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Knockin' on heaven's door? Reframing the debate on temporary employment and wages: evidence from Europe

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Abstract

This article reframes the debate on the consequences of flexibilization in European labour markets focusing on the unexplored impact of temporary employment on occupational wages for permanent workers. Exploiting the variation in the temps' density within occupation and age groups across European countries between 2003 and 2010, we find that temporary contracts negatively affect occupational average wages for insiders' workers. These results are still robust using a dynamic system based on generalized method of moments (GMM-SYS) to account for potential endogeneity issues. We also explore the existence of heterogeneity across different occupational clusters and institutional settings. Our estimates indicate that the knock-on effect is large in countries with low employment protection legislation and it is driven by occupations characterized by untechnical work logics.

Key words: skills, labour market institutions, flexibility, occupations, income distribution, employment

JEL classification: J24, J31, J42

1. Introduction

Since the 1980s, European governments have pursued asymmetric reform of the employment protection legislation (EPL) as one of the major policy responses to the increase of unemployment rate (Boeri, 2011). The new employment 'deregulatory' rules were mostly oriented to ease employer constraints on the sole use of temporary employment contracts

while keeping fairly unaltered labour turnover costs of permanent workers (Bentolila and Dolado, 1994; Esping-Andersen, 2000).

Initial studies on the consequences of EPL changes suggested that flexibilization improved labour market performance, promoting job creation through the reduction of workers' firing costs (Saint-Paul *et al.*, 1996; Houseman, 2001). In contrast, recent empirical research has shown that the partial labour market deregulation undertaken by European governments, liberalizing the sole use of temporary contracts, generated a transitory stage of employment growth characterized by an increase of unstable and unsecured jobs (Boeri and Garibaldi, 2007).

The policy consensus seems to suggest that if the next best option for temporary workers is unemployment or inactivity, then fixed-term contracts can provide them with some benefits (Hamersma *et al.*, 2014). Against this argument, some scholars have objected that labour market deregulation has created new jobs (Avdagic and Salardi, 2013), while it potentially has induced a substitution between permanent and temporary workers (Jahn and Weber, 2016)—the latter being easier to dismiss.[1] In addition, a new stream of socio-economic literature acknowledges that this perms–temps substitution has a detrimental impact both on the employment opportunities of standard workers and on their bargaining power (Emmenegger *et al.*, 2013). The main proposition here is that labour market dualism is taken to induce a price competition between labour market segments once EPL reforms lower only the labour costs of temporary workers (Marx, 2015). In this respect, a number of studies have predicted that temporary workers, who generally receive lower pays (Brown and Sessions, 2005) and minimize employer's turnover and firing costs (Bentolila and Dolado, 1994), potentially create a considerable wage pressure on permanent employees (Koutentakis, 2008; Alemán, 2009; Beissinger and Baudy, 2015). The threat of temporary workers is then supposed to foster insiders' wage moderation and weaken perms' downward wage rigidity (Marx, 2015). Under these circumstances, we can expect a negative impact on the economic standards of employees with a permanent contracts (Koutentakis, 2008; Eichhorst and Marx, 2011) and, therefore, a potential reduction of permanents workers' remuneration (Baccaro and Benassi, 2017).[2]

The predictions above support the argument that the increase of atypical contracts triggers downward competition between insiders and outsiders, leading to the aforementioned potential decrease in the wages of permanent workers. We extend the reasoning and question the existence of a *de facto* wage rigidity for regular workers, insofar given as a conventional wisdom. We hypothesize instead an unanticipated knock-on effect: a raise in the spread of temporary workers is likely to represent a crucial channel through which permanent workers, who generally have better paid positions, may face a reduction in their bargained wage.

In this article, we reframe the debate about the economic consequences of labour market flexibility, investigating whether and under what conditions the diffusion of temporary employment contributes to the deterioration of insiders' wage. We question the broadly shared

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1   The empirical stream of socio-economic research has widely addressed the impact of flexibilization of labour market on perms–temps wage differentials and temps' earnings instability (Gash and McGinnity, 2007; Picchio, 2008; Bellani, 2009; Cervini-Plá and Ramos, 2012; Bosio, 2014).

2   The perms' wage reduction would, in turn, undermine the redistribution between capital and labor.

consensus on the impermeability of economic boundaries between core workers and marginal workers, and we introduce an analytical framework that attempts to address the driving forces underneath the association between temporary employment and perms' wage. Our main analytical innovation consists in the study of the relationship between temporary employment and the economic reward of protected workers considering its potential heterogeneity across occupations. Borrowing from the contributions of Autor *et al.* (2003, 2013) in economics and from the work logics framework proposed by Oesch (2006) in sociology, we focus on the notion of replaceability between perms and temps as a function of the capital-labour complementarities.

In detail, we make two main contributions to the literature on the consequences of labour market flexibility.

First, we engage in a critical discussion on the theories of dual and segmented labour markets, which are the dominant paradigms in the literature of the last decades, and we contrast them with the notion of temps–perms replaceability to capture how temporary workers may exert an impact on perms' economic conditions. By identifying the concentration of temporary contracts in age–occupation–years cells across countries as a proxy of the level of perms–temps replaceability, we empirically analyse to what extent the diffusion of atypical workers affects the occupational wages of insiders' workers. To the best of our knowledge, no previous study has measured this impact in a comparative way. In particular, while theories of dual and segmented labour markets treat workers with different contractual forms as distinct and not as (easy) replacements of each other, our intuition is that the substitution between the two segments is intrinsic to the nature of the job, that is, in terms of skill-specific workers' position within the division of labour. One possible hypothesis is that the economic returns of the insiders nested in certain occupations are more responsive to the share of temporary workers; to test this reasoning, we identify the degree of replaceability between perms and temps, mirroring in large part of the literature on work logics (Oesch, 2006).

Secondly, we consider another potentially relevant factor influencing the extent to which the share of temporary workers affects permanents' wages, the heterogeneity across countries in terms of job security regulation. The challenge here is to understand whether labour market institutions are likely to stimulate or weaken the opportunity for firms to substitute perms with temps. Rigid protection legislation, creating 'beneficial constraints' (Streeck, 1989), can make low-cost production strategies unfeasible, inducing a decline in replaceability between the two segments of labour market. This should *de facto* maintain the boundaries between core and marginal workers.[3]

In our empirical analyses, we consider different skill cells defined at age–occupation level across European countries for each year from 2003 to 2010. Each cell represents a differentiated 'local' labour market characterized by specific occupational skills that limit workers' movement between occupations. An increase of temps' density in a specific cell is likely to modify the degree of competition between perms and temps by giving employers more

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3 Intuitively, the presence of a rigid job security regulation can lower the elasticity of substitution between labor and capital and, indirectly, can also weaken the gains for the firm associated with the substitution of perms with temps (Hijzen and Swaim, 2010). This emphasizes the role of institutional setting as one potential driver of the relationship between the spread of temporary jobs and insiders' wage claim (Van der Wiel, 2010).

options to replace regular with contingent workers. Consequently, the substitutability between the marginal and core workers may undermine permanent workers' wage claims, even partly losing their economic rents. Using this analytical structure, we can investigate the existence and magnitude of a knock-on effect on perms' wages generated by a rise in the fraction of temps along the occupational lines.

Under certain conditions, our results seem to argue against a strict dualization of labour markets. Overall, permanent employees are more likely to experience a wage penalty in occupations characterized by a growing incidence of temps. This effect is detectable even after controlling for potential confounding factors related to the demographic composition of the labour market (e.g. gender, cohort and immigrants' share) and to perms' bargaining power (e.g. average occupational tenure, distribution of firm size and unionization rate). To deal with potential bias in the association of interest, we implement a dynamic GMM system, relying on multiple moment conditions in a time-lag structure of our model. This approach reduces simultaneity bias while taking into account temporal persistence in the effect of temps' density on perms' occupational wages. Thus, the results obtained provide support for the knock-on effect.

Our general conclusion is that the temps' share leads to a negative impact on permanent wages across local labour markets. Our findings reveal key differences between occupational groups. Interpersonal but also organizational work logics represent portions of the labour market where the knock-on effect is evident, while this is not the case for technical work logics, thus confirming that the nature of jobs matters for the level of temps–perms competition. Moreover, after controlling for country-specific trends, only permanent employees in countries characterized by low EPL experience a wage reduction when the share of temporary workers increases. Similar results hold when we interact measures of the degree of labour market flexibility with the occupational dimension. In short, we find that an institutional setting characterized by rigid EPL seems to protect insiders' rewards from the competition of a growing share of temporary contracts. These findings lead us to conclude that both the work logic framework and the institutional perspective are particularly instructive to understand which factors strengthen the wage loss of insiders in a context of increasing temporary employment.

Our results provide novel insights on the relationship between the reduction of beneficial constraints (Streeck, 1997) and the impetus of low-cost production strategies. The analysis of the knock-on effect also sheds light on the mechanisms that, together with the technical progress and the globalization of markets (Guscina, 2006; Bengtsson and Ryner, 2015), generate the current distribution of factors share (Damiani *et al.*, 2018).[4]

The present study is organized as follows. In Section 2, we discuss the main theories on labour market segmentation and present our critical approach. Section 3 describes the mechanisms behind the knock-on effect. In Section 4, we outline our empirical strategy, the data and the descriptive statistics. In Section 5, we present our empirical results. Finally, in Section 6, we draw the conclusions of our analyses.

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4   This argument is in line with recent studies on the decline of labour share. These suggest a negative association between deregulation on temporary contracts and three specific factors such as the entry wages for protected workers (Ordine and Rose, 2016), the bargaining power of unions and the labour share (Damiani *et al.*, 2018).

2. Shortcomings of labour market theories on temporary jobs

Several studies have provided clear evidence of socio-economic penalties associated with temporary contracts in many European countries. On the other hand, there is a lack of research on a potential 'knock-on effect' of temporary employment on economic conditions of permanent workers. This unanticipated effect seems at odds with the core predictions inherent in dualistic and segmented labour market theories. We review these theoretical models to provide an organized view of their approaches and of their potential limitations.

The core idea of dual and segmented labour market theories is that specific groups of workers are excluded from internal/primary labour markets. Such exclusion results in the formation of two segments of the workforce that differ in terms of job stability, economic returns and career prospects. To our knowledge, there is no univocal definition of labour market divisions in the existing literature. As we will discuss below, various theoretical strands have differed in the conceptualization of dualism constructs in the labour market. The most important in the literature has been the Insiders–Outsiders theory and the Labour Market Segmentation theory.

2.1 The Insiders–Outsiders theory

The Insiders–Outsiders (I–O) theorists claim that, at the firm level, a group of workers, the insiders, performing individually valuable and specific firm tasks, is less exposed to market mechanisms compared to their outsider counterpart (Lindbeck and Snower, 1988)—that Rueda (2006) explicitly identifies with fixed-term workers (and unemployed). In other words, the dominant view within the I–O literature conceptualizes a dualism in the labour market. Such dualism mainly consists of a divide between perms and temps concerned with firm-level practices. As I–O theory proponents have argued, while flexible workers have a lower attachment to the firm and, hence, a lower firm-specific human capital (thus a lower productivity) (Becker, 1964), this is not the case for permanent workers, given their higher survival probability in the firm (Jahn *et al.*, 2012). Thus, it is expected that higher investment in specific firm tasks and perms' higher survival probability will ensure perms a greater bargaining power and a privileged position (given their high firing costs) that will positively affect their rent-optimization capacity (Bentolila and Dolado, 1994; Sorensen, 1994; Polavieja, 2003). Temporary workers (as outsiders) are seen detached from or only partially included in the bargaining process within firms (Bentolila and Dolado, 1994; Broschak *et al.*, 2008)—given that they are unable to bid down the insiders' wage. Due to these barriers, they are forced to accept contracts characterized by lower (hiring and) firing costs.

Some scholars have claimed that this theoretical construction is not fully convinced. They argue that the relative value of firm-specific skills has partly deteriorated in a context characterized by a growing technological change (Longhi and Brynin, 2010). In this type of context, general skills (Iversen and Soskice, 2001) portable across jobs (e.g. communicative) assume a higher value in the labour market compared to non-transferable (specific) skills (Autor, 2010)—that are marketable only in a single firm or in a specific industrial sector. Under such circumstances, returns to occupational skills are better predictors of wages than employee's tenure (Zangelidis, 2008, Kambourov and Manovskii, 2009). Hence, it is no longer defensible the assumption of I–O framework that firm skill specificity, bound to a certain context, increases perms' economic rewards (Kahn, 2012).

2.2 The Labour Market Segmentation Theory

The Labour Market Segmentation theory, both in its economic and in its institutional variants, recognizes the existence of dualism as a structural feature of labour markets (Doeringer and Piore, 1971). Contrary to the I–O model, it posits that the segmentation is associated to demand-side factors (demand fluctuation in the product market) more than to supply-side (personal characteristics of the workers, such as job tenure) (Piore, 1980). The Labour Market Segmentation theory is characterized by two variants that we refer to economic and institutional perspectives.

The economic perspective of the Labour Market Segmentation theory emphasizes that, due to the volatile and cyclical components of the market, demand plays a major role in the segmentation of workers. Accordingly, only employees nested in the primary segment are guaranteed, while those of the secondary segment are not—since they absorb demand fluctuations. This theoretical construct is based on the concept of occupational skill divide between workers. Workers of the primary segment have usually higher qualification and 'good jobs', while the others, characterized by a low level of qualification, represent a buffer stock that is volatile by definition. The occupational skill divide thus leads to a reinforcement of the barriers between the two groups (Doeringer and Piore, 1975).

Recent studies, however, have stressed that the use of non-standard contracts has produced unanticipated effects related to the perms/temps dualism (Wrenn, 2016). Accordingly, recent features of labour market segmentation have led to an increase of the spread of temporary workers across occupations, encompassing a diverse set of work arrangements and skills requirements (Polavieja, 2006; Marx, 2015). The growing incidence of temps across occupational categories has modified the structure of opportunities for both high- and low-skilled permanent workers (Lautsch, 2002; Ashford et al., 2007). This, in turn, has prompted an alteration of the competition between the two segments of the labour market also in terms of economic returns (Vough et al., 2005; Pedulla, 2013)—that was not predicted by the economic perspective of the Labour Market Segmentation theory.

The institutional perspective of the Labour Market Segmentation theory adds a new element to the debate. Accordingly, the segmentation is the direct result of the changes occurred to the 'institutional rules' under which labour markets operate. In this sense, labour market legislation may exert a pressure for temps' diffusion independently from the fluctuations in product labour demand. In the simplest version of the institutional approach to segmentation, the features of labour market (de)regulation are seen as largely exogenous.

Another variant of the institutional perspective of this theory, the so-called core-periphery framework (Kalleberg, 2001; Cappelli and Neumark, 2004), states that the regulatory context of dismissal costs and the level of inclusiveness of collective bargaining are tied to permanent workers' bargaining power that pursues the so-called 'buffering strategy' (Piore, 1980). In this sense, permanent workers benefit from a stronger bargaining power especially for the institutionalized higher firing costs attached to their contracts—both in terms of severance payments and procedural difficulties. Accordingly, temporary contracts, circumventing EPL and avoiding firing costs, protect perms' bargaining power also in the case of market volatilities (Gebel and Giesecke, 2011). The rent optimization capacity of perms is expected to be associated with the dimension of the buffer stock of temporary jobs (Dolado et al., 2002). Given that firms can fire temps without any costs, the greater the share of temporary workers (external flexibility), the less convenient it will be for firms to dismiss perms (Bentolila and Dolado, 1994).

The institutional view of segmentation, however, has been recently questioned for its inability to account for unanticipated effects related to the deregulation of the sole use of non-standard contracts (Wrenn, 2016). Since labour market deregulation has made more convenient for employers to replace permanent staff with cheaper workers (Koutentakis, 2008), the use of fixed-term contracts has become more and more widespread, thus representing a threat also to standard employees' job security (Kraimer *et al.*, 2005; De Cuyper *et al.*, 2009).

These criticisms remind to the predictions of the Radical Political Economy. According to this framework, the alternative forms of job protection mirror employers' strategy to rule employees by cultivating divisions within the working class (Marglin, 1974). Throughout the differentiation of contractual forms, employers attempt to fragmentize the employees' interest and to reduce the propensity of workers for collective actions, leading to severe divisions between employees (Gordon *et al.*, 1982, p. 288). Thus, the intuition at the core of the Radical Political Economy seems to be illustrative of the recent process of erosion of protected positions—that are increasingly replaced by temporary workers (Platt, 2003; Damiani *et al.*, 2018). Pursuing the principle of 'divide et impera', perms' power to maintain control over the ability of firms to hire temporary workers is expected to decrease—at least partially (Tilly and Tilly, 1998; Cappelli, 2001). To contrast strategically the threat of greater external flexibility, perms may opt to accept more flexible working time and to limit the labour cost differentials (Vough *et al.*, 2005; Eichhorst and Marx, 2011). In this sense, the expectation of the Radical Political Economy offers a theoretical argument for the emergence of the knock-on effect. However, the adoption of this employers' strategy acting to divide labour force may depend, among other factors, on the degree of replaceability of perms with temps within occupations. According to Beissinger and Baudy (2015), an increase of the incidence of temporary workers due to flexibilization policies can force permanent workers to accept lower wages only if temporary workers are substitutes; if temps, instead, are complementary to perms in production, flexibilization may boost perms' wages. At this regard, Koutentakis (2008), employing a dynamic model of the dual labour market with adjustment costs, shows that the diffusion of temporary employment potentially carries out a negative spillover on job security of permanent workers. If the wage differentials between perms and temps are higher than the discounted firing costs, firms, under certain conditions, will find more convenient temporary work than the permanent one. Intuitively, these findings imply a sort of upper bound on the wage that insiders can bargain over and reflect potential channels through which the traditional trade-off between remuneration and security gap operates.

On that point, we consider occupational labour market as a key dimension to frame our analysis since the degree of substitution or complementarity is likely to vary according to the occupational characteristics and to the institutional setting. In this sense, the adoption of the model of 'occupational labour markets' ensures a more comprehensive analysis of the effects of temporary employment on the wage structure and is more suitable to examine whether labour market dualism makes perms less, and not more, rewarded.

To sum up, our hypothesis is that, overall 'permanent workers should experience a reduction of their wages associated with an inflow of temporary jobs. This should be the case for those employed in occupational labour markets characterized by a higher degree of perms–temps replaceability'. As we will explain below, we expect that the strength of the

relationship of interest will principally depend on the nature of the work and on the institutional setting.

3. The occupational dimension of temporary employment

3.1 The role of work logics and EPL

As explained in the previous section, we expect that, among other factors, the level of replaceability of perms with temps within occupational labour markets is likely to impact on permanents' wage. More specifically, we predict that the incidence of temporary workers is likely to exert a wage penalty for permanent workers but that this should depend on the degree of substitutability between the two groups of workers at the occupational level.

According to the recent literature on occupational change, the level of replaceability of permanent with temporary workers within occupations is associated to three main factors such as (a) labour supply-demand conditions, (b) type of skills required (demand-side attributes) and (c) perms' bargaining power. Depending on the dimension considered, substitution or complementarity between temps and perms would prevail.

As shown by socio-economic studies, in the last decade, the demand for high- and low-skilled occupations has increased, while the demand for jobs with medium-skilled level has declined (Goos and Manning, 2007). In this sense, some occupations have been hit by positive shocks, while others by negative ones (Nickell and Saleheen, 2009). The trend in the incidence of temporary workers may be associated, at least for some occupational groups, with a positive demand shock. Since new entrants are more often employed under temporary contracts, it is likely that a positive shock is associated with an increase in the incidence of temporary workers. Besides, it may also be the case that temporary workers enter the labour market because of supply shocks. In both cases, an increase in the labour supply could force permanent workers to moderate their wage claims—due to the labour cost differentials between the two groups of workers.

Moreover, we expect differences in the level of replaceability between perms and temps depending on the occupational group considered. According to the literature on occupational heterogeneity of post-industrial societies, specific job attributes should alter the employment and economic consequences of an increase in temporary employment (Marx, 2011; Reichelt, 2015). Besides the job characteristics related to skills (vertical differentiation), the widely cited framework by Oesch (2006), emphasizing the importance of work logics (horizontal differentiation) for the categorization of occupations, can help to analyse whether occupational attributes modify the knock-on effect. According to Oesch (2006), jobs are characterized by horizontal structure along four dimensions such as the setting of the workplace, the relations of authority, the primary orientation of the worker and the skill requirements that, in turn, identify three different work logics such as the technical, the organizational and the interpersonal work logics. The argument here is that certain work logics give more incentives to employers to offer non-standard employment contracts and these, in turn, influence the incidence of non-standard work on the bargaining power of perms (Marx, 2011). More specifically, the degree of substitution is expected to be related to whether an occupation is characterized by a direct face-to-face exchange between worker and people's need (interpersonal work logic), by strict parameter of work process (organizational work logic), or by a development and use of technical skills (technical work logic). Perms employed in occupations characterized by an interpersonal work logic (such as

routine service workers or nursing aides), attending directly customers' or patients' demands, work autonomously and are not strictly integrated in a complex division of labour or in a structured career path. Their competencies, relying primarily on social and communicative skills, are portable across different job positions and are not bound to a specific organization. Hence, perms in this work logic are expected to be replaceable by temporary workers. The predictions are slightly different for perms placed in organizational work logic (such as routine office clerks). These are usually employed in administrative and clerical tasks on different hierarchical levels in the large bureaucratic organization with the idiosyncratic organizational procedure. The main competencies are associated with general skills, like coordinative and clerical, which, by definition, are portable and replaceable. However, compared to workers in interpersonal work logic, careers are more structured, also due to the existence of internal labour markets integrated into specific technology and regulation. Hence, flexible workers are partially attractive for employers and represent, only to a certain degree, a valid substitution to perms. The level of substitutability between perms and temps is expected to be low for workers in jobs related to the production of goods, especially for those in high value-added industries (technical work logic). Here, workers are employed in the production process with a high level of complexity that requires continuous feedback by costumers. In addition, they perform specific tasks that are strictly related to the job of the other members of the work team (e.g. freight handlers). These elements make insiders less substitutable from external workers (Marx, 2011).

Finally, the level of substitution may depend also on insiders' bargaining power, defined as the capacity of permanent workers to maximize their economic return. In the context of coordinated labour markets (Soskice, 1990), collective actions and institutions are expected to shape the degree of substitution between the two groups of workers (Polavieja, 2003; Jahn and Weber, 2016). In particular, the job security regulation can have a crucial impact on the level of replaceability and, therefore, on regular employees' wage bargaining (Vlandas, 2013). High levels of job protection for permanents workers (i.e. high dismissal costs) may be associated with a low chance of replaceability of perms with temps, especially when temporary contracts are synonymous of unsecured jobs. In addition, since a higher job protection motivates employees to acquire more specific skills, rigid labour markets are likely to reduce the variability of future income (Iversen, 2005, pp. 9–12). These conditions may decrease perms' fear of job losses, thus preventing downward pressures on wage claims.

4. Methodology and data

4.1 Empirical strategy

In our empirical framework, we estimate the relationship between the temporary contracts' density and the average occupational wage for permanent workers. As discussed above, temporary workers could be poor substitutes for permanent workers within each age–occupation cell across countries, due to their lower productivity (Addessi, 2014) and their limited bargaining power (Gebel and Giesecke, 2016). On the other hand, temps and perms could be perfect substitutes so that occupation-specific wages may be affected by an inflow of temporary contracts within occupational labour markets. To investigate the implicit degree of replaceability between temps and perms across distinct occupational profiles, we frame our analysis on skill cells represented by the combination of two-digit occupation codes (using

the International Standard Classification of Occupation - ISCO88), two age groups across European countries over time. Therefore, each cell corresponds to a differentiated local labour market (Cohen-Goldner and Peserman 2006; Caines *et al.*, 2017).

Our empirical strategy allows us to examine the effects of variations in the fraction of temporary employment on changes of insiders' average wages within the same local labour market. Thus, we seek to achieve identification by exploiting the cross-sectional variation in the share of temps within each skill cell. As in Bosch and Ter Weel (2013) and in Stops (2014), we do not expect individuals to move between occupational labour markets, even in the case of a relative oversupply. In fact, in the short-run, occupational mobility is restricted because it requires a large investment in training. In turn, this reduces the worker's ability to react to changes in the structure of occupational wages. The age dimension is also crucial to define local labour markets since it has been shown to predict the level of perms' wage premium (Kahn, 2016).

To capture the hypothesized knock-on effect of temps' density on perms' wages, we define our baseline estimating equation as follows:

$$\ln(w_{ajct}) = \alpha + \delta TEMPDENS_{ajct} + \beta X_{ajct} + \theta X_{jc} + \gamma_{ajt} + \gamma_{ct} + \epsilon_{ajct} \tag{1}$$

where a indexes age group, j occupation at two-digit level, c countries and t years.

Specifically, the dependent variable $\ln(w_{ajct})$ is the (natural) logarithm of nominal average hourly wage for permanent workers measured for each age–occupation cell across countries and years. The explanatory variable $TEMPDENS_{ajct}$ is the fraction of temporary workers on the total employees in each local labour market.[5] The vectors X_{ajct} and X_{jc} include controls for average demographic characteristics (for each cell) and for other potential confounders capturing perms' bargaining power. In particular, we control for the shares of male perms, college graduates, and migrants, as well as firm dimension, average tenure and unionization rate.[6]

The controls for perms' bargaining power are here discussed in detail as follows:

- *The firm dimension within cell* is defined as the share of permanent workers employed in firms with no more than 10 employees in each age–occupation–country–year cell. The existence of an effect of firm size and internal careers on perms' wages as well as on the use of temporary work is well documented (Winter-Ebmer and Zweimüller, 1999).[7]
- *The share of migrants within cell* is defined as the relative fraction of workers who are migrants, calculated for each age–occupation–country–year cell. There exists an extensive

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5   Given that the explanatory variable 'temps' density' in the first percentile of the distribution is equal to zero, our explanatory variable is the level of temps' share, avoiding logarithm transformation that reduces the sample size. However, as a robustness check, we provide a specification in which temps' density is defined in logarithm in order to interpret it as an elasticity. We use as synonymous of temps' density, the term 'temps' share as well as the term "concentration of temporary workers"'.

6   With the exception of the unionization rate calculated at the occupation–country level, all other control variables are defined at the age–occupation–country–year level.

7   Traditionally, literature on the relationship between firm dimension and employees' wage has supported the thesis that large employers generally share the excess profits with their workers to avoid or mimic unionization. In this way, they also try to substitute high monitoring costs by higher wage premia. Empirical studies only partially confirmed these traditional arguments (Schmidt and Zimmerman, 1991).

stream of empirical studies that emphasize the potential effect of migration on wages as well as on the likelihood of having a temporary contract (Card, 2001; Kogan, 2011; D'Amuri and Peri, 2014).

- *The average job tenure within cell* is defined as the average number of years employees spent in the same job position in each age–occupation–country–year cell. This control captures the specific differences in the occupational wages of perms that can be explained by the distribution of job tenure, which could be significantly different from one occupation to another (Sullivan, 2010).
- *The unionization rate at occupation–country level* is defined as the share of workers that are trade union members in each occupation–country cell. The rationale is that a larger fraction of union members could reflect higher insiders' bargaining power to increase wages in each local labour market (Fitzenberger *et al.*, 2013).[8]

In the model, we have included also an age–occupation–year fixed effect, γ_{ajt}, and a country–year fixed effect, γ_{ct}, to control for the fact that average wages for perms in a local labour market are traditionally driven by a combination of production factors and unobservable determinants of wages within age group, occupation, country and year (Caines *et al.*, 2017). Thus, these fixed effects terms absorb part of the variation in relative wages due to labour demand shocks over time that are age–occupation and country–year specific.

Finally, ϵ_{ajct} represents an idiosyncratic error term. We use White-corrected standard errors to control out for heteroskedasticity and weight each cell by the employment level to down-weight smaller cells with larger sampling errors.

To check the heterogeneity of the knock-on effect across occupational categories and national contexts, we re-estimate Equation (1), dividing the sample according to two dimensions such as work logics and the degree of strictness of employment legislation. In the analysis of the first dimension, we follow Oesch (2006). who categorizes occupations focusing on horizontal cleavages. Thus, we divide occupations into three groups such as technical, organizational or interpersonal work logics—for a detailed description of the occupational composition of each work logic, see Table A1 in the Appendix. Regarding the second dimension, we refer to the EPL index on regular workers (based on the index developed by the Organization for Economic Co-operation and Development - OECD) for each year and country considered. This index quantifies the 'procedures and costs' relative to dismissing permanent employees.[9]

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8   We are aware that the most correct measure would be the union coverage calculated at the occupation–country–year level. Unfortunately, this index is not available and, for this reason, we resort on the European Social Survey, Round 2 (2004/5), Round 3 (2006/7) and Round 4 (2008/9) information related to union membership by occupation–country. We also calculate a measure of unionization based on both actual and past membership. The results, available upon request, are quantitatively the same.

9   It should be noted that the EPL index on regular and EPL index on temporary work differ radically in their construction. The EPL on temporary contracts (*eplt*) measures the procedures and costs of hiring workers on fixed-term, temporary work agency (TWA) contracts. In this sense, *eplt* reflects the average of specific regulation, respectively, on temporary contracts and TWA, but the final value can hide different trends in two specific sub-regulations. Given different weights associated to each sub-regulation, policymakers and scholars consider this index less robust to capture the 'real regulation' on temporary employment. For this reason, following the common procedure in the literature (Hijzen and Swaim, 2010), in our empirical analysis, we rely on *eplr*.

In particular, we construct a dummy reflecting whether a country has high level of EPL on regular contracts. In this sense, we define a country as rigid (not rigid) when its EPL index on regular contracts is higher (equal or lower) than the median of the sample of countries included in the OECD indicator in the same year (D'Amuri and Peri, 2014).[10]

It should be noted that Equation (1) does not include age–occupation–country as in the standard panel data analysis. The inclusion of this term would entirely absorb the age–occupation–country variation and the coefficient of interest would be identified only on the limited within-cell variation across time in the share of temps.[11]

Despite our effort to account for unobservable determinants of perms' occupational wages that could be correlated with the share of temps in each local labour market, potential biases could still persist. As an example, an age–occupation combination, within a specific time span, is more concentrated in a sector with better economic performances than the average: under such condition, the labour demand for the same age–occupation combination is likely to increase. In turn, this concentration can increase the bargaining power of perms nested in this specific occupational labour market. In this scenario, the controls for country–time and age–occupation–time fixed effects will not fully capture such specific unobservable determinants. In addition, occupation-specific wages will be not-fixed in each country but could depend on the industry composition of employment. To address this issue, we account for potential productivity shocks in each local labour market, exploiting a demand shift index following Katz and Murphy (1992) and Moretti (2004). We add to our estimating equation a labour demand shift index for each specific age–occupation combination based on the industry composition of permanent employment at the country level. Specifically, the index is defined as follows:

$$\text{demandshift}_{ajct} = \sum_i \omega_{ajc} E_{ict} \tag{2}$$

where E_{ict} reflects the permanent employment at the one-digit industry level i in country c and year t, while $\omega_{ajc} = \frac{L_{ajic}}{\sum_i L_{ajic}}$ represents the average share of permanent workers in age group a and occupation j employed in industry i for each country c over the period 2003–2010.[12] This term reflects a proxy for local labour market conditions as captured by the evolution of labour demand (Katz and Murphy, 1992). We treat this indicator as the predicted labour demand for perms in a certain age–occupation cell, which is determined, in turn, by the industry composition of occupations in each country.

4.2 Data description

Our primary data source is the European Survey on Income and Living Conditions (EU-SILC) for the years 2003–2010.[13] The EU-SILC has been designed with a standard methodology to yield comparable information across European countries on several features,

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10 We have also implemented a second indicator, exploiting the notion of dual labour market proposed by Basso *et al.* (2012). The results (not reported here) confirm our findings.

11 More specifically, a model for the average occupational wages that include only age–occupation–country fixed effects captures more than 92% of the total variance in the data.

12 In order to reduce potential measurement error issue related to small sample size of some local labour markets, we constructed the average share of permanent workers in age group a and occupation j employed in industry i for each country c, over the total period 2003–2010, as in Moreno-Galbis and Tritah (2016) rather than in the initial year.

13 We use EU-SILC cross-sectional data.

including earnings and labour market conditions. We restrict our analysis to employees aged 15–55 years, excluding self-employed workers and full-time students.[14] We exclude, from the sample, all employed individuals over 55 years of age to avoid issues related to early retirement schemes. We also drop self-employed workers because it seems unreasonable to classify them in terms of contract status. To obtain more reliable measures of labour market composition, we complement the EU-SILC data with the harmonized individual-level European Union Labour Force Survey (EU-LFS) for the period 2003–2010.[15]

To estimate the parameters of our model (see Section 4.1), we use data for 13 countries and 24 occupations over 8 years and two age groups, obtaining a cross-sectional dataset with at most 4992 (13*24*8*2) observations mapping to four dimensions such as occupation, age, year and country. The 13 European countries in our study are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain and the UK. We exclude workers employed in armed forces and in agricultural and fishery occupations. To obtain more reliable estimates, we also drop age–occupation–country–year cells with less than 50 observations in the EU-SILC data, therefore reducing our sample to 3506 local labour market cells.[16] Additional details on the number of cells and on occupational classification are reported in Tables A2 and A3 in the Appendix.

4.3 Descriptive statistics

The incidence of temporary employees across selected European countries (EU15) has increased by 3.5% between 1995 and 2010, moving from 11.5% to 14.0%.[17] There is, however, a considerable degree of variation between countries, and they generally diverge from the aggregate trend, with the exception of France, Germany and Italy (where the incidence moved from 7.2% to 12.7%). The percentage of temporary employment in Spain strongly exceeds the European average, even if it decreased from about 35.2% to 25.2% during the selected period. In other countries, such as the UK, Denmark and Norway, the incidence of fixed-term contracts remains low.

The share of temporary workers varies significantly also between occupations (Figure 1): in particular, during the period of analysis (2003–2010), it is higher for health and teaching professionals, personal and protective services workers, skilled agricultural workers, service elementary occupations and manufacturing labourers, while it is lower for legislators and managers, science professionals, science associate and handicraft, craft printing trades workers, stationary plant and related operators and transport operatives. Importantly, we do not observe any discernible pattern in the concentration of temporary workers in low-skilled occupations. The distribution of temporary contracts appears not to be structured along any clear hierarchical differentiation by skill level (Polavieja, 2006; Marx, 2015). Finally, the

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14   We exclude also individuals with missing data on wage, occupation and type of contract.
15   We rely on EU-SILC data to construct the dependent variable, perm's wage. We use EU-LFS to construct temps' share, the demographic controls (share of male workers and share of college graduates) the firm dimension, the share of migrants and the average job tenure within cell.
16   In any case, the results are qualitatively the same even if we retain also smaller cells in terms of sample size.
17   In line with the previous literature, we classify as temporary workers of all individuals who are employed under a fixed-term contract.
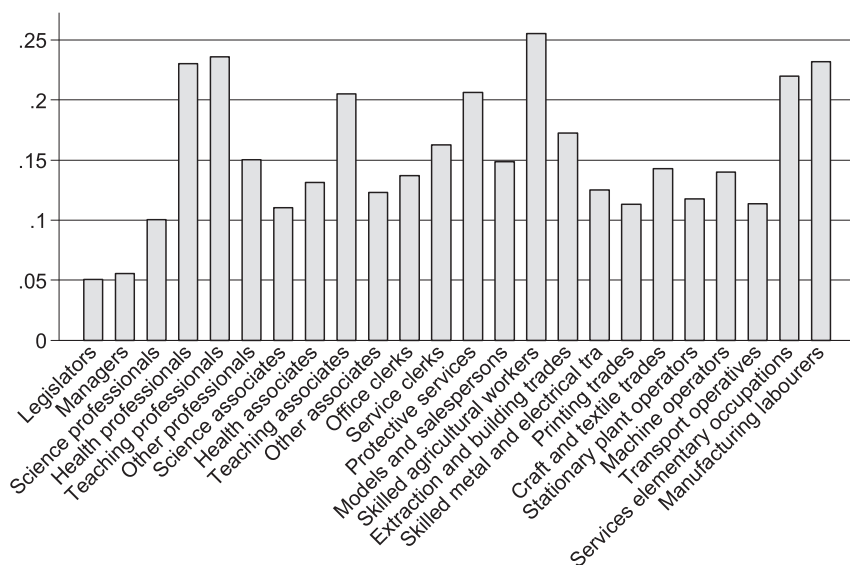
Figure 1 Temporary jobs' concentration by two-digit ISCO classification codes, 2003–2010 and percentages.
Source: EU-LFS.

occupational distribution of temporary workers is mostly constant over time (Figure 2), with some exception in particular in low-skilled and service occupations.[18]

We observe a negative association between the temporary contracts' density across occupations and the logarithm of the average occupational hourly wage for perms (Figure 3).[19] This indicates that the average wages for standard workers are lower in occupations with a relatively high share of temps.

In a similar vein, Table 1 presents the share of temps for each work logic and the mean values of average perms' hourly wages (in logarithm). The statistics reported do not provide clear-cut evidence about the relationship of interest. On one side, we can observe that organizational work logic is characterized by a lower share of temps and the highest average hourly wage for perms, and on the other side, the association between the share of temps and perm's wage for interpersonal and technical work logics is not consistently negative.[20]

Clearly, these associations may be due to observed and unobserved factors related to occupation or the country examined, hiding a spurious correlation between temporary density

18   In the Appendix (Figure A1), we report the evolution of the share of temporary workers by country over time, differentiating young and adult workers. We can observe that the share of young temporary workers has increased over time in almost all the countries analysed, while this is true only partially for adult workers.

19   In Table A4, we report the log wage for temporary and for permanent workers by ISCO code as well as their difference.

20   In Table 1, we replicate the same analysis, distinguishing also between low- and high-EPL countries. However, the levels of average occupational (log) hourly wage in the two groups are not entirely comparable given the different scale of variation between the low- and high-EPL countries.

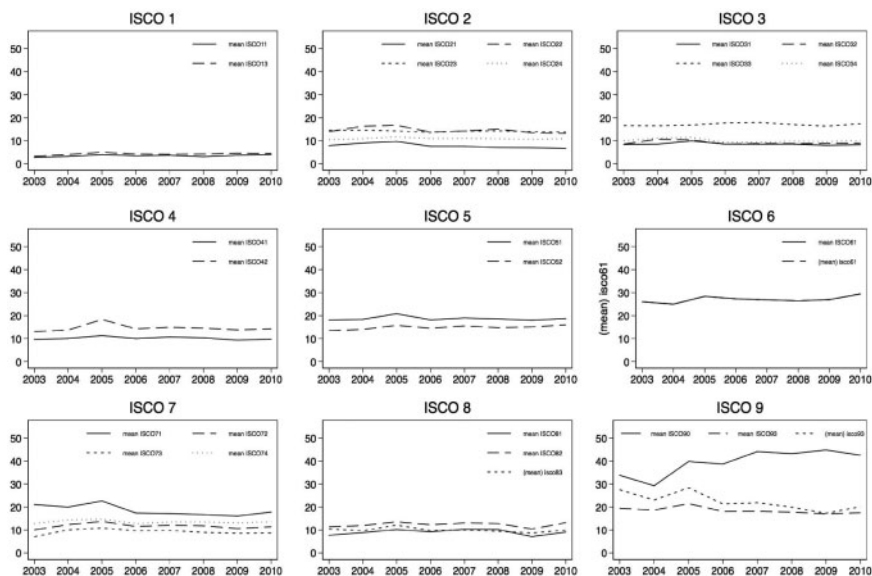**Figure 2** Share of temporary workers by ISCO and years (%).
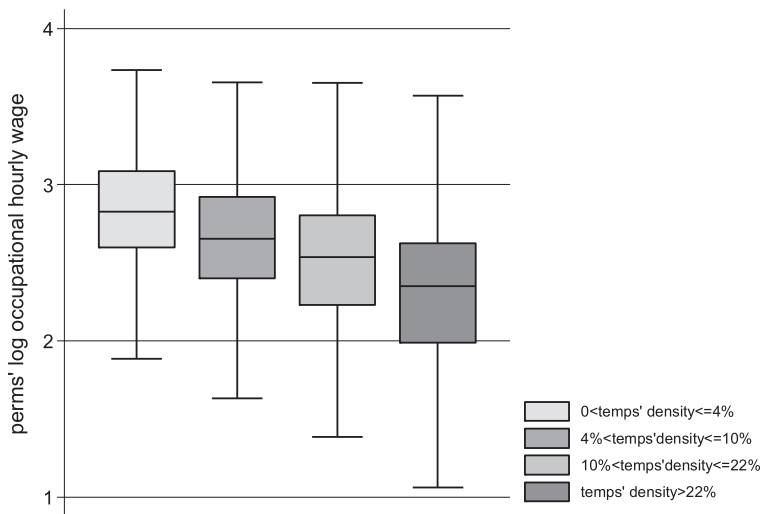*Source*: EU-LFS.

Figure 3 Box plot of the association between temporary jobs' concentration and perms' occupational wages by quartiles of the distribution.
Source: EU-LFS and EU-SILC.

Table 1 Share of temps and average perms' hourly wage in logarithm by work logics

	Interpersonal	Organizational	Technical
All countries			
Share of temps (%)	18.21	11.31	15.01
Perms' log hourly wage	2.60	2.67	2.46
High-EPL countries			
Share of temps (%)	19.66	13.26	16.11
Perms' log hourly wage	2.45	2.52	2.29
Low-EPL countries			
Share of temps(%)	16.89	9.56	13.88
Perms' log hourly wage	2.73	2.80	2.62

Source: EU-LFS and EU-SILC.

and perms' wages at the occupational level. In the next section, we present a statistical analysis that addresses these limitations that tackle the endogeneity issues related to the concentration of temporary jobs.

5. Empirical results

In this section, we first discuss the impact of temps' concentration on perms' occupational wages by presenting ordinary least squares (OLS) estimates of our standard specification. This analysis is accompanied by additional robustness checks to stress the sensitivity of our results. Secondly, we investigate whether the overall effect could hide remarkable heterogeneities. For this reason, we replicate the analysis by categorizing occupations in different work logics and considering different institutional settings. In our empirical model, we control for unobserved heterogeneity at the age-, occupation-, country- and time-level with the inclusion of age–occupation–year and country–year fixed effects. Standard errors are robust to the presence of heteroskedasticity.

5.1 The impact of temporary employment at the local labour market

We estimate the impact of the temps' concentration on insiders' wages considering country–occupation–age–year cells. Our estimation results reported in Table 2 are based on the assumption that all workers in a cell compete within the same local labour market.[21] OLS point estimates in columns (1–6) range between −0.174 and −0.121. The coefficients are statistically significant at 1% with robust standard errors and also after clustering standard errors at the age–occupation–year level.[22] In column (2), we show the results after controlling for socio-demographic composition factors within cells, represented by the share of male workers and the share of tertiary-educated workers.[23] In the OLS specification, an

21 In this model, the impact of temporary employment on perms' wages is assumed identical across all occupations.

22 The coefficients obtained when clustering standard errors are not reported but are available upon request.

23 There has been a rapid increase in the average educational attainment of the workforce within occupation over time as well as a rise in the returns to education. This process has favored a sort of

Table 2 The effect of temps' density on permanent's wages: OLS estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Share of temps	−0.174***	−0.122***	−0.119***	−0.120***	−0.122***	−0.121***
	(0.038)	(0.036)	(0.040)	(0.040)	(0.040)	(0.040)
Share of male workers		0.384***	0.379***	0.379***	0.373***	0.375***
		(0.030)	(0.032)	(0.032)	(0.032)	(0.032)
Share of college graduates		0.112***	0.113***	0.125***	0.117***	0.118***
		(0.024)	(0.026)	(0.027)	(0.027)	(0.027)
Share of immigrants			−0.042	−0.040	−0.047	−0.048
			(0.053)	(0.053)	(0.053)	(0.052)
Share of employed in firms with no more than 10 employees			−0.278***	−0.273***	−0.272***	−0.269***
			(0.037)	(0.037)	(0.037)	(0.037)
Average occupational tenure				0.053**	0.041*	0.043*
				(0.023)	(0.023)	(0.023)
Current unionization rate					0.090***	0.091***
					(0.026)	(0.026)
Constant	2.032	2.047	2.125	1.507	1.548	1.420
	(0.054)	(0.051)	(0.143)	(0.110)	(0.111)	(0.182)
Age–occupation–year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country–year FE	Yes	Yes	Yes	Yes	Yes	Yes
Laboir demand shift	No	No	No	No	No	Yes
R^2	0.94	0.94	0.94	0.94	0.94	0.94
N	3506	3506	3252	3252	3252	3252

Note: The dependent variable is the logarithm of the average occupational hourly wage for permanent workers. We exclude all age–occupation–country–year cells with less than 50 observations. All the regressions are weighted by the employment level of each cell and include a constant term, age–occupation–year and country–year fixed effects. Robust standard errors are reported in parenthesis.
Source: EU-LFS and EU-SILC.
*$P < 0.1$, **$P < 0.05$, ***$P < 0.01$.

increase of temps' density is generally associated with a negative impact on perms' wages. To improve the robustness of our results, we replicate our base model by including additional controls related to wage bargaining factors. In Column (3), we introduce the share of perms employed in small firms (less than 10 employees) as well as the fraction of migrant workers among perms. The estimated temps' density parameter for this model is −0.119, which is not different from the estimates of our basic specification while still being statistically significant at 1%. Similarly, the estimates of model in Column (4), which includes the

educational upgrading among all occupations in the last decades (Goos and Manning, 2007), forcing part of highly educated workers to accept lousier jobs for which they are overqualified (Chevalier, 2000; Hartog, 2000). Accordingly, to better disentangle the effects of the temporary contracts' concentration from the evolution of skill requirements, it is relevant to include this control in our specifications.

average job tenure of permanent workers by occupation, do not diverge from those reported in our basic specification. Overall, the temps' density within occupation–age cells across countries has a negative and significant impact on perms' average wages. To further stress the robustness of results, we add an additional potential confounder to our model: the unionization rate within country–occupation. Despite the inclusion of this variable in our model, the negative effect of temps' density on insiders' wage is still present and unaffected in magnitude (Table 2, Column 5). These results suggest that the spread of temporary jobs in the European labour markets may dampen the insiders' capability to extract rents, thus reducing their final wages. The magnitude of the impact is estimated evaluating the wage effects at the means level: the fraction of temporary employment, on average, reduces perms' wages of about 2% points (Column 5).

Finally, we consider a further potential confounding factor related to the presence of unobserved time-varying labour demand shocks. This variation may be correlated with the fluctuation in the spread of temporary jobs and may influence local labour market conditions. To account for this possibility, we use the industry-driven labour demand shift index as specified in Equation (2). Again, the coefficient associated with the share of temps is negative and statistically significant (Table 2, Column 6).

To further stress the sensitivity of our results, we perform three additional checks on our standard specification. Estimation results are reported in Table 3. First, we use an alternative cut-off point to define the age groups to test whether the results obtained are driven by our specific choice of age interval. The rationale is that alternative age thresholds could capture different trends in labour demand and could, therefore, exert an influence on the relation of interest. We replicate the analysis by comparing different age brackets for young workers, defined as those aged 15–30 years (Table 3, Columns 1 and 2). Our results confirm that the effect of the concentration of temporary jobs on perms' wages is negative and that the strength of the relationship is similar to the ones reported in our baseline models (see Table 2, Columns 5 and 6).

Secondly, we run a model specifying the temps' concentration in logarithms instead of levels to capture potential non-linearities in the relationship of interest. For instance, we expect the impact of the spread of temporary jobs to be more prominent in those occupational labour markets that are more exposed to non-standard work. The analysis of these non-linearities is an important contribution, as it allows us to identify the existence of a scale effect. The estimates, which can be interpreted as elasticities, show a negative and significant relationship between temps' concentration and perms' occupational wages, thus confirming the robustness of our results (Table 3, Columns 3 and 4).[24]

Finally, we extend our standard specification to capture heterogeneity across labour markets, allowing time-varying labour demand shocks to include age-specific, occupation-specific and country-specific components as well as age-by-occupation, age-by-country and occupation-by-country fixed effects. In this way, we control for the potential unobservables that influence the sorting of temps' in a labour market characterized by better employment performance (Moreno-Galbis and Tritah, 2016). The results in Columns (5) and (6) of

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24 We also replicate all standard analysis *h* by relaxing the restriction on cells' size larger than 50 to be included in the estimation sample. Performing alternative threshold as well as including all the age–occupation–country cells without any restriction on size leaves the results qualitatively unchanged. This further confirms the robustness of our results.

Table 3 Robustness check on age cohorts' definition: OLS estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Share of temps	−0.179***	−0.180***	–	–	−0.155***	−0.164***
	(0.047)	(0.047)			(0.059)	(0.059)
Log (share of temps)			−0.017**	−0.016**		
			(0.007)	(0.007)		
Constant	1.577	1.588	2.976	2.902	3.376	2.842
	(0.137)	(0.141)	(0.185)	(0.190)	(0.179)	(0.176)
Age–occupation–year FE	Yes	Yes	Yes	Yes	No	No
Country–year FE	Yes	Yes	Yes	Yes	Yes	Yes
Occupation–year FE	No	No	No	No	Yes	Yes
Age–year FE	No	No	No	No	Yes	Yes
Age–country FE	No	No	No	No	Yes	Yes
Age–occupation FE	No	No	No	No	Yes	Yes
Occupation–country FE	No	No	No	No	Yes	Yes
Labour demand shift	No	Yes	No	Yes	No	Yes
R^2	0.94	0.94	0.94	0.95	0.98	0.98
N	2624	2624	2852	2852	3252	3252

Note: The dependent variable is the logarithm of the average occupational hourly wage for permanent workers. We exclude all age–occupation–country cells across years with less than 50 observations. All the regressions are weighted by the employment level of each cell. Column (1) replicates the baseline model, by changing age threshold. More precisely, we distinguish workers aged 15–30 years with those aged 31–55 years. In column (2), we introduce the logarithm for the share of temps. Column (3) provides an alternative combination of fixed effects as controls, by including country–time, occupation–time, age–time, age–country, age–occupation and occupation–country fixed effects. Robust standard errors are reported in parenthesis.
Source: EU-LFS and EU-SILC.
*$P < 0.1$, **$P < 0.05$, ***$P < 0.01$.

Table (3) indicate that the negative impact of temps' share on perms' occupational wages is still present, even after including these additional fixed effects as control variables.

As expected, the inclusion of additional controls in the regression model leads to a decrease in the magnitude of our estimated coefficients. Nonetheless, the estimates remain significant. Our analyses suggest that differences in local labour market composition are a key element to reliably measure the impact of temps' incidence on insiders' average occupational wages. It is important to note that the results presented so far can only be interpreted as a controlled correlation: OLS estimates do not allow identification of causal relations if biases due to unobserved heterogeneity and endogeneity issues are not addressed. Despite this limitation, we are still confident about the robustness of our results. In fact, the negative sign of the relationship between temps' concentration and perms' occupational wages persists also in models that control for potential unobserved time-varying productivity shocks and for the presence of potential sources of bias.

5.2 The heterogeneity across occupational clusters
In the previous section, we have reported that the concentration of temporary jobs negatively impacts the occupational wages for permanent workers and that the magnitude and

sign of this impact are unaffected when using different age groups' definition. In this section, we test whether the overall effect may hide a substantial variation across different occupational labour markets.

Our estimation results reported in Table 4 clearly show that work logics represent a key channel to capture the occupational heterogeneity of the knock-on effect, albeit its distinct characteristics lead to variations in the estimated parameters.[25] The coefficients associated with interpersonal work logic are around -0.170. After controlling for the labour demand shifts, these results imply that the fraction of temps on average reduces permanent workers' wages of about 3 percentage points for interpersonal work logic, evaluated at the mean of temps' density that is around 19% (Table 4, Column 2). A key point is that this group is associated with occupations demanding a high degree of social and communicative competencies that are less specific and portable across jobs and organizations. It is also associated with tasks that are not integrated in a complex structure and that are independent from location and potential co-workers. The growing incidence of temporary employment within occupations characterized by interpersonal work logic may, therefore, increase the substitutability between perms and temps, reducing the average wages of permanent workers. This identifies a knock-on mechanism that is also likely to be present for high-skilled knowledge-intensive and creative service occupations (Marsden, 2011), both characterized by extended turnover and unstructured career paths.

We find a different scenario when we examine the relationship of interest in the case of technical work logic. In this case, the estimated parameters are negative but not statistically significant (Table 4, Columns 3 and 4). One possible interpretation is that the nature of these jobs favors long-term career paths in which tenure as well as investment in human capital play a key role.[26] The complexity of the production process characterizing this work logic requires larger organizational units where internal labour markets and structured career paths still prevail. At the same time, unions traditionally have stronger bargaining power in large organizational units, especially in manufacturing sectors, and, in this context, they are able to preserve rents for insiders through collective agreements at the firm level (Marx, 2011; Beissinger and Baudy, 2015).

In the case of organizational work logic, the coefficients of interest are negative, statistically significant, and their magnitude is larger compared to the other work logics (Table 4, Columns 5 and 6). Note that organizational work logic applies to occupations such as clerks with coordination tasks and workers of large bureaucratic organization (Oesch, 2006). On one hand, job experience may play a key role for workers nested in this work logic, thus favoring structured and internal careers. On the other hand, the spread of ICT technology and the diffusion of 'shared economy' can facilitate the introduction of common procedures in large bureaucratic organizations, thus promoting the substitutability between perms and temps. In such a context, it would be reasonable to find a negative effect on regular employees' wages associated with an increase in the incidence of temporary contracts.

In sum, the marginal effect of temps' concentration at the mean is larger for interpersonal work logic, around 3.1 percentage points, while it is not statistically different from zero for technical logic. As expected, the result lies in the middle for organizational logic, with an

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25 All equations are weighted by employment of each age–occupation–country cell.
26 It requires a certain degree of skill specificity, by the typical process of learning by doing of these positions.

Table 4 The effect of temps' density on perms' occupational wages across work logics

	(1)	(2)	(3)	(4)	(5)	(6)
	Interpersonal		Technical		Organizational	
Share of temps	−0.170**	−0.162**	−0.020	−0.019	−0.295**	−0.293**
	(0.080)	(0.080)	(0.050)	(0.050)	(0.115)	(0.115)
Share of male workers	0.094*	0.112**	0.498***	0.497***	0.662***	0.670***
	(0.054)	(0.054)	(0.055)	(0.055)	(0.064)	(0.064)
Share of college	0.159***	0.170***	0.186***	0.184***	0.286***	0.277
graduates	(0.044)	(0.044)	(0.045)	(0.044)	(0.060)	(0.060)
Share of migrants	−0.036	−0.030	−0.224***	−0.224***	−0.163	−0.123
	(0.093)	(0.093)	(0.074)	(0.074)	(0.288)	(0.288)
Share of employed in	−0.480***	−0.453***	−0.198***	−0.200***	−0.084	−0.101
firms with less	(0.057)	(0.059)	(0.058)	(0.059)	(0.091)	(0.093)
than 10 employees						
Average occupational	−0.012	−0.003	0.055	0.052	0.010	−0.002
tenure	(0.039)	(0.039)	(0.034)	(0.035)	(0.050)	(0.052)
Current unionization	−0.031	−0.030	0.203***	0.204***	0.061	0.074
rate	(0.050)	(0.049)	(0.033)	(0.032)	(0.096)	(0.097)
Constant	3.337	2.005	2.495	2.509	1.285	1.347
	(0.181)	(0.195)	(0.167)	(0.172)	(0.286)	(0.291)
Age–occupation–year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country–year FE	Yes	Yes	Yes	Yes	Yes	Yes
Labour demand shift	No	Yes	No	Yes	No	Yes
R^2	0.94	0.94	0.96	0.96	0.95	0.95
N	1156	1156	1390	1390	706	706

Note: Dependent variable is the logarithm of the average occupational hourly wage for permanent workers. We exclude all age–occupation–country cells across years that have less than 50 observations. All the regressions are weighted with the employment level of each cell and include a constant term, age–occupation–year and country–year fixed effects. Robust standard errors are reported in parenthesis.
Source: EU-LFS and EU-SILC.
*Significant at 10%, **significant at 5% and ***significant at 1%.

average effect of about 2.9 percentage points. These results are in line with the initial hypothesis that the knock-on effect of temporary jobs' concentration on perms' occupational wages is heterogeneous across work logics. Concisely, our estimates suggest that the job content might influence the degree of substitutability between perms and temps, which, in turn, contributes to the 'penalty' for insiders' wages.[27]

5.3. Differences across labour market institutions: the role of dual EPL

We have shown that mechanisms at the occupational level are able to explain, at least in part, the asymmetric ongoing trends in the incidence of non-standard employment across alternative skill groups and its impact on the wage structure. However, the institutional

27 In particular, the untechnical nature of the employment cluster appears to be a relevant element to explain this relation of interest.

context may play a relevant role as well in explaining the influence of temporary employment spread on perms' rents in the European labour market (Hipp *et al.*, 2015).

A relevant question is whether rigid labour regulations dampen the employment competition between perms and temps, thus reducing the negative impact of temporary employment on perms' wages. While the relationship between the level of employment protection and the incidence of temporary jobs has already been examined (Kahn, 2010), we focus on how institutional settings affect the relationship between temps' incidence and perms' wage in occupational labour markets. The expectation is that a rigid EPL system can offset at least part of the knock-on effect. As argued in the literature that relates EPL and wages (Van der Wiel, 2010), institutional settings can hinder competition between the two groups and preserve occupational wages of perms. Ideally, institutional contexts that are characterized by more stringent employment protection provisions on regular jobs might stimulate firms to hire a larger share of temps, therefore favoring the duality in the labour market (Hijzen et al. 2017).

After controlling for time-varying occupation and country-level differences by time-fixed effects, we expect EPL in each country to be a crucial (residual) determinant of perms wages' dynamics associated with temporary density.

To analyse the role of institutional settings, we re-estimate our standard equation using a country-level indicator that measures the rigidity of labour market regulation. The rationale is that strictness in the EPL index on regular employees captures the substitution possibilities for firms and it can be expected to weaken the degree of replaceability between perms and temps as the share of temporary contracts increases. In addition, constraints on the use of temporary jobs have shown relevant changes in the last decades. Therefore, the level of this index could be misleading as a proxy for labour regulation.[28] Most of the countries that eased EPL on temporary contracts are placed above the mean on EPL for regular work and have experienced two-tier reforms. Consistently, several theoretical predictions (Boeri and Garibaldi, 2007) suggest that the rigidity of EPL on regular works seems to influence the share of temporary employment more than the (rigidity of) EPL on fixed-term contracts.

Table 5 reports the coefficients for high-EPL countries (Columns 1 and 2) and for low-EPL countries (Columns 3 and 4). For each group, the first column shows our standard specification [see Equation (1)], while the second column includes the labour demand shift indicator driven by sectoral employment composition. We note that the impact of temps' share on perms' wages is negative and statistically significant only in countries with low levels of EPL for regular contracts, while in high-EPL countries, the effect is marginally positive. These results imply that low-EPL countries make easier for firms to recruit temps, fostering competition between perms and temps, which, in turn, negatively influences wages of regular workers. In contrast, rigid employment regulations can weaken the process of substitution and protect the capability of insiders to extract rents. In addition, labour market rigidities can interact with negative demand shocks, inducing an inefficient reallocation and larger use of temps as a buffer. This institutional context enhances the duality of labour

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28 Addressing the criticism of OECD indicators on EPL and the role of effectiveness in the enforcement of employment protection regulation, Venn (2009) argued that monitoring is more complicated in the case of EPL on temporary contracts, given that there exist relevant differences between de facto and measured protection across countries in the regulation of different forms of temporary contracts.

Table 5 The effect of temps' density on perms' occupational wages by institutional setting

	High-EPL countries		Low-EPL countries	
	(1)	(2)	(3)	(4)
Share of temps	0.135*	0.134*	−0.160***	−0.153***
	(0.072)	(0.072)	(0.057)	(0.058)
Share of male workers	0.210***	0.204***	0.413***	0.409***
	(0.050)	−51	(0.054)	(0.054)
Share of college graduates	0.438***	0.434***	0.013	0.013
	(0.046)	(0.046)	(0.036)	(0.036)
Share of immigrants	0.105	0.104	−0.281***	−0.283***
	(0.079)	(0.079)	(0.096)	(0.096)
Share of employed in firms with no more than 10 employees	−0.213***	−0.221***	−0.198***	−0.210***
	(0.073)	(0.074)	(0.054)	(0.055)
Average occupational tenure	0.075**	0.073**	0.132***	0.123***
	(0.035)	(0.035)	(0.038)	(0.039)
Current unionization rate	0.220***	0.216***	0.057	0.063*
	(0.037)	(0.037)	(0.038)	(0.038)
Constant	1.123	1.131	2.265	2.310
	(0.182)	(0.181)	(0.178)	(0.180)
Age–occupation–year FE	Yes	Yes	Yes	Yes
Country–year FE	Yes	Yes	Yes	Yes
Labour demand shift	No	Yes	No	Yes
R^2	0.96	0.96	0.94	0.94
N	1603	1603	1649	1649

Note: The dependent variable is the logarithm of the average occupational hourly wage for permanent workers. We exclude all age-occupation-country cells across years with less than 50 observations. All the regressions are weighted by the employment level of each cell and include a constant term, age-occupation-year and country-year fixed effects. Robust standard errors are reported inparenthesis.
Source: EU-LFS and EU-SILC.
*$P < 0.1$, **$P < 0.05$, ***$P < 0.01$.

markets, lessening the ability of temps to represent a concrete alternative to insiders. As a result, the knock-on mechanism in rigid labour markets seems absent. This claim confirms the theoretical intuition proposed by Koutentakis (2008): if perms' wages exceed temps' wages by an amount higher than the discounted firing costs, then firms facing a negative shock will react by favoring temporary employment. In other words, the spread of temps introduces *de facto* an upper limit on the wages that insiders are able to bargain. This specific limit is consistently lower in countries characterized by less rigid job protection regulation and firing costs on permanent contracts. Our empirical results are coherent with this theoretical prediction.[29]

29 In addition, we test the robustness of our results to an alternative index capturing the two-tier nature of the regulation in the labour market, as anticipated in Section 4.1. The results, available upon request, are qualitatively similar and confirm the same patterns as in the case of EPL index on regular work.

It is widely debated (Eichhorst and Marx, 2015) that labour market institutions do not equally affect the regulatory regime between occupations. For this reason, the potential presence of heterogeneous employment practices within a specific institutional setting needs additional considerations.[30] As our contribution to the debate, we analyse whether the role of EPL in shaping the knock-on effect varies across work logics. Our goal is to examine the interplay between labour market institutions, occupational heterogeneity and the knock-on effect. In detail, we estimate our empirical model for different sub-samples of country–occupation–age–year cells, where subsamples are given by all possible combinations of work logics (interpersonal, organizational and technical) and EPL regimes (low and high). Our expectation is that a rigid EPL system can offset, at least partially, the knock-on effect found for interpersonal and organizational work logics.

The model specification interacting occupational and institutional dimensions leads to smaller sample size for our analysis, reducing the estimates precision in terms of statistical significance. For this reason, we restrict our analyses to the sign of the coefficient of temps' incidence, which we use to characterize how the feature of national EPL regime shapes the knock-on effect for each occupational profile.[31]

Our estimation results reported in Table 6 indicate that rigid EPL settings strengthen, at least partially, the duality of labour market as well as the complementarity between perms and temps (Columns 1–3). In particular, regular workers in technical work logic seem to gain from a higher temps' concentration, with an estimated coefficient of 0.221. This is consistent with the special nature of work in the manufacturing sector, where workers tend to benefit more in terms of economic returns and employment conditions from the high value they add in the manufacturing process. The results for perms' wage in organizational and interpersonal work logics are not statistically significant and do not allow to identify any influence of temps' density. In contrast, in low-EPL countries, the institutional context may ease the replaceability between perms and temps only for interpersonal work logics (Columns 4–6). For this occupational group, in a context of less strict employment legislation, the incidence of temporary jobs seems to negatively affect the wages of insiders, with an estimated coefficient of −0.253.

In a nutshell, the institutional factor can complement the occupational dimension in identifying the level of substitutability between perms and temps and the subsequent knock-on effect. We are aware that small sample size does not help to identify empirical patterns that are statistically robust. Caution is warranted in the interpretation of these estimates. In addition, the implementation of adjusted correlation raises several challenges; for instance, the issue that both channels (i.e. work logics and EPL setting) may not only affect the temps' share in each local labour market, but also the evolution of occupational wages for insiders. In the next section, we focus on this particular issue and we provide robustness checks to strengthen the interpretation of our results.

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30   Eichhorst and Marx (2015) argued that 'Institutions may have legal coverage or they enforceability is low. Therefore, actual employment practices should be expected to depend on additional factors beyond the legal framework' (cit.)

31   This clearly pushes up standard errors; for this reason, the coefficient of interest is now not statistically significant. Since we are estimating an equation with age–occupation–year and country–year fixed effects, a large part of the data variation is absorbed by the fixed effects.

Table 6 The effect of temps' density on perms' occupational wages by work logics and institutions: OLS estimates

	High-EPL countries			Low-EPL countries		
	Interpersonal (1)	Organizational (2)	Technical (3)	Interpersonal (4)	Organizational (5)	Technical (6)
Share of temps	0.176	−0.226	0.221**	−0.253*	−0.053	−0.072
	(0.117)	(0.219)	(0.092)	(0.133)	(0.173)	(0.057)
Constant	1.716	0.459	0.733	3.107	2.464	2.180
	(0.259)	(0.462)	(0.291)	(0.325)	(0.454)	(0.280)
Age–occupation–year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country–year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.96	0.96	0.97	0.93	0.96	0.96
N	561	339	703	595	367	687

Note: The dependent variable is the logarithm of the average occupational hourly wage for permanent workers. We exclude all age–occupation–country cells across years with less than 50 observations. All the regressions are weighted by the employment level of each cell and include a constant term, age–occupation–year and country–year fixed effects. Robust standard errors are reported in parenthesis.
Source: EU-LFS and EU-SILC.
$*P < 0.1, **P < 0.05, ***P < 0.01$.

5.4 Robustness checks

Endogeneity and omitted variable biases could remain a concern when attempting to recover a causal interpretation of our estimates. For instance, changes in the temps' share could be correlated with changes in unobserved components of wages within the same labour market, which could occur if temps sorted into occupations where demand grew. In this scenario, skill requirements related to each form of contract would likely evolve over time across countries and occupations, affecting simultaneously both the demand for temporary workers and the rewards for insiders. Another potential source of endogeneity arises from the chance that perms' wages at time t could be influenced by past demand for temporary workers. In this case, we could expect lagged terms in the relationship between temps' spread and insiders' occupational rewards.

These heterogeneity and endogeneity issues are significant challenges towards the achievement identification of a causal relationship. Longitudinal fixed effects (FE) models represent the standard approach to tackle potential unobserved heterogeneity related to time-invariant characteristics at the age–occupation–country level. As mentioned in Section 4, the inclusion of these fixed effects would absorb almost all the variation in our variable of interest. For this reason, a fixed-effects approach is not a feasible strategy to improve the robustness of our estimates. In addition, the use of a fixed-effects model does not allow to control for potential endogeneity related to the simultaneity between changes in the temps' share in each local labour market and changes in perms' occupational wages. Instrumental variables strategies can address this simultaneity bias and the use of time lags can also provide useful instruments. We rely on multiple moments conditions in a time-lag structure of our covariates through the implementation of a dynamic GMM-SYS estimator (Arellano and Bond, 1991; Blundell and Bond, 1998). This approach is likely to reduce simultaneity

bias by exploiting statistical moments restrictions between lagged control variables and residual terms and by combining level and time-differenced information accounting for persistence in labour market conditions in a dynamic framework. The emphasis is on the relationship between the current and the past structure of the workforce, given that a high share of temps in the past could impact how the spread of temporary jobs evolves over time within the same local labour market. In other words, the dynamic GMM-SYS takes into account temporal persistence in the temps' share and at the same time correcting for endogeneity issues. As argued by Roodman (2009), the advantage of the GMM-SYS estimator is that the inclusion of time-invariant covariates does not asymptotically influence other estimated parameters under the assumption of orthogonality between instruments in the level equation and the time-invariant controls.

We follow the standard approach to estimate GMM-SYS (Giuliano *et al.*, 2017; Damiani *et al.*, 2018) and consider our baseline specification [Equation (1)], accounting for the unobserved heterogeneity at the age–occupation–country level and including the same control variables as described in Section 4. To stress the validity of our estimates, we rely on the test for over-identification proposed by Hansen (1982) that examines the validity of internal instruments generated by the estimation procedure. We also implement the Arellano and Bond (1991) test for autocorrelation, which assumes the absence of second-order autocorrelation in the first-differenced residuals and provides a reliability measure for the number of lags in the model.[32]

The implementation of a dynamic GMM-SYS allows accounting for persistence in occupational wages and, in turn, improves the identification of the coefficients of interest (Bond, 2002). This class of models represents an ideal strategy to correct potential endogeneity issues related to the presence of serially productivity shocks that could be correlated with control variables and to capture potential lags in the impact of temps' share on perms' occupational wages.

Estimation results for the dynamic GMM-SYS model are shown in Table (7): in Column (1), we include country and time fixed effect separately; in Column (2), we introduce standard country–time fixed effects; and in Column (3), we add the labour demand shift indicator. As in the OLS results, the coefficients associated to the temps' share show the expected negative sign and are statistically significant. The larger magnitude of the effect may be related to both the inclusion of unobserved heterogeneity at the age–occupation–country level and the instrumentation of the GMM approach. Tests for second-order autocorrelation in the residuals, reported in each column of Table (7), indicate no evidence of additional serial correlation. Finally, for all regressions, we cannot reject the null hypothesis of the valid instrument as indicated by Hansen tests.

In conclusion, the estimates from dynamic GMM-SYS emphasize the negative impact of temps' concentration on average perms' wages in each local labour market. These results seem to confirm the theoretical predictions that an increasing spread of temporary jobs could reduce perms' bargaining power and, in turn, their average occupational wages. The

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32 We start using a standard two lags approach as internal instruments. Obviously, we are aware that the time dimension of our data introduces some restrictions on the number of lags in the dynamic GMM-SYS. However, we test the sensitivity of our results, by implementing higher number of lags as instrument in the difference equation. The results (available on request) are substantially the same and the models do satisfy both specification and autocorrelation tests.

Table 7 The effect of temps' density on permanent's wages: dynamic GMM-SYS estimates

	(1)	(2)	(3)
Share of temps	−0.422*	−0.617**	−0.727**
	(0.235)	(0.289)	(0.313)
Share of male workers	0.117***	0.103***	0.101***
	(0.024)	(0.025)	(0.026)
Share of college graduates	0.670***	0.651***	0.648***
	(0.022)	(0.023)	(0.024)
Share of employed in firms with less	−0.052*	−0.126***	−0.133***
than 10 employees	(0.027)	(0.046)	(0.047)
Average occupational tenure	0.165***	0.121**	0.117**
	(0.039)	(0.048)	(0.048)
Current unionization rate	0.227	0.219***	0.221***
	(0.058)	(0.063)	(0.063)
Constant	1.617	1.874	1.905
	(0.202)	(0.252)	(0.261)
Country FE	Yes	No	No
Time FE	Yes	No	No
Country–year FE	No	Yes	Yes
Labour demand shift	No	No	Yes
Instruments for differences equation		*Share of temps with lags*	
Instruments for level equation		Δ (Share of temps)	
Hansen *J* statistics (*P* value)	7.87	9.51	9.29
	(0.547)	(0.391)	(0.411)
Arellano–Bond AR2 (*P* value)	0.73	1.37	1.36
	(0.466)	(0.171)	(0.175)
N	3252	3252	3252

Note: The dependent variable is the logarithm of the average occupational hourly wage for permanent workers. In all specifications, we apply the backward orthogonal deviations transformation to the instruments for the transformed equation. Instruments are replaced with their deviations from past means.
Source: EU-LFS and EU-SILC.
*$P < 0.1$, **$P < 0.05$, ***$P < 0.01$.

limited time span of our data does not allow to introduce a fully dynamic structure in the model and to disentangle short- and long-run effects of the variable of interest.

6. Discussion and conclusion

This article has sought to reframe the debate about the consequences of the process of flexibilization on the employment conditions for permanent workers by focusing on the interaction between the incidence of temporary workers and perms' wages at occupational level. So far, the dominant views investigating the effects of two-tier reforms have conceptualized labour market as a deep divide between insiders, stable and fully insured employees, and outsiders, the 'employment underclass' overrepresented in cheap labour and unskilled jobs (Rueda, 2006). Instead of relying on a strict dualism of the two segments, the analytical framework presented in this article emphasizes the interdependency between the marginal

and the core workers, which is expected to have an unanticipated impact on the position of regular employees in the bargaining process.[33] Recent studies have shown that when the two segments of the labour market are not analysed in isolation, then an increase of atypical workers is likely to put pressure on employment opportunities for permanent workers (Jacobi and Schaffner, 2008, Koutentakis, 2008, Marx, 2015). This, in turn, is likely to generate a substitution effect of perms with temps (Kahn 2012).

In this article, we challenge another assumption of dual and segmented labour market theories, namely that the impact of temporary employment commonly reinforces the economic rents of insiders. Moving from this perspective, our general approach questions the idea that temps are complementary to perms, which has traditionally been the reason why temporary employment has been expected to leave the economic rents of insiders untouched (Bentolila and Dolado, 1994). Under a process of legislative changes aimed at relaxing employment protection for the sole use of temporary contracts, firms have seen large increases in their incentives to replace permanent positions with less costly and more precarious temporary workers (Gebel and Giesecke, 2016). As predicted by the Radical Political Economy, greater external flexibility is likely to threat the bargaining power of permanent workers. Following this approach, our analysis investigates whether insiders experience a reduction in their rents, an effect that we call the knock-on effect. The economic implications of temporary employment on perms' conditions is expected to depend crucially on the degree of replaceability between perms and temps (Eichhorst et al., 2013; Cahuc et al., 2016). This, in turn, is likely to be strictly related to the occupational cluster in which workers are employed and to the institutional settings in which they are embedded. In particular, the configuration of the institutional setting related to the EPL (Drager and Marx, 2017), giving more or less incentives to firms to create temporary jobs, should alter the substitutability between the two segments.[34]

To study the knock-on effect and to capture this potential heterogeneity, we consider the incidence of temps' on perms' wages in occupation–age cells across European countries for the period 2003–2010. The empirical analysis lends support to our main hypothesis that a larger density of temporary jobs depresses the rewards of permanent employees, consistently reducing their average occupational wages. Thus, reforms that deregulate the sole use of temporary jobs, even if intended as normative changes concerning only a marginal fraction of the labour force, seem rather to entail an unanticipated impact on insiders' outcomes, leading to a decrease in their economic returns.

We take a more disaggregated view by unpacking the effect of temps' concentration for different employment clusters. Our results reveal that the knock-on effect is more evident in occupations characterized by non-technical work logic. This is consistent with the predictions of previous studies (Marx, 2011), according to which the employment substitutability of perms with temps would be most pronounced in work logics, such as interpersonal and organizational, exhibiting frequent deviations from traditional long-term employment relations (Collins, 2006). This leads to a higher level of interdependence in the bargaining

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33   As in the original formulation of the segmented/dual labour markets, where the two segments of workers are assumed to be totally segmented and without any sort of interaction (Piore, 1980).

34   A closely related study is Nunziata and Staffolani (2007) that investigates at the macroeconomic level how the elasticity in the share of temporary jobs to productivity shock is mediated by the different EPL settings.

process between firm, insiders and outsiders that ultimately may determine a downward pressure on perms' wage. This is not the case for technical work logics, where skills specificity seems to ensure a lower level of replaceability. This is enhanced by high transaction costs for employers in the substitution process between perms with marketable skills and temps.

We also examine the potential role of institutional settings for the knock-on effect. We show that perms' (in)ability to negotiate higher wages is strictly connected with labour turnover costs. When perms' firing costs are not prohibitively high for employers (e.g. in countries with low EPL), insiders and outsiders are more likely to compete (as in Autor's 2001 model of temporary help firms). Thus, institutional reforms asymmetrically deregulating temporary employment seem to preserve the wage of permanent workers only in rigid labour markets, thus enhancing dualism in the labour market: given that many countries have not altered firing costs for permanent workers, employers are not able to replace the primary segment of the labour market with the secondary one. We remark, however, that this conclusion should not be considered as general.

The various empirical pieces presented in our analysis add up to an argument concerning the long-term change of labour markets and its relationship with the distribution of income between labour and capital in Western economies. One of the key insights of this study is that, among other relevant factors, changes in the regulation of labour markets through liberalization of temporary employment can contribute to a deterioration of workers' wage conditions, resulting in a competition worse than a zero-sum game.[35] While temporary employment, according to the traditional I–O framework, is expected to generate rents for insiders, leaving outsiders (i.e. those employed on temporary basis) with lower wages and bad working conditions, our study suggests instead that the ultimate result is a potential negative-sum game, where both segments lose bargaining power, possibly in favor of capital remuneration as predicted by the Radical Political Economists. Notably, the consequent deterioration of labour share is in line with the recent decline reported in empirical studies for developed economies, meaning that labour receives less national income now than in the past (Guscina, 2006; Krämer, 2011). In this sense, our results are coherent with the argument that the growing incidence of temporary jobs acts as a potential determinant in the labour share decline (Damiani *et al.*, 2018).

This trend seems to characterize some occupational labour markets in particular, while others remain untouched. As each occupational group experiences a different degree of replaceability, the negative wage impact of temporary employment appears associated especially with jobs involving non-technical work logics.

In conclusion, the upshot of this study is that explaining changes in the European labour markets requires a better understanding of how occupational clusters react to the flexibilization process and to what extent institutional settings can strengthen this relationship. This article provides a first contribution in this direction, but there is still need for future research to further clarify the mechanisms behind the effect of temps' incidence on the evolution of wages and to address potential limitation related to data availability. Progress in defining better indexes of occupational classifications and comprehensive labour market institutions could provide a substantial contribution to enrich the debate among policymakers and scholars.

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35 Empirical studies focused on several aspects concerning the evolution in labour market perspectives, such as globalization, occupational change, technological progress and immigration.

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Appendix

Table A1 Work logics' classification by ISCO code

Work logics' classification by ISCO code
Interpersonal
22 Life science and health professionals
23 Teaching professionals
24 Other professionals
32 Life science and health associate professionals
33 Teaching associate professionals
51 Personal and protective service workers
52 Models, salesperson and demonstrators
91 Sales and service elementary occupations
Organizational
11 Legislators
12 Corporate managers
13 Managers of small enterprises
34 Other associate professionals
41 Office clerks
42 Customer service clerks
Technical
21 Physical, mathematical and engineering professionals
31 Physical, mathematical and engineering associate professionals
61 Skilled agricultural and fishery workers
71 Extraction and building trade work
72 Metal, machinery and related trade work
73 Precision, handcraft, craft printing and related trade worker
74 Other craft and related trade work
81 Stationary plant and related operators
82 Machine operators and assemblers
83 Drive and mobile plant operators
92 Agricultural, fishery and related labourers
93 Labourers in mining, construction, manufacturing and transport

Source: EU-LFS, based on Oesch (2006) classification.

Table A2 Data availability and sample composition

Country	Period	Total number of observations in age–occupation–year cells
Austria	2003–2010	384
Belgium	2003–2011	384
Finland	2003–2009	326
France	2003–2010	383
Germany	2004–2010	336
Greece	2003–2010	376
Ireland	2003–2009	336
Italy	2003–2009	334
The Netherlands	2004–2010	333
Norway	2004–2010	384
Portugal	2004–2010	368
Spain	2004–2010	383
The UK	2004–2006; 2008–2010	287

Source: EU-LFS and EU-SILC.

Table A3 Overview and description of ISCO occupation codes available in EU-LFS and EU-SILC

ISCO code	Work logics	Description
11	Organizational	Legislators and senior officials
12	Organizational	Corporate managers
13	Organizational	Managers of small enterprises
21	Technical	Physical, mathematical and engineering professionals
22	Interpersonal	Life science and health professionals
23	Interpersonal	Teaching professionals
24	Interpersonal	Other professionals
31	Technical	Physical, mathematical and engineering associate professionals
32	Interpersonal	Life science and health associate professionals
33	Interpersonal	Teaching associate professionals
34	Organizational	Other associate professionals
41	Organizational	Office clerks
42	Organizational	Customer service clerks
51	Interpersonal	Personal and protective service workers
52	Interpersonal	Models, salesperson and demonstrators
61	Technical	Skilled agricultural and fishery workers
71	Technical	Extraction and building trade work
72	Technical	Metal, machinery and related trade work
73	Technical	Precision, handcraft, craft printing and related trade worker
74	Technical	Other craft and related trade worker
81	Technical	Stationary plant and related operators
82	Technical	Machine operators and assemblers
83	Technical	Drive and mobile plant operators
91	Interpersonal	Sales and service elementary occupations
92	Technical	Agricultural, fishery and related labourers
93	Technical	Labourers in mining, construction, manufacturing and transport

Source: EU-LFS and EU-SILC.

Table A4 Temps' and perms' log wage and their difference by ISCO occupation codes

| ISCO code	Work logics	Temps' log wage	Perms' log wage	Difference
11	Organizational	2.94	3.18	0.24
13	Organizational	2.43	2.80	0.37
21	Technical	2.64	3.01	0.37
22	Interpersonal	2.82	3.12	0.30
23	Interpersonal	2.87	3.06	0.19
24	Interpersonal	2.67	2.97	0.30
31	Technical	2.49	2.82	0.33
32	Interpersonal	2.52	2.71	0.19
33	Interpersonal	2.58	2.75	0.17
34	Organizational	2.51	2.74	0.23
41	Organizational	2.33	2.58	0.25
42	Organizational	2.29	2.52	0.23
51	Interpersonal	2.22	2.42	0.20
52	Interpersonal	2.17	2.29	0.12
61	Technical	1.99	2.25	0.26
71	Technical	2.18	2.42	0.24
72	Technical	2.21	2.55	0.34
73	Technical	2.10	2.53	0.43
74	Technical	2.02	2.32	0.30
81	Technical	2.25	2.62	0.37
82	Technical	2.17	2.45	0.28
83	Technical	2.31	2.46	0.15
91	Interpersonal	2.17	2.27	0.10
93	Technical	2.19	2.35	0.16

Source: EU-SILC.
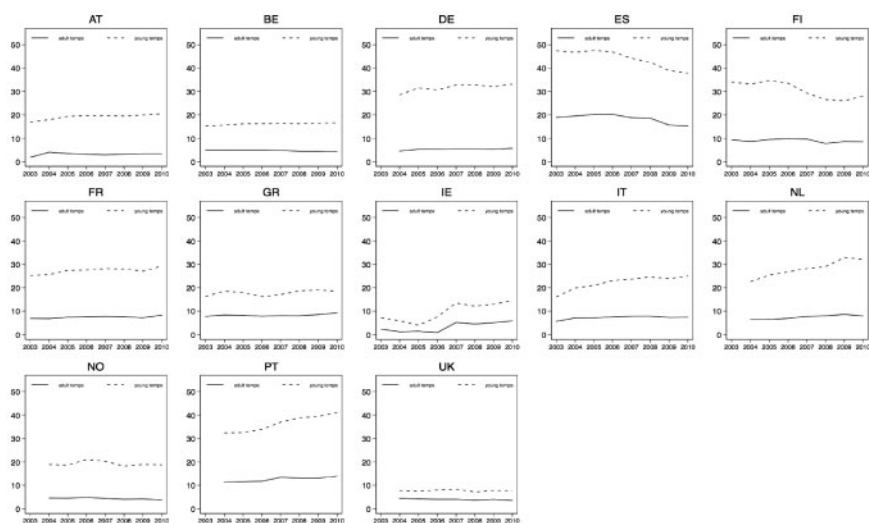
Figure A1 Evolution of the share of temporary workers by country, adult temps (aged 36–55 years) and young temps (aged 15–35 years).