition of the wage hierarchy in the workforce, that is a *composition effect*, as we called it in the previous section, rather than a *competition effect*. It is necessary to correct for this composition effect to reversely identify the competition effect of temporary workers on wages in our cross-country panel estimations (section 5).

So far, the macro-economic literature (section 2) has relied primarily on country level data. As available aggregated wage data do not discriminate between permanent and temporary employees, macro-economic approaches have not disentangled competition from possible composition effects. This is fundamental in our case since variation in our main independent variable – the incidence of temporary employment – triggers variation in the employment composition and potentially in wage growth. The dualization literature (section 3), on the other hand, has primarily used individual level data to investigate heterogeneous effects at the meso or micro level. The empirical approach taken in this paper brings both strands together. We start at the individual level, where we are able to discriminate between temporary and permanent employees and aggregate the respective individual wage data up for each country and year. This allows us both, to estimate a wage Phillips curve in a relatively comprehensive macro-panel setting and by the same time rule out possible composition effects.

More specifically, we rely on micro data to construct a time series for each country reflecting the wage growth of permanent employees only and hence to disentangle potentially different wage dynamics across contract groups. If a competition effect exists, temporary employees will have a significantly negative impact on the wage growth of permanent employees. As permanent employees make up around 90% of the labor force in Europe, the wage growth of permanent employees is very likely to be representative for the overall development of wages in Europe. Nevertheless, the use of micro data allows us to easily construct a wage growth series for *all* employees in a country (not only the permanent ones) while netting out potential composition effects. By this, we are able to estimate the sensitivity of *overall*

aggregate wage growth with respect to the prevalence of temporary work in Europe.

4.1 Adjusting for a changing employment composition

To construct our main dependent variable, we rely on data of the European Union Statistics on Income and Living Conditions (EU-SILC). This contains the longest running cross-national dataset available with annual information on employment and wages⁸. EU-SILC is a representative population survey conducted annually with the purpose to collect income data for the measurement of poverty and living conditions. It has been used by precursor studies, such as [Bellani and Bosio \(2019\)](#) who conduct their analysis for a sample of European countries at the occupational level. The survey combines demographic variables from the current year with wages from the previous year (except for Ireland and the UK) ([Eurostat, 2018](#)). Since we focus on wage growth, we use the year of the reported wage, i.e. one year prior to the other data collected. We use all waves 2004 to 2018 and hence yield an (unbalanced) macro-panel of wage data spanning the period 2003-2017⁹.

We use *gross employee cash or near cash income (PY010G)* for dependent workers as our main variable for wages since we are interested in the pre-tax wages. We rely on the *number of hours usually worked per week in main job (PL060)* to compute hourly wages at the individual level. We compute aggregate measures at the country level using the *personal cross-sectional weight (PB040)* and compute the average annual change in nominal hourly wages. We discuss the data and aggregation of country level time series in [appendix A](#). To confirm the validity of our aggregation, we compare our time series to Eurostat’s officially published EU-SILC country-level data.

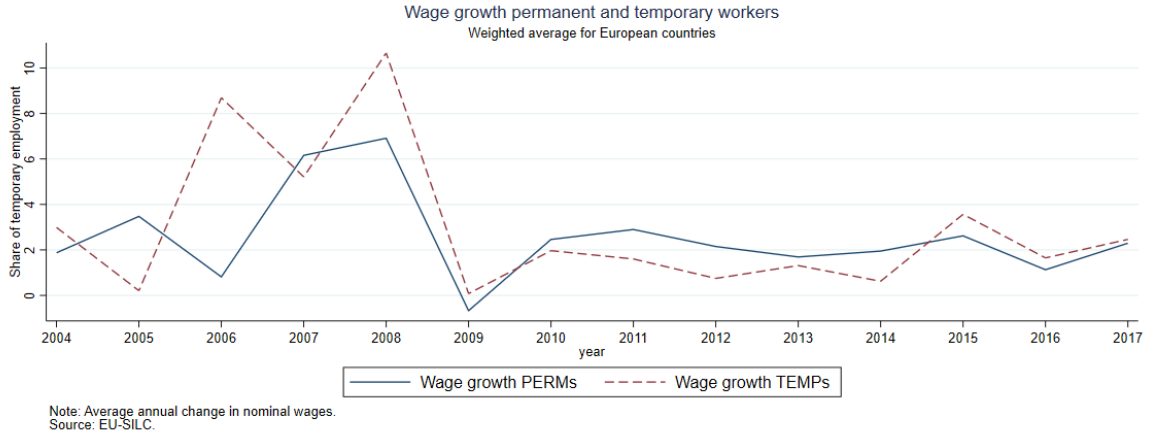
In addition to the *unadjusted* aggregate wage growth variable of all employees included in the survey, we calculate a wage growth variable of permanent workers as discussed above. This is possible, as EU-SILC data contains information on the contract type of employees (*PL140*). [Figure 5](#) illustrates wage dynamics in Europe for both contract groups separately.

⁸The EU-LFS individual data do not contain the wage level. The EU-SES is only conducted every four years.

⁹Note that our dependent variable is wage growth, i.e. the effective sample starts only in 2004.

What stands out immediately is that wage growth has slowed down since the onset of the GFC, a stylized fact that has been discussed in detail in section 2. Interestingly, this applies to both groups, but seems to be more pronounced in the group of temporary employees. This might be related to the strong *relative* demand for temporary employees before the onset of the crisis (see figure 1), which could have accelerated wage growth. Likewise, the weakened relative demand from 2008 to 2014 (see figure 1) might be the reason for the observed slow-down in wage growth in the respective period.

Figure 5: Wage growth permanent and temporary workers



Finally, we calculate a counterfactual wage growth variable by assuming that the share of temporary employees had stayed constant since 2003. More specifically, we employ *inverse probability weighting (IPW)* (Rosenbaum and Rubin, 1983; DiNardo et al., 1996; Fortin et al., 2011)¹⁰ to obtain a wage growth variable of a pseudo-workforce with a constant employment composition over time. We follow in the application the procedure as in Fessler et al. (2017). First, we use a logit model to predict the probability of each observation of being in temporary employment per year, 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. We estimate the re-weighting factors for each year and replicate the analysis for each country. Second, we use the propensity scores obtained to re-

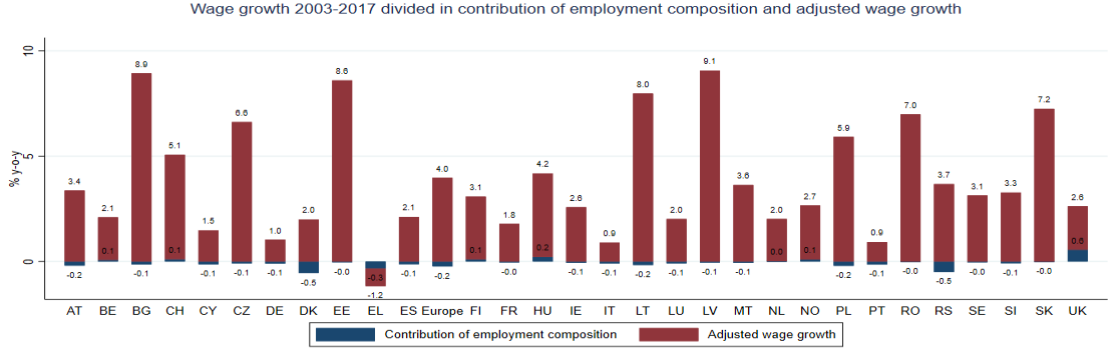
¹⁰IPW is typically used to estimate the counterfactual outcome when assignment is not random or all subjects in the population were assigned treatment. It removes confounding by re-weighting to create a pseudo-population in which the treatment is independent of the measured confounders.

weight the cross-sectional population weights of each observation to equal the employment composition with regard to work contract in the first year available. For the base year, we keep the original weight $g_1 = g$, whereas for control individuals, we multiply the weight g with the inverse propensity score $g_{1+n} = g \frac{p(x)}{1-p(x)}$.¹¹ Finally, we aggregate the individual 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 contract.

Figure 6 presents the adjusted wage growth variable for each country (averaged over the whole sampling period) and the employment composition effect. The latter represents a pure mechanical effect from the changing incidence of temporary workers over time. Since temporary workers suffer from a wage penalty compared to permanent workers, an increasing incidence of temporary workers lowers the aggregate average wage. The size of the competition 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 such a large role for Europe as a whole. Some countries are characterised 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. Some countries exhibit larger composition effects in specific years when the share of temporary workers changed, such as Germany, Italy, Spain, the UK and others in the post 2008 crisis period (see figure B.1). The adjustment allows us to control for heterogeneity between countries in the panel estimations described in the next section.

¹¹Note that 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 procedure.

Figure 6: Wage growth 2003-2017 divided in contribution of employment composition and adjusted wage growth



Note: Contribution in employment composition refers to the part of wage growth that originates from the change in the share of temporary workers over time. Temporary workers have a lower average wage than permanent workers. A change in the share of temporary workers lowers the average wage level and thus, annual wage growth.

Adjusted wage growth refers to aggregate wage growth minus the contribution of the employment composition. It represents the rate of wage growth if the share of temporary workers would have remained constant over time.

Wage growth refers to average annual change in nominal wages. Periods may be limited depending on countries data availability. Europe refers to the simple average of all countries shown. The weighted average of adjusted wage growth only amounts to 2.7% since small CEE countries are driving up the simple average.

4.2 Estimating factors of wage growth

Having stripped our wage variable off misleading composition effects we proceed to specify our empirical strategy. The most widely used empirical model to study the cyclical drivers of wage growth is the wage Phillips curve. The traditional wage Phillips curve relates nominal wage growth to a measure of labor market slack. Additional determinants that are typically considered are (expected) inflation and labor productivity growth (see e.g. [Nickel et al. \(2019\)](#)). We will use such an augmented Phillips curve setup to study the impact of dualization on nominal wage growth in Europe. We estimate a standard reduced form equation in a panel data frame-work of the form:

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

As outlined in the section above, our dependent variable is nominal wage growth obtained

from EU-SILC data. As a benchmark, we will first study the dynamics of the unadjusted aggregate wage growth to represent the work horse Phillips curve model. In a second step, we will look at the impact from labor market dualization on nominal wage growth of permanent employees and finally implement our main dependent variable, which is nominal wage growth net of composition effects ($\dot{W}_{i,t}$). While the bulk of studies estimating wage Phillips curves uses quarterly data¹², we have to stick to an annual frequency (like in the original contribution by Phillips (1958) or more recently in Kiss and Van Herck (2019)) as the computation of our dependent variable is only feasible based on yearly data (see also section 4.1). Our sample includes 30 European countries (i) and ranges from $t = 2003, \dots, 2017$, which leaves us with roughly 340 observations¹³. We intentionally choose a static representation as we do not observe any persistence in wage dynamics in our sample (likely due to the annual frequency of data). Moreover, as we are interested in the within-variability of the data, we consider the time-invariant country effects (μ_i) as fixed (and not random).

As a baseline, we use the most conventional labor market slack indicator, which is the headline unemployment rate $U_{i,t}$, but consider also several other measures of labor market slack as a robustness check. Further, we control for the impact of labor productivity ($\text{Prod}_{i,t}$) on wages, which we measure as the growth rate of real output per employment, as well as for inflation ($\pi_{i,t}$). Empirical 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 in our baseline setting¹⁴.

Finally and most importantly, we add to this rather standard Phillips curve specification a variable to identify the competition effect resulting from the presence of a dualized labor market. So far, studies exploring the impact of dualized labor markets on wages have consid-

¹²Examples are Bonam et al. (2021), Nickel et al. (2019) and Bulligan and Viviano (2017)

¹³Note that data for some countries are only available after 2003, such that the overall sample size is reduced to 341.

¹⁴We have also considered a survey-based measure capturing forward-looking inflation expectations provided by the European Commission (Exp. Infl.). As this variable is not available for two of our countries (Switzerland and Norway) and did not improve the explanatory power, we decided to stick to realized consumer price inflation.

ered *overall* temporary employment as a proxy (Ramskogler, 2021; Bellani and Bosio, 2019). Given the annual frequency of our empirical setup, we are able to differentiate between involuntary and voluntary temporary employment as data for the respective sub-groups are available on a yearly basis. This distinction is important for the identification of the competition effect, which is supposed to be triggered by the presence of a disadvantaged group of workers, i.e. by those who would prefer to have a permanent contract but were only able to find a temporary one. More specifically, we measure the extend of labor market dualization by the number of *involuntary* temporary employees as a share of the active working-age population ($\text{Invol. Temp}_{i,t}$). This indicator is a survey-based measure provided by Eurostat (based on the Labor Force Survey), which is collected since 2002 and is available for all countries in our sample. A detailed description of the measurement of all variables and their sources is included in table E.1 in the Appendix.

5 Results – Dualization and the macro-economy

The micro-data based measure of wage growth, which we introduced in very detail in the previous section, allows us to empirically investigate our two main research questions that are also shaping the structure of this section. First, we will test whether competition effects are relevant in a macro-economic context. If a competition effect, as defined above, existed we should be able to identify a dampening effect of the incidence of involuntary temporary employment on the aggregate wage growth of permanent employees. Moreover, by having netted out composition effects (caused by changes in the share of temporary employment), we are able to estimate the sensitivity of overall aggregate wage growth (i.e., the wage growth of all employees in an economy) with respect to labor market dualization. The second important question that we aim to address is whether the competition effect is significant in economic terms as well. More specifically, following our discussion on the literature on subdued wage growth in section 2, we explore the relative importance of the competition effect for aggregate wage growth within the traditional Phillips curve framework, where we take account of various labor market slack measures as well as the possibility that the Phillips

Curve might have flattened in the post-crisis period.

5.1 Identifying the competition effect at the macro-economic level

We start out presenting the result for the work horse Phillips curve model, which we summarize 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. Hence, an increase in the inflation rate transmits almost one to one into a rise of nominal wage growth¹⁵. In contrast, labor market slack is negatively associated with nominal wage growth. According to the point estimate, a one percentage point increase in the unemployment rate reduces nominal wage growth by 0.6 percentage points. This is also a common finding in the literature, reflecting that a larger share of job-less people diminishes the bargaining power of workers and puts downward pressure on wages.

In column (2) we add the explanatory variable of main interest, i.e. *Invol. Temp_t*. As expected, it is negatively associated with nominal wage growth and 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 0.9 percentage points. As we have considered the *unadjusted* wage growth rate so far, the coefficient estimate captures both, potential composition *and* competition effects. However, before we alter our main dependent variable to isolate the competition effect, we include time dummies in our model to control for common shocks that might have affected wage dynamics equally across countries over time, like the financial crises. 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 almost all variables, as we can see in column (3). This is particularly true for inflation, which even becomes statistically insignificant. Obviously, price dynamics across countries have followed

¹⁵This finding likely is linked to the annual context of our estimations and corresponds to the results in Kiss and Van Herck (2019). While it is not very common in the literature using quarterly data, Rusinova et al. (2015) show that if 4 lags of inflation are considered in quarterly estimations the aggregate effect again accumulates to close to 0.9.

Table 1: Identifying the competition effect

<i>Dep. variable:</i> <i>wage growth</i>	all workers, unadjusted			permanent workers		all workers, adj.
	work- horse PC (1)	invol. Temp (2)	time dummies (3)	comp. effect (4)	insti- tutions (5)	overall effect (6)
$Prod_t$	0.54*** (3.09)	0.56*** (3.31)	0.35** (2.29)	0.37** (2.56)	0.28* (1.79)	0.33** (2.26)
$Infl_t$	0.99*** (3.56)	0.89*** (3.04)	0.55 (1.21)	0.51 (1.11)	0.41 (0.87)	0.54 (1.16)
U_t	-0.58*** (-3.03)	-0.62*** (-3.57)	-0.48** (-2.70)	-0.48** (-2.59)	-0.58*** (-2.98)	-0.50*** (-2.78)
$Invol. Temp_t$		-0.88** (-2.70)	-0.88*** (-3.09)	-0.93*** (-3.17)		-0.95*** (-2.92)
...low TUD					-1.52*** (-3.60)	
...med. TUD					0.37 (0.67)	
...high TUD					-0.15 (-0.49)	
Cons	6.02*** (3.51)	10.97*** (4.98)	10.74*** (3.87)	10.96*** (3.83)	11.23*** (4.20)	11.34*** (3.91)
Model	FE	FE	FE	FE	FE	FE
TimeD	excl.	excl.	incl.	incl.	incl.	incl.
Weights	equal	equal	equal	equal	equal	equal
N	358.00	353.00	353.00	351.00	346.00	344.00

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis.

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 being an important driver of consumer price dynamics.

We will now alter our dependent variable in column (4) by considering the nominal wage growth of employees with permanent contracts only. This will allow us to estimate the competition effect, as we isolate that part of wage growth that cannot be affected by changes in relative weights between temporary and permanent employees. Compared to column (3) all coefficient estimates remain broadly the same. The impact from involuntary temporary employment even increases slightly and remains highly significant. This strongly supports our thesis that the incidence of a dualized labor market has negative spill over effects on the dynamics of wages of employees with permanent contracts. Notably, our result is consis-

tent 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 group¹⁶. In addition to their findings, our results show that competition effects are also relevant in a macro-economic context, where other important wage growth determinants like labor market slack are accounted for. Moreover, unlike in previous literature, our empirical setting allows us to focus on *involuntary* (rather than on *overall*) temporary employment to measure the degree of labor market dualization. In effect, comparing both indicators in the robustness section C shows that the crucial aspect in measuring dualization is to quantify those temporary employees who would prefer to be employed on a permanent basis (see Table C.1, columns (1)-(2)).

As we have highlighted in section 3, the macro-economic relevance of the competition effect might very much depend on a country's labor market institutions. We take account of these considerations in specification (5). Following our country grouping established in section 3.1, which classifies economies on the basis of their trade union density, we allow the competition effect to be group-specific. In accordance with our expectations, we find the competition effect to be only significant and large in countries with low trade union density. Further, if we want to interpret non-statistically significant coefficients, medium levels of trade union density appear to be most accurately represented by the insider-outsider model, where we find a positive impact from labor market dualization on the wage growth of permanent employees. Yet, the coefficient estimate is statistically insignificant, but the sign of the coefficient seems to be robust to variations of the country grouping as can be seen in the robustness section C (see Table C.1, columns (3)-(4)). This lends some support to the view that in countries with a medium strength of organised labor, trade unions will entrench the position of insiders and aim to insulate them from outsiders. By contrast, in countries where trade union density is low, permanent employees are more exposed to competitive pressure by outsiders - thus permanent workers suffer from a strong competition effect. According to the coefficient estimate, which remains also highly significant when we alter the country

¹⁶[Bellani and Bosio \(2019\)](#) exploit EU-SILC data for 13 European countries in the period 2003 to 2010. The observation unit is based on 24 occupations and two different age groups. Temporary workers are classified as all individuals who are employed under a fixed-term contract.

grouping, an increase in involuntary employees by one percentage point (measured in % of the labor force) decreases wage growth of permanent employees by 1.5 percentage points. Hence, the impact from dualization on wage growth is more than 60% higher in low-TUD countries compared to the unweighted European country average (depicted in column (3)). Our results thus strongly support the hypothesis that competition effects arising from labor market dualization very much depend on national particularities that are related to countries' labor market institutions.

At the same time, however, it has to be stressed that the competition effect is not driven by wage developments in some small countries of Europe while leaving aggregated *weighted* wage dynamics unaffected. In contrast, the competition effect remains highly significant and increases in magnitude when we put more weight¹⁷ on countries that are larger as we demonstrate in the robustness section C (see Table C.2, columns (3)-(4)). This is consistent with the observation that low TUD countries have a particular strong competition effect as the countries belonging into this group (comprising 15 out of 30 countries) make up more than 75% of overall employment in Europe and are therefore shaping the aggregate weighted effect.

Having established the existence of a competition effect we now can finally investigate its impact on overall aggregate wage growth. We re-estimate specification (4) employing a wage growth variable net of composition effects arising from changes in the relative share of permanent and temporary employees. The results are depicted in column (6) of Table 1 and show that coefficient estimates remain almost unchanged.¹⁸ This resembles the findings in Ramskogler (2021), who establishes a significantly negative effect from temporary employment on aggregate wage dynamics 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. As already discussed in previous chapters, a composition effect would be the result of a mechanical deceleration of overall wage growth due to an

¹⁷The relative weight of each country is based on the number of employed persons in 2005.

¹⁸Note that this result is not surprising given that permanent employees make up 89% of all employees on average in our sample and that composition effects, although in some years and countries significant, are rather low on average.

increasing weight of temporary employees earning less on average. As we have ruled out this possibility by construction (recall section 4.1), we can conclude that labor market dualization had a significant dampening effect on wage growth in Europe over the 2003 to 2017 period and that it is *competition* between permanent and involuntary temporary employees that is driving this result.¹⁹

Based on this final specification we conduct several additional robustness checks in Appendix C. In Table C.1, we show that our results are not driven by one particular country by excluding one country at a time from the sample. Moreover, as the estimated sensitivity of wage growth to labor market dualization and unemployment might be affected by a potential endogeneity bias, we discuss this issue thoroughly in Appendix D.

5.2 The relative importance of dualization for aggregate wage growth

So far we have learnt that competition effects play a statistically significant role in explaining aggregate nominal wage growth. Yet, from a policy perspective it is particularly important to assess the economic significance of dualized labor markets for the wage formation process in Europe. Let us put this in the form of a question: do involuntary temporary employees dampen aggregate wage growth to an extent that is relevant to macro-economic developments? In order to tackle this question, we will compare the relative importance of labor market dualization with the usual macro-economic determinants of nominal wage growth we have already introduced in Table 1. In addition, following up on specification (6) in Table 1, we extend the Phillips curve framework by allowing for a different unemployment parameter after the crisis to take account of the large literature on the PC flattening (see also section 2). Concretely, we interact the unemployment rate with a post-crisis dummy that equals 1 for the years 2013 to 2017 and 0 for the period before²⁰. The results from this model extension are presented in Table 2 in column (7). Two things stand out. First, the slope parameter

¹⁹Note that the results established in column (5) also hold when we employ the adjusted wage growth variable used in column (6). Hence, the different magnitude of the competition effect along the degree of trade union density is also observed in the context of overall aggregate wage growth.

²⁰Note that we have experimented with 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 onwards.

of the unemployment rate is statistically different across the two time periods and points to a decreased sensitivity of wage dynamics to labor market slack of more than 50% since the post-crisis period. While a decrease in the unemployment rate boosted wage growth by 0.71 percentage points before 2013, this sensitivity reduced to 0.29 percentage points²¹ in the post-crisis period. Our results thus add to the debate on the Phillips curve flattening and support the empirical findings in the literature that indicate a lower explanatory power of labor market slack measures in the post crisis period (e.g. [Byrne and Zekaite, 2020](#)). Second, the sensitivity of nominal wage growth with respect to involuntary temporary employment remains largely unchanged in the altered setup.

Table 2: labor market slack, the PC flattening and the relative importance of dualization

<i>Dep. variable:</i> <i>adjusted wage growth</i>	headline unemp.	standardized coefficients			
		headline unemp.	broad unemp. measure (U-5)	U-5 & invol. part-time	unemp. gap
	(7)	(8)	(9)	(10)	(11)
$Prod_t$	0.36** (2.27)	0.15** (2.27)	0.14* (1.81)	0.12 (1.43)	0.12** (2.13)
$Infl_t$	0.56 (1.21)	0.17 (1.21)	0.28** (2.32)	0.27** (2.10)	0.13 (0.92)
U_t	-0.71*** (-3.16)	-0.48*** (-3.16)	-0.46** (-2.71)	-0.50*** (-3.17)	-0.46*** (-4.24)
$U_t * post-crisis$	0.42* (2.04)	0.35* (2.04)	0.46** (2.29)	0.42* (1.87)	0.30*** (3.73)
$Invol. Temp_t$	-0.89** (-2.48)	-0.50** (-2.48)	-0.43** (-2.24)	-0.51** (-2.19)	-0.65*** (-3.17)
$Invol. Part_t$				0.11 (0.78)	
Cons	9.42** (2.74)	-0.28 (-1.21)	-0.44** (-2.12)	-0.44** (-2.17)	0.12 (0.80)
Model	FE	FE	FE	FE	FE
TimeD	incl.	incl.	incl.	incl.	incl.
N	344	344	310	305	318

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis.

Following up on this extended set of variables, we will re-estimate specification (7) based on standardized variables, which allows us to rank the independent variables in terms of their strength in explaining nominal wage growth. According to the resulting standardized (beta) coefficient estimates, which we present in column (8), an increase in the rate of involuntary

²¹The slope parameter of unemployment after 2012 is obtained as follows: $-0.71 + 0.42 = -0.29$.

temporary employment by one standard deviation leads to a drop in nominal (composition adjusted) wage growth by half a standard deviation. More importantly though, temporary employment turns out to be the most relevant determinant for wage growth followed by the unemployment rate. The parameter that captures the flattening of the Phillips curve ($U_t*post-crisis$) ranks third. Taking into account the uncertainty surrounding the parameter estimates, which is particularly pronounced in the case of the PC flattening (highest confidence intervals), all three mentioned variables are equally meaningful in explaining nominal wage growth in the period 2003-2017²². Hence, we can conclude that labor market dualization is at least as important as the flattening of the Phillips Curve that caused so much debate in the macroeconomic literature. Furthermore, the unemployment rate, which is a standard predictor for nominal wage dynamics in macro-economics, is economically not more important than the competition effect caused by involuntary temporary work.

In the remaining specifications (columns 9-11) we aim to look at whether the relative importance of dualization changes when other labor market slack measures are employed. There are various approaches in the literature to account for labor market slack in the economy, as we have highlighted in section 2. Starting from the headline unemployment rate (often referred to as U-3) in specification (8), we extend the unemployment rate concept by additionally considering discouraged as well as marginally attached workers (often referred to as U-5). Furthermore, in specification (9) we additionally include a variable that accounts for employees, who work part-time but do so involuntarily, to account for labor under-utilization. Note however, that unlike in Bell and Blanchflower (2019), we are not able to account for labor under-utilization based on desired hours of work but have to stick to headcounts to capture the degree of underemployment (due to data availability). Finally, in the last specification we consider a cyclically adjusted unemployment rate often considered in the literature. We rely on the concept of the non-accelerating wage rate of unemployment (NAWRU) and measure labor market slack as the unemployment gap arising between the headline unemployment rate (U-3) and the NAWRU.

The major take-away from the results presented in specifications (9) to (11) is that our

²²Note that a test on parameter equality is not rejected.

conclusions based on the headline unemployment rate (U-3) do not change. Considering a broader unemployment rate concept like in column (9) shows that the variables are of roughly comparable economic significance. By contrast, employing a cyclically adjusted concept of unemployment (column 11) seems to downgrade the unemployment-based measures. However, despite these small variations in coefficients, the parameter on labor market dualization remains statistically of the same magnitude as any of the labor market slack variables (and of higher magnitude compared to productivity and inflation) throughout all specifications. Thus, to sum up, we can state that our results provided in Table 2 clearly demonstrate that competition between permanent and temporary employees have sizeable macroeconomic effects that are not only statistically but also economically significant.

6 Conclusion

In this paper we have synthesised the rag rug of explanations for the period of subdued wage growth in Europe after the GFC. We have brought together the macroeconomic- and dualization literature in a concise graphical exposition that allows to take a bird's eye view on the relevant mechanisms linking unemployment, employment and wage growth. Trying to take the debate further, we have demonstrated that competition between temporary and permanent employees in Europe has exerted a substantial downward pressure on aggregate wage growth over recent years. Findings of the dualization literature, thus, bear important implications for the macroeconomy.

Our analysis has focused on aggregate wage growth at the country level, thereby combining a macro-level framework with an adjustment via micro-level data. This has not only allowed us to test the existence of the competition effect, but to estimate the relative importance of dualized labor markets in shaping aggregate wage growth dynamics compared to conventional labor market slack variables. Our results revealed that involuntary temporary employment is at least as important in explaining aggregate wage growth as the unemployment rate, which is the standard proxy for the bargaining power of workers in empirical macro models. This effect only exists in countries with low trade union density, where organized labor does not

have sufficient bargaining power to shelter insiders from competition by outsiders.

Yet, we only assessed the impact of temporary workers but due to data limitations not of other precarious jobs, such as agency work, multi-party employment or dependent self-employment - all of which may amplify the dampening effect of labor market dualization on overall wage growth. Future research would be well advised to carve out the micro-mechanisms of the competition effect underpinning the aggregate dynamics. Exploiting variation of labor market dualization on the occupational, sectoral and regional level seems a promising avenue. Policy-changes in the regulation of temporary contracts could be leveraged by quasi-experimental designs to further assess the causal impact of temporary workers on wage growth.

Extrapolating the given trend of growing temporary employment since the GFC allows us to point out some implications for the outlook of wage growth in Europe. As long as temporary employment continues to increase and labor market dualization continues to prevail, wage growth is likely to remain depressed. Past labor market recoveries have pushed up involuntary temporary employment above the pre-crisis level, thereby further fuelling competition between workers of different labor market segments resulting in wage restraint. Whether the Covid-19 pandemic has induced a structural break in these dynamics will need to be monitored closely.

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A Appendix: EU-SILC data

A.1 Wage growth aggregated vs published (net)

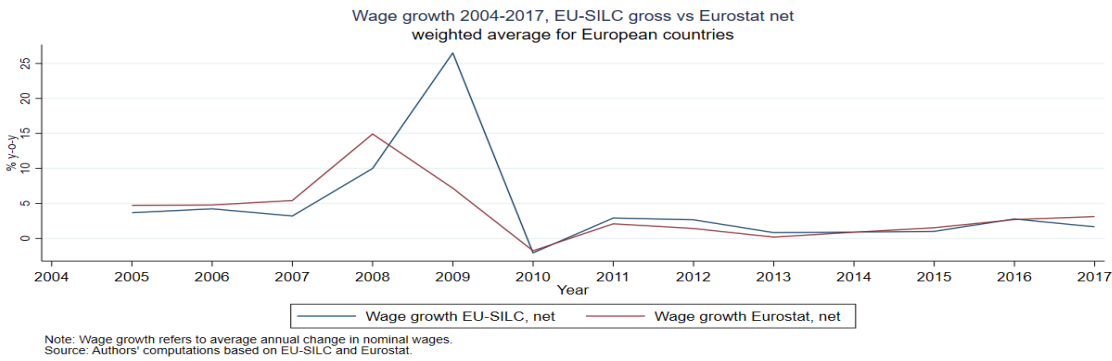
EU-SILC has been the established standard for cross-country income comparisons in Europe. A large effort is put on harmonisation of definitions and variables across countries, although some caveats apply due to national differences in data collection. The income reference period for most countries is the calendar year previous to the survey year with two exceptions: Ireland and the UK. In Ireland the income reference period is the last twelve months. In the United Kingdom the current income is annualised and aims to refer the current calendar year, i.e. weekly estimates are multiplied by 52, monthly by 12 (Eurostat, 2018). Since its start in 2004, an increasing number of countries have shifted to rely on national registries to construct or correct the wage variables strengthening accuracy and reliability (for a detailed overview see Goedeme and Trindade (2020) and Lohmann (2011)). We carefully examine national particularities in our data cleaning and aggregation procedure following Trindade and Goedeme (2019) on the income variables and GESIS (2021) in addition to the EU-SILC methodological guidelines and national quality reports to ensure a maximum of cross-country comparability. However, processing and aggregating individual level data always entails a series of small decisions that can affect the outcome and research should be transparent about them. We document our aggregation procedure in detail in our annotated Stata code. Eurostat does not publish sufficient details on their procedure for data processing and aggregation that we could follow. For a detailed discussion of representativity, in particular sampling design errors related to EU-SILC see Goedeme (2013); Zardo Trindade and Goedeme (2016).

To assess the validity of our aggregation, we compare the published aggregate of wages by Eurostat based on EU-SILC to our country aggregation of the individual level data. Since Eurostat does not publish an aggregate series for *gross* wages from EU-SILC but only for *net* wages, we use *net* wages (*net employee cash or near cash income (PY010N)* in EU-SILC) for comparison. Our aggregated series aligns closely with the officially published time series across Europe (appendix figure A.1 and figure A.2), although with two limitations. First, in 2009, several countries changed from survey to register data for documenting wages in EU-SILC resulting in some differences prior to the adjustment, most notably in the year of change (2009). As a result, alignment of the two series is substantially improved from 2010 onwards. Second, wage growth for Cyprus has an unreliable profile in *net* terms, although our series for *gross* wages in Cyprus is smoother (figure A.2).²³ Excluding both, the year

²³Goedeme and Trindade (2020) indicate that Cyprus relies on surveys to collect income data but matches

2009 and Cyprus, we obtain a correlation coefficient of 0.91 between our aggregated series and the officially published Eurostat data.

Figure A.1: Net wage growth EU-SILC aggregated vs published by Eurostat



it with register data to correct for apparent mistakes and keeps extreme or outlying values in the data if they have been verified.

Figure A.2: Net wage growth EU-SILC aggregated vs published by Eurostat for countries with available data for net wages

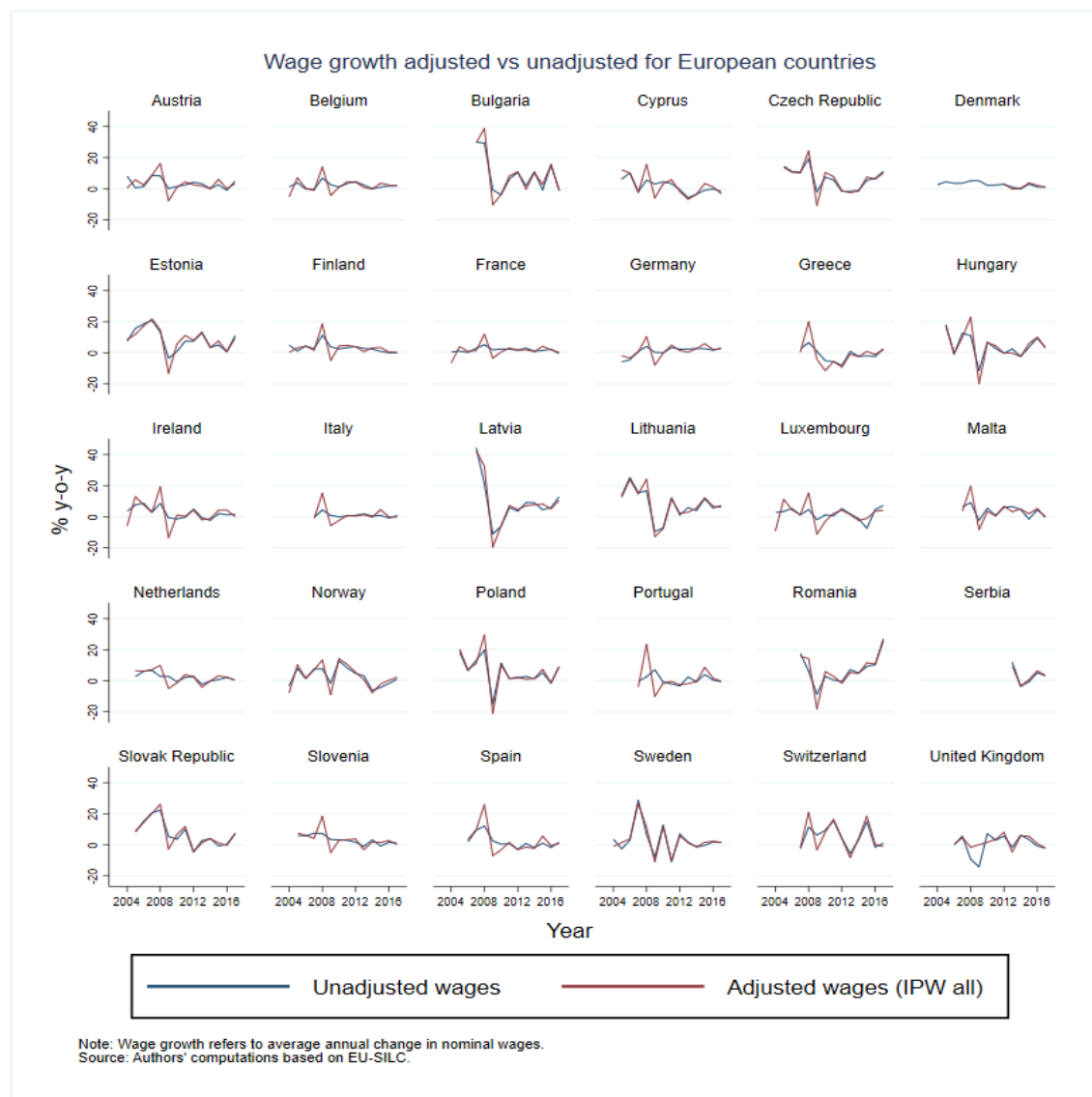


Note: Wage growth refers to average annual change in nominal wages. Results are shown for all countries with available data for net wages.
Source: Authors' computations based on EU-SILC.

B Appendix: Micro Adjustment

B.1 Adjusted vs unadjusted wage growth

Figure B.1: Wage growth adjusted vs unadjusted for European countries



C Appendix: Robustness

In Table C.1 we check the sensitivity of the competition effect when countries are excluded one at a time from the sample. In Table C.2 we present several robustness checks with respect to the measurement of labor market dualization (columns 1-2), the country grouping (columns 3-4) and weighting (column 5). All robustness checks are based on our main estimation results discussed in section 5.1 and are modifications of columns (4) to (6) in Table 1.

Table C.1: Sensitivity of labor market dualization to country exclusion

Country	Invol. Temp.	T-stat.	Country	Invol. Temp.	T-stat.
AT	-0.96***	-2.96	IT	-0.98***	-2.95
BE	-0.97***	-2.84	LT	-1.06***	-3.30
BG	-1.00***	-3.11	LU	-1.00***	-3.10
CH	-0.96***	-3.01	LV	-0.87**	-2.70
CY	-1.04***	-3.09	MT	-0.97***	-2.92
CZ	-0.94***	-2.81	NL	-0.97***	-2.95
DE	-0.91***	-2.80	NO	-1.01***	-3.07
DK	-0.94***	-2.87	PL	-0.81**	-2.26
EE	-1.00***	-3.00	PT	-0.92***	-2.78
EL	-0.86**	-2.43	RO	-0.83**	-2.67
ES	-0.93**	-2.52	RS	-0.91**	-2.55
FI	-0.90**	-2.75	SE	-0.98***	-2.85
FR	-0.94***	-2.85	SI	-0.94***	-2.88
HU	-1.08***	-3.31	SK	-0.81**	-2.62
IE	-1.05***	-3.09	UK	-0.95***	-2.89

Notes: Two-tailed significance levels: *: 10% **: 5% ***: 1%. The regression is based on specification (6) of table 1. Dependent variable: adjusted wage growth, i.e. counterfactual overall aggregate wage growth assuming a constant share of temporary employees in total employees over time (base year: 2004).

Table C.2: Robustness analysis: dualization measures and country grouping/weighting

<i>Dep. variable:</i> <i>wage growth</i>	permanent workers				all workers, adj.
	measures of segm.		country grouping/weighting		
	all temp. jobs	voluntary temp. jobs	UK changing group	TUD from OECD only	weighted country sample
	(1)	(2)	(3)	(4)	(5)
$Prod_t$	0.36** (2.49)	0.37** (2.56)	0.28* (1.78)	0.24 (1.26)	0.04 (0.15)
$Infl_t$	0.49 (1.03)	0.48 (1.02)	0.41 (0.86)	0.42 (0.95)	-0.25 (-0.38)
U_t	-0.53** (-2.54)	-0.51** (-2.57)	-0.58*** (-3.00)	-0.60** (-2.71)	-0.45** (-2.08)
$Temp_t$	-0.68** (-2.38)				
$Invol. Temp_t$		-1.00*** (-3.13)			-1.13*** (-3.39)
$Vol. Temp_t$		-0.34 (-1.20)			
...low TUD			-1.54*** (-3.62)	-1.49*** (-3.71)	
...med. TUD			0.42 (0.76)	0.44 (0.71)	
...high TUD			-0.14 (-0.48)	-0.22 (-0.83)	
Cons	12.64*** (2.92)	12.92*** (3.07)	11.18*** (4.19)	11.34*** (7.33)	14.33*** (3.91)
Model	FE	FE	FE	FE	FE
TimeD	incl.	incl.	incl.	incl.	incl.
Weights	equal	equal	equal	equal	empl.
N	356	351	346	302	344

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis. The dependent variable in specifications (1) to (4) is wage growth of permanent workers. Specification (5) is based on overall (contract) adjusted wage growth. In column (1) labor market dualization includes both, the voluntary and involuntary temporary employees (in % of the labor force) denoted as $Temp_t$. In column (2) we insert both indicators separately at the same time into the model, i.e. involuntary ($Invol. Temp_t$) and voluntary temporary employment ($Vol. Temp_t$). In columns (3) and (4) the country grouping along the degree of trade union density (TUD) is altered. In specification (3), the UK moves from the low to the medium TUD group. In specification (4), the country grouping is formed based on only one data source (i.e. on OECD data), which reduces the sample by four countries (BG, RO, MT and CY). The last column presents estimates from a weighted sample regression, where countries are weighted based on the number of employed persons in 2005.

D Appendix: Endogeneity

Simultaneity bias arising from reverse causality between nominal wage growth and labor market slack can be a concern in our specification. Usually, this issue is approached by inserting the slack variable in its one-period lagged form into the model (see e.g. [Ramskogler, 2021](#); [Byrne and Zekaite, 2020](#); [Nickel](#)

et al., 2019). While this is certainly a valid approach when using 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 from 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 are 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.

A standard approach to account for a potential simultaneity bias is to use instrumental variable techniques. As exogenous instruments are not at hand, neither for labor market slack 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 estimator²⁴ (Arellano and Bond, 1991; Blundell and Bond, 1998) and treat both variables as endogenous (by using the lagged levels of the variables as instruments).

We summarize our results in Table D.1, which also includes a memo item recalling our baseline results from section 5.1 (Table 1, column (6)). As displayed in column (1) involuntary temporary employment and unemployment have the expected negative signs and are statistically significant. However, compared to the fixed effect estimation (see column (6)) we observe an increase in the coefficient estimate for both variables, which is more pronounced for *Invol. Temp_t*. Obviously, controlling for simultaneity has an effect on the estimates in the direction that we expected, i.e. labor market variables seem to be underestimated in a fixed-effects setting. A very similar result can be found in Bellani and Bosio (2019), who report an increase in the impact of temporary employment after controlling for reverse causality. Yet, the most relevant conclusion from the results presented in this robustness section is that the relative importance of labor market dualization does not change. More specifically, a test on parameter equality reveals that the coefficients of U_t and *Invol. Temp_t* are of the same magnitude. This result also holds in a setting with standardized variables²⁵. Hence, we can confirm our baseline results that competition effects play a significant role in a macro-economic context and that they are at least as relevant as unemployment in driving wage growth in Europe.

In column (2) we add inflation to the set of endogenous variables. If firms increase prices as a result of increasing labor costs, reverse causality from wage growth to price inflation may occur. As

²⁴Note that our dependent variable is not persistent. This is why we choose a static representation and the difference rather than the system GMM estimator.

²⁵Note that re-estimating the same specification on standardized variables yields coefficient estimates of -0.43 and -1.12 for U_t and *Invol. Temp_t* respectively, which are statistically not different from each other.

Table D.1: Robustness analysis: controlling for potential endogeneity

<i>Dep. variable:</i>	memo Table 1	reverse causality		omitted vars	
	(6)	(1)	(2)	(3)	(4)
<i>adjusted wage growth</i>					
$Prod_t$	0.33** (2.26)	0.35** (2.51)	0.35*** (2.61)	0.15 (0.84)	-0.07 (-0.36)
$Infl_t$	0.54 (1.16)	0.47 (1.08)	0.44 (0.85)	0.70* (1.76)	-0.02 (-0.06)
U_t	-0.50*** (-2.78)	-0.57*** (-3.59)	-0.65*** (-4.18)	-0.54** (-2.44)	-0.39** (-2.60)
$Invol. Temp_t$	-0.95*** (-2.92)	-1.67** (-2.06)	-1.87** (-2.29)	-0.85** (-2.68)	-0.76** (-2.26)
TUD_t				0.42*** (3.29)	0.63*** (3.25)
EPL_t					-1.49 (-0.67)
CBC_t					-0.10** (-2.37)
Cons	11.34*** (3.91)	14.52*** (3.00)	16.28*** (3.33)	-0.96 (-0.23)	2.65 (0.30)
Model	FE	GMM	GMM	FE	FE
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	344	293	248

Two-tailed significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. T-statistics are reported in parenthesis. Specifications (1) and (2) 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, see also Roodman (2009)). Specification (2) treats only U_t and $Invol. Temp_t$ as endogenous, while specification (3) assumes that all variables are endogenous except $Prod_t$. Columns (3) and (4) are based on specification (6) and include institutional variables: employment protection legislation (EPL), trade union density (TUD) and collective bargaining coverage (CBC). As CBC time series have a lot of gaps, we impute missing values with lagged available values.

our results show, controlling for potential endogeneity with respect to inflation does not have any significant influence on the estimation outcome. This might be related to the fact that a large part of consumer price dynamics is already captured by time dummies.

Finally, a potential source of endogeneity in our setting might occur due to omitted variables. So far, we have mainly controlled for the cyclical drivers of wage dynamics. However, institutional factors are likely to influence bargaining power and thus, could have had an influence on our dependent and independent variables, wage growth and – more importantly – also on the development of labor

market dualization. Generally, fixed effects models already tackle the problem of omitted variables to the extent that they capture time-invariant determinants of the independent variable. Hence, the influence from a country’s individual institutional setting on the process of wage formation should to a large extent be captured by the so far presented model estimates. Still, although institutional changes evolve only slowly over time, these changes nevertheless could have had an influence on wage dynamics and on temporary employment. In order to control for changes in institutional settings, we consider the three labor market institutions with the most likely effect on worker bargaining power and thus, wages and labor market dualization, namely employment protection legislation (EPL), trade union density (TUD), and collective bargaining coverage (CBC). We use the most-established measures provided by the OECD (see Appendix E), with the drawback that they are not available for the non-OECD member countries in our sample²⁶ and that they are not collected annually.

The resulting gaps in the available time series for the three institutional variables would cut our sample size in half. Therefore, in a first step, we complement the TUD series with data from the ICTWSS database (Visser), which saves 22 observations²⁷. Re-estimating specification (6) by including TUD as the only institutional variable leaves us with a sample size of 293 (compared to 344). As shown in column (3), considering TUD has only a modest impact on labor market dualization. The coefficient estimate of $Invol. Temp_t$ remains negative and significant, but decreases slightly compared to specification (6). This might be related to the fact that in countries, where union density is rather low, the incidence of involuntary temporary employment is higher, which seems to dampen the effect from labor market dualization on wage growth. This is in line with the theoretical expectation that weak trade unions are unable to prevent the replacement of permanent with temporary workers (see section 3). In turn, stronger worker bargaining power may reduce part of the negative competition effect of temporary workers on wage growth. At the same time, stronger trade unions are associated with higher wage growth as our specification (4) indicates. However, trade unions may pursue different strategies with regard to permanent and temporary workers: trade unions of medium strength will be insider-oriented to the detriment of outsiders, while stronger trade unions pursue an outsider encompassing strategy and weaker trade unions are unable to exert substantial influence. Indeed, our earlier results (Table 1) indicate that countries with a low trade union density experience a sizeable competition effect, while countries with medium and high trade union density do not.

In a second step, we add the remaining two institutional variables into the model, i.e. EPL and CBC.

²⁶There is no data for Malta, Cyprus, Bulgaria, Serbia and Romania.

²⁷The ICTWSS database includes TUD data for various years in Malta, Cyprus, Bulgaria and Romania, which we can make use of.

As the CBC series has the largest gaps but is a slow moving variable, we impute the missing values in the CBC series (with lagged available values), which saves 82 observations. We display our results in the final column of Table D.1. Regarding the impact of employment protection legislation on wage dynamics, it is interesting to point out, that the strictness of EPL has a negative though insignificant effect on wage growth. While a negative sign seems counter-intuitive to the political-economy expectation of EPL as a factor for worker bargaining power, it is in line with the economics literature. EPL is identified as the main source of labor market rigidity preventing job-to-job transitions, which is arguably one of the most important drivers of wage growth. Finally, we find a small negative effect of collective bargaining coverage on wage growth. Further research could take these findings as a starting point to investigate the relationship of labor market institutions and wage growth on a more fine-grained level as the effects are likely to vary between different groups of workers.

E Appendix: Variable measurement and sources

Table E.1: Variable measurement and sources

Abbrev.	Variable	Measurement	Source
Wage growth	Annual average change in nominal wages	Gross employee cash or near cash income (PY010G)/months employed (PL073+PL074)/hours worked (PL060) (separated for full time and part time) aggregated with personal cross-sectional weights (PB040)	EU-SILC
Prod.	labor productivity growth	Nominal GDP/employment*100, annual change	Eurostat (naida_10_pe, naida_10_gdp)
Infl.	HICP Inflation	Annual average change of HICP	Eurostat (prc_hicp_aind)
Exp. Infl.	Inflation expectations	Monthly consumer survey asking for price trends over the next months, yearly average over 12 months	European Commission
U	Unemployment rate (U-3)	Unemployed (ILO definition) in % of active working age population (aged 15-74)	Eurostat (lfsa_urgan)
Invol. Temp	Involuntary temporary employment	Employees with a temporary contract who could not find a permanent job, in % of active working age population (aged 15-74)	Eurostat (lfsa_etgar, lfsa_eegais, lfsa_agan)
Temp	Temporary employment	Employees with a temporary contract, in % of active working age population (aged 15-74)	Eurostat (lfsa_etgadc, lfsa_agan)
Vol. Temp U-5	Voluntary temporary employment U-5 Unemployment rate	Temp – Invol. Temp Unemployed incl. discouraged (not seeking, but available) and marginally attached workers (available, but not seeking)	Eurostat (lfsa_urgan, lfsa_sup_age)
NAWRU	Non-accelarating wage rate of unemployment	Estimates from a model-based approach, European Union, 2017.	European Commission
Invol. Part	Involuntary part-time employment	Share of involuntary part-time employees in labor force, in %	OECD Statistics
EPL	Employment protection legislation	Strictness of employment protection – individual and collective dismissals (regular contracts)	OECD Statistics
TUD	Trade union density	Union members in % of employees (administrative and survey data)	OECD, ICTWSS
CBC	Collective bargaining coverage	Percentage of employees with the right to bargain	OECD Statistics