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ABSTRACT

Do Firms Demand Temporary Workers When They Face Workload Fluctuation? Cross-Country Firm-Level Evidence on the Conditioning Effect of Employment Protection[1]

Although the negative economic effects of temporary employment are widely discussed, cross-country research on firms' demand for temporary employment is rare. National studies indicate that workload fluctuations are one major motive for firms to employ temporary workers. By studying a novel data set of 18,500 firms from 20 countries, we show that workload fluctuations increase the probability of hiring temporary workers by eight percentage points in rigid labour markets, but no such effect is observed in flexible labour markets. This conditioning effect of employment protection is in line with a recently developed search-and-matching model. Our results are robust to subgroups, subsamples and alternative estimation strategies.

JEL Classification: J23, J28, J21, J63, J68, J82

Keywords: temporary employment, employment protection, labour demand, firm-level data

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Introduction

Temporary employment accounts for a considerable part of the EU27 workforce – around 14 per cent, 60 per cent of which is involuntary (Eurostat, 2012). Workers on temporary contracts are one of the most vulnerable groups to economic downturns (Boeri, 2011: 1207). This might lead them to considerable welfare losses, as unemployment can persistently reduce subjective well-being (Lucas, 2007; Frey and Stutzer, 2002). A frequent claim is that temporary employment also has a direct negative impact on subjective well-being, as temporary workers have fewer training opportunities, lower wages and higher job insecurity compared to permanent workers (e.g. De Cuyper et al., 2008; Booth et al., 2002). Gaining deeper insights into the mechanisms that generate temporary employment is relevant for policy making. This paper contributes by studying firms' demand for temporary workers, especially in the presence of workload fluctuations.

Research shows that it is not only workload fluctuation but also the institutional context, such as employment protection legislation, that matters for the spread of temporary employment and for firms' hiring policies in general (e.g. Boeri and Garibaldi, 2007; Cahuc and Postel-Vinay, 2002; Houseman, 2001; Bentolila and Saint-Paul, 1992). Building upon this literature, this paper asks whether the effect of workload fluctuations on firms' decision to employ temporary workers differs with respect to employment protection legislation for permanent workers. Based on a recent search-and-matching model by Cahuc et al. (2012), we expect firms to be more likely to employ temporary workers when exposed to productivity shocks. However, the extent of this effect depends on sufficiently high employment protection for permanent workers. To the best of our knowledge, we are the first study to investigate this relation empirically.

Previous studies close to the present paper include: Nunziata and Staffolani (2007), who show that elasticities in the share of temporary workers to macroeconomic shocks are less strong when employment protection for permanent workers is high; Bentolila and Saint-Paul (1992), who find for Spanish firms that employment elasticities to firm shocks are higher for temporary workers, and Cahuc et al. (2012). Compared to the first study, which makes use of macro-data, we add the micro-perspective by combining institutional data with firm-level data. Thus, we are able to account for composition effects. Compared to the literature on labour demand and employment protection which employs firm-level data, we add a cross-country perspective. Thereby, we construct a unique data set and can assess the effect of country-specific institutions on firms' hiring decisions. Finally, we are the first to test empirically the theoretical argument developed by Cahuc et al. (2012).

Our empirical strategy uses novel data from the 2009 European Company Survey on 18,500 firms clustered in 20 European countries in combination with macro data. We chose a cross-country design to obtain sufficient variation in employment protection legislation (Boeri and Jimeno, 2005). We estimate a binary choice model on the pooled data, with clustered standard errors and country dummies in order to account for autocorrelation due to clustering and unobserved heterogeneity at the country level. Our main result is that firms facing workload fluctuations in flexible regimes are not more likely to employ temporary workers compared to firms without fluctuations. However, in countries with a sufficient high level of employment protection legislation, firms are significantly 8 percentage points more likely to employ temporary workers (70 per cent versus 78 per cent). This is also true for the subgroups of temporary agency and fixed-term contract workers. Our results are robust to different estimation strategies, subsamples and different specifications.

We begin with our theoretical argument based on labour demand and search-and-matching models. From this, we derive our reduced-form empirical labour demand model and discuss the empirical strategy. After describing data sources and central concepts, we present our results and discuss endogeneity, as well as robustness issues.

Theory

Most European labour markets are characterized by heterogeneous employment protection for permanent and temporary workers. These are typically modelled in either dynamic labour demand models under uncertainty (e.g. Boeri and Garibaldi, 2007; Nunziata and Staffolani, 2007; Hamermesh, 1996; Bentolila and Saint-Paul 1992)[2] or in search-and-matching models (e.g. Bentolila et al., 2010; Blanchard and Landier, 2002; Cahuc and Postel-Vinay, 2002). However, most theoretical models analyse the impact of two-tier labour market reforms on economic outcomes such as average employment or unemployment levels (e.g. Boeri and Garibaldi, 2007). Only few models focus on the impact of employment protection on the distribution of permanent and temporary jobs. The study by Nunziata and Staffolani (2007) is an important exception. They predict with their dynamic labour demand model that an increase or decrease of temporary employment depends on the state of the economy and on the constraints in employing temporary workers.

[2] Labour demand models with heterogeneous workers are often based on the classical labour demand model and firing costs with one type of worker by Bentolila and Bertola (1990).

As Berton and Garibaldi (2006) note, the literature on two-tier labour market reforms in rigid labour markets often assumes (or implies) that after reforms at the margin, firms rely on temporary employment exclusively when filling vacancies. However, it is more realistic to assume a continuing coexistence of permanent and temporary contracts. For employers, the choice between contract types entails a trade-off: permanent contracts may exhibit a higher job-filling rate, but temporary contracts provide flexibility in case of productivity shocks (Berton and Garibaldi, 2006). Assuming that employers continue to hire permanently[3] points to the important question of what determines employers' choice between permanent and temporary employment contracts.

Cahuc et al (2012: 2) explain this choice with the "heterogeneity of expected duration of jobs". Other job search-and-matching models include productivity shocks for jobs but not heterogeneity in shock arrival rates. Intuitively, the choice of employment contracts is most likely based on expectations about the durability of production opportunities. Permanent contracts are associated with high dismissal costs, while temporary contracts can be terminated – after a pre-determined duration – at no cost. If dismissal protection imposes sufficiently high turnover costs on permanent workers and employers expect the task a worker performs to be limited in time, a temporary contract is chosen. When employment protection is low for permanent workers, permanent contracts are always chosen – even for jobs with an expected low duration. Hence, dismissal costs and the probability of a worker becoming unproductive (the job's shock arrival rate) interact in determining the choice of employment contracts.

In contrast to conventional labour demand models, Cahuc et al. (2012) explicitly model the choice between contract types by including the durability of jobs in the argument. This is an important extension of labour demand models, which we apply in this paper to firm behaviour.[4]

The theoretical models on the use of temporary work point to the paramount importance of firm and job characteristics *in interaction with* institutional features determining firing costs. Taking the view of the firm (and leaving workers' decisions aside),[5] we can formulate the following hypothesis for the choice between temporary and permanent contracts: Firms' propensity to

[3] Previous contributions do not imply that the stock of permanent contracts is completely crowded-out over time because they allow for the conversion of temporary into permanent contracts (e.g. Nunziata and Staffolani, 2007; Blanchard and Landier, 2002).

[4] Theoretically, the shock arrival rate is specific to jobs not to firms. This makes sense, since temporary and permanent work coexist in many firms. However, as we argue below, characteristics determining choice of employment contract are easier to observe at the firm level than on the level of specific jobs. Estimating job-specific shock arrival rates would require comparable linked employer–employee data.

[5] As most temporary contracts are involuntary, we expect firms' to be the more powerful actor in the bargaining process, and hence, focus on modelling their behaviour. In the EU27, 60.4 per cent of temporary workers preferred a permanent job over a temporary job in 2009 (Eurostat, 2012).

offer temporary contracts increases with the probability that jobs within the firm become unproductive with a higher shock arrival rate *conditional upon* sufficiently high adjustment costs for permanent workers.

Empirical research analysing this interaction at the firm level does not exist. But empirical studies already show that firing costs are important for the impact of shocks on the workforce. First, firm-level studies on the use of temporary work are typically limited to individual countries.[6] They show that workload fluctuations are important to determine firms' choice whether to (at least partially) hire on temporary contracts (e.g. Boockmann and Hagen, 2001; Houseman, 2001) or important to determine the size of the workforce (Bentolila and Saint-Paul, 1992). This is in line with Cahuc et al. (2012), as workers become unproductive with production opportunities of different lengths. Second, in the vein of Cahuc et al. (2012), studies already show that firing costs are quite relevant for the effect of fluctuations or cyclical elements on employment. For instance, Bentolila and Saint-Paul (1992) show for 1980s Spain that firm-level cyclical elasticity to sales increased with the availability of temporary contracts. At the aggregated level, Nunziata and Staffolani (2007) find that economies decrease the share of temporary workers on overall workers and that this cyclical response is even stronger when temporary agency workers are well protected. However, cyclical elasticity of temporary employment does not change with protection for permanent workers at the aggregated level. While Bentolila and Saint-Paul (1992) and Nunziata and Staffolani (2007) are strongly related to our research question, they do not focus on the impact of employment protection for permanent workers on the shock elasticity of temporary employment: the former studies the impact of the use of temporary employment on shock elasticities of employment in Spanish firms; the latter studies the impact of macroeconomic shocks in interaction with firing costs on the aggregated share of temporary employment. To the best of our knowledge, we are the first to analyse the above-elaborated theoretical argument.

In order to assess our theoretical hypotheses, we would ideally require the combination of institutional variables (firing costs) and firm-level variables (firm-specific shock arrival rates). This has two implications for the empirical research on the choice between employment contracts. First, to obtain variation in dismissal costs, which are typically determined at the country level, cross-country or within-country variation can be exploited (Boeri and Jimeno, 2005).However, within-country variance is relatively small: employment protection legislation is historically grown and, specifically for permanent workers, it has been quite stable in

[6] An exception is Salvatori (2009).

Europe; and variable enforcement of employment protection for permanent workers across firm size applies, for instance, to Germany and Italy, but it is also limited in its variation. Second, aggregated (national) data disguises heterogeneity in shock arrival rates across sectors and firms. Hence, to account empirically for both institutional differences and heterogeneity in expected job duration, one would ideally employ comparative firm-level data. We meet these requirements for European firms by employing a relatively new data set.

Empirical specification

Our hypothesis is that firms' propensity to offer temporary contracts is high when the job is expected to be of a relatively short duration and employment protection for permanent workers is high. To link our theoretical argument to a reduced-from empirical labour demand model, we make simplifying arguments which are partly driven by pragmatic reasons and data availability (see below for details on the used data source and variable measurement). The propensity to offer temporary contracts is ideally measured with flow data – the composition of hiring – and the probability of a job becoming unproductive refers to job-specific characteristics – aspects of jobs which can differ within firms. Ideally, we would have linked employer–employee data, but such indicators are difficult to obtain in a comparative framework. Hence, we use the composition of the stock of employees by contract type and workload fluctuations for the shock arrival rate (see below for measurements). Finally, adjustment costs are partly determined by employment protection legislation for permanent workers at the national level. This allows us to rephrase our hypothesis as follows: firms' likelihood of having temporary contracts in their workforce is higher (ceteris paribus) if the firm is exposed to workload fluctuations. This is only the case if the costs for dismissal of permanent contracts (as stipulated by law or collective agreement) are sufficiently high.

In our baseline specification, we assume that the profit of firm *i* in country *j* employing at least one temporary worker can be characterized by a latent variable y_{ij}^*:

$$y_{ij}^* = \beta_0 + \beta_1 EPL_j * WF_{ij} + \beta_2 WF_{ij} + \boldsymbol{\beta}_3 \mathbf{C} + R_{ij} + U_j$$

with

$y_{ij} = 1$ if $y_{ij}^* > c$,

$y_{ij} = 0$ otherwise

With employment protection legislation for permanent workers EPL_j, short-term workload fluctuation WF_{ij}, a vector of controls **C**, and the error term components R_{ij} and U_j. There is at least one temporary worker in the workforce of a firm ($y_{ij} = 1$), when the profit of employing the worker exceeds the threshold c. We also replace the dependent variable by the two subgroups of fixed-term contract workers and temporary agency workers, to which our theoretical argument similarly applies.[7]

The main variable of interest is the effect of WF_{ij} in different institutional contexts on the propensity that a firm employs temporary workers. For this, we require variation on the institutional level. As already mentioned above, there are two options: within and between country variance (Boeri and Jimeno, 2005). We identify by the variation of EPL across countries rather than within countries. First, we believe that variation across countries has been much stronger than variation within countries in the last 20 years. Second, we are interested in whether the theoretical argument holds for Europe and not only for one specific country.

Concerning our estimation strategy for our baseline model, we assume that the firm-specific error component R_{ij} is i.i.d. and logistic distributed. However, due to firms clustered within countries, U_j causes autocorrelation. Furthermore, there might be unobservables on the country level which are correlated with other covariates, hence introducing biased estimates. We tackle these issues by including country dummies and clustering standard errors.[8] For robustness checks, we estimate models which only correct for the clustering by employing clustered standard errors (without country dummies) and by employing a random effect model – both models ignore unobservables at the country level. The results remain robust with reference to WF_{ij} and EPL_j*WF_{ij}. Furthermore, we estimate different specifications, subsample models and individual country models. Overall the results are quite robust, which is specifically true for short-term fluctuations.

[7] We extended the analysis by employing the percentage of fixed-term contract workers. Based on the theoretical argument, we expect that the share is higher in firms with annual fluctuation given sufficiently high EPL for perms. We estimated a two-component model taking account for corner solutions and different processes (Cameron and Trivedi, 2009: 538ff).

[8] As clustered data are a general case of short-panel data which have within individual clustering (Cameron and Trivedi, 2009: 307ff), one can employ panel methods – random effects and fixed effects – to deal with the clustering. One implication of clustering is that errors are correlated across firms in countries. If this is the only problem, one can easily employ cluster-robust standard errors (Cameron and Trivedi, 2009: 306). The random effects model is also referred to as a type of "multilevel model" (Rabe-Hesketh and Skrondal, 2008; Snijders and Bosker, 1999).

The vector **C** includes several controls such as country dummies, firm-size and industry dummies. For the firm level, various strands of literature argue that workplace representation may have an impact on the use of temporary jobs (e.g. Salvatori, 2009). However, empirical results are ambiguous, and it is theoretically unclear in which direction the effect of workplace representation goes (Böheim and Zweimüller, 2009; Bentolila and Dolado, 1994). Since works councils are not at the core of our argument, we refrain from making an explicit theoretical claim, but include a control dummy variable measuring whether there is workplace representation in the company. Furthermore, in empirical labour demand models, labour costs, costs of intermediate goods, capital stocks and performance indicators are usually controlled for (e.g. Bentolila and Saint-Paul, 1992). We include the change in the number of employees as a subjective performance indicator, which was found to be a valid indicator for the development of added value (Gensicke et al., 2009: 30). For the others, we control indirectly by firm size and economic sector. Further controls are the rate of female and high-skilled employees in the workforce, since these groups differ in their likelihood of holding temporary contracts (Kahn, 2007).

Depending on whether we included country dummies or not, we also include control variables at the institutional level. It is argued in the literature that wage rigidity exacerbates the effect of employment protection legislation, since higher turnover costs cannot be compensated for by lower wage costs (Lazear, 1990). One major source of wage rigidity is collective bargaining. Therefore, we include the proportion of eligible workers covered by collective agreements (collective bargaining coverage rate) in our model. The data is obtained from Hayter and Stoevska (2011) and Eurofound (2007). Finally, we control for the unemployment rate in the first quarter of 2009 (as provided by Eurostat) to control for business cycle effects on the use of temporary contracts (e.g. Bentolila and Saint-Paul, 1992).

Stylized facts and data sources

We utilize establishment-level data with more than 18,500 establishments in 20 European countries and merge them with the Organisation for Economic Co-operation and Development (OECD) employment protection indicator, which is a measure on the country level. The European Company Survey (Eurofound 2010b) provides our data on the establishment level. The ECS started in 2005 and is repeated every four years by the European Foundation for the Improvement of Living and Working Conditions (Eurofound). Our analysis mainly focuses on the most recent wave, with data collected in spring 2009. The sample is representative for

establishments with more than ten employees and consists of around 27,000 firms from 30 European countries.[9] Ten of these had to be excluded because of missing data, either on the micro-level or the institutional level.[10] Hence, we restrict our sample to 20 European countries, which yields around 18,500 observations.[11]

To the best of our knowledge, no other data source on the establishment level exists which is comparable to the European Company Survey (ECS) in its broad coverage of European establishments in combination with the details on contract types. For instance, the company database AMADEUS covers a broad sample and provides information on the stock of the overall workforce, but variables on the composition of the workforce are not available. A second advantage is that the unit of observations is establishments. This provides us with a much disaggregated perspective. A limitation of the ECS might be that the sampling procedure excludes agriculture and forestry and these are sectors with major seasonal fluctuation, which is one of our main variables. However, we do not believe that this bias our results, but we do lose important observations because of it.

The ECS asks whether temporary contracts were used by a company between spring 2008 and spring 2009 and it includes a more precise variable on the proportion of employees holding a fixed-term contract in the respective company. However, as the data was collected in spring 2009 – a time in which most countries experienced a severe economic crisis – we do not use this variable in the main analysis. First of all, our main explanatory variable is also binary, and therefore less suitable for predicting precise shares of temporary contracts in a company. Second, the precise share of fixed-term contracts is arguably more sensitive to asymmetric adjustments of staff levels in the crisis than the binary variable. Third, the wording of the question which our binary dependent variable is derived from refers to the entire previous year rather than only the time of the interview. Therefore, it should be less affected by the crisis (Eurofound, 2010a: 2). Hence, we focus on the binary choice variable.[12]

[9] The survey covers all relevant sectors, excluding agriculture, forestry, private household with employed persons (NACE Rev. 1.1 P) and extra-territorial organisations and bodies (NACE Q). The latter two sectors are both of negligible size (Eurofound, 2010a: 3).

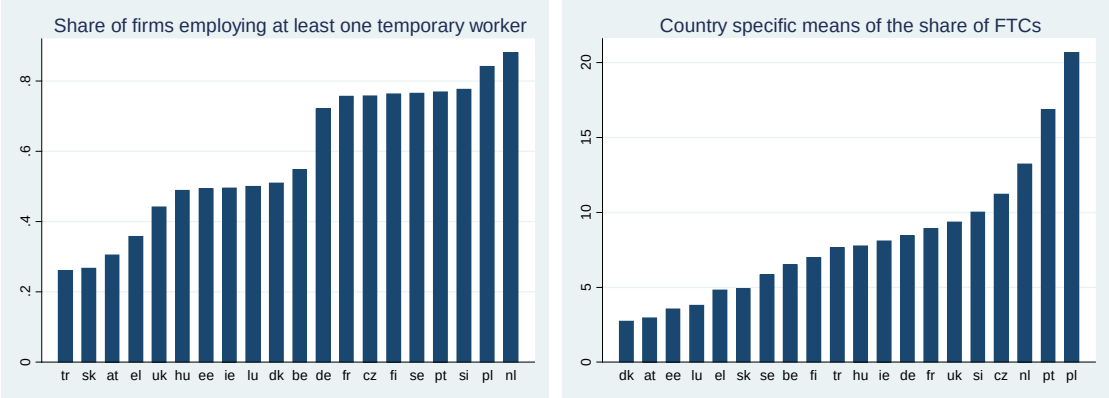
[10] Bulgaria, Croatia, Cyprus, Italy, Latvia, Lithuania, Malta, Romania, Spain and the Former Yugoslav Republic of Macedonia

[11] Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Sweden, Turkey and the United Kingdom.

[12] However, the restriction to a binary dependent variable is clearly a limitation and therefore we also analysed the share of temporary contracts as a robustness check.

The descriptives for both variables are shown in Figure 1.[13] In our sample, around 68 per cent of the firms use temporary contracts, but the value differs strongly across countries. It varies from 26 per cent in Turkey to almost 90 per cent in the Netherlands. The average share of fixed-term workers (including firms without any such contracts) is 9 per cent –ranging from 3 per cent in Denmark to 21 per cent in Poland.

Figure 1: To what extent do European firms employ temporary and fixed-term contract workers?

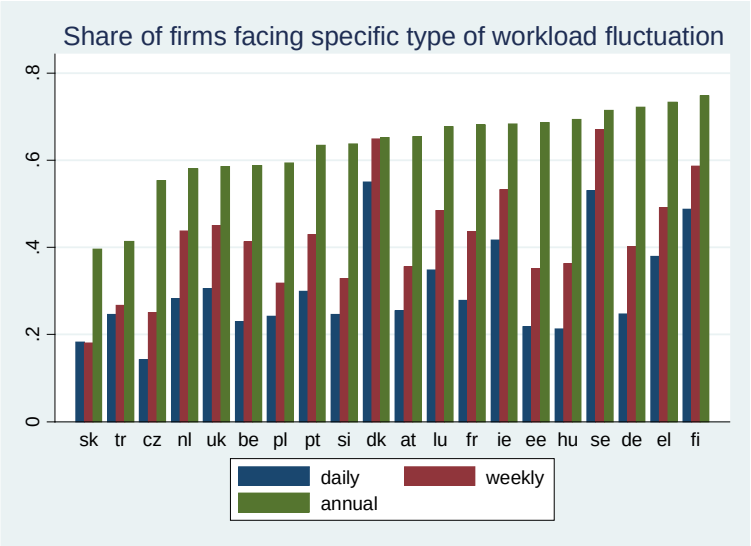


Source: ECS 2009 (Eurofound, 2010a).

According to our theoretical argument, companies expecting to face fluctuations in the productivity of jobs should anticipate that some workers will become unproductive and therefore hire (partly) on temporary contracts. The ECS contains an item which can be directly related to the duration of existing jobs in the firm. The survey question asks whether the firm normally has to "cope with major variations of the workload" within a day, within a week or within a year. Productivity shocks in labour demand models are usually related to objective measures, for instance to sales variation (e.g. Bentolila and Saint-Paul, 1992). However, the question in the ECS is almost perfectly related to our theoretical concept, as we are interested in expected variations. We include all three variables as dummies in the model. However, we only expect a positive effect of fluctuation within a year, as fluctuation within days and weeks should be dealt with by hiring on part-time rather than on temporary contracts. Figure 2 shows that workload variations within a year are the dominant form of fluctuations in most countries. In our sample, 63 per cent have to deal with such fluctuations, while the values range from 40 per cent in Slovakia to 75 per cent in Finland. Yearly fluctuations are specifically strong in sectors which have to deal with seasonal variations, such as construction, accommodation and food service activities, transportation and storages. They are less relevant in sectors with a constant workload, such as administrative and support service activities.

[13] Summary statistics of all the variables are presented in Tables 2 and 3 of the Appendix.

Figure 2: Which expected workload fluctuations dominate in Europe?

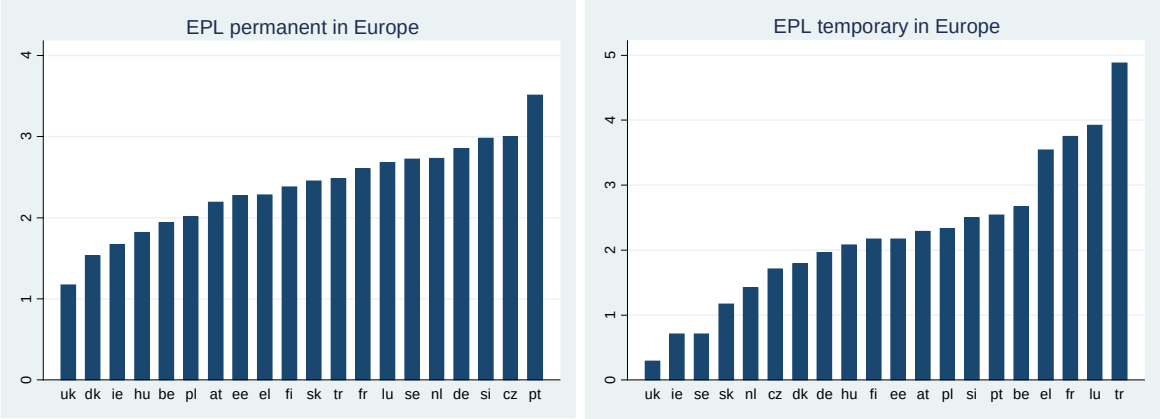


Source: ECS 2009 (Eurofound, 2010a).

The effect of fluctuation on the likelihood of employing temporary contracts should be conditional upon sufficiently high firing costs for permanent workers. Hence, we need data on labour market institutions. For this purpose, we employ the well-established OECD indicator on the strictness of employment protection legislation (Venn, 2009).[14] The indicator has various subcomponents measuring how strictly different contract types are regulated. We include subcomponents for temporary employment in our model, as they have been shown to interact with regulation of permanent contracts (Nunziata and Staffolani, 2007). However, we expect the effect of institutions to be dominated by regulation of permanent contracts. Even if temporary contracts are, by comparison, strictly regulated, they are usually still more flexible than permanent contracts. Hence, irrespective of their level of regulation, temporary contracts should be attractive if firing costs for permanent workers are high. The OECD indicator is shown in Figure 3 for EPL for temporary workers and for permanent workers across Europe. Typically, southern European countries such as Portugal is relatively strong regulated while Ireland and United Kingdom are quite flexible.

[14] Bentolila et al. (2010) recently criticized the OECD indicator for Spain for being too high for regulations on temporary contracts and too lax for regulations on permanent contracts. However, to the best of our knowledge, this is the indicator which is best known and most often employed for comparative studies.

Figure 3: How strong are European permanent workers and temporary workers protected?



Source: EPL 2008 (OECD, 2012).

Empirical results

Workload fluctuation and temporary contracts

Theoretically, we expect firms anticipating fluctuations in workload to be more likely to hire temporary workers than firms without such expectations. This effect should, however, be conditional upon sufficiently high EPL (employment protection legislation) for permanent workers. The results presented in Table 1 largely confirm this hypothesis for our binary choice model. Model (1), which accounts for unobserved country fixed effects by including country dummies, shows that the odds of employing at least one temporary worker is 33 per cent higher for firms with annual fluctuations when EPL for permanent workers is held constant at the mean. This effect is highly significant. This finding provides European support for fluctuations being a main motive for American firms to employ temporary workers (Houseman, 2001), for Boockman and Hagen (2001) as well as for Bentolila and Saint-Paul (1992) – in the sense that workload fluctuations (sales) are relevant for hiring decisions (total employment as well as rigid employment). In line with our argument, the odds ratio is even higher when EPL increases by one unit (1.52).[15] As expected, other types of fluctuation have no or only a weak effect on the likelihood of employing temporary workers. The results are robust across the specifications in Models (2) and (3).

[15] The coefficient of the interaction term in the logistic model with odds ratios are the ratios of odds ratios (Norton et al., 2004: 160). The interaction term in this model tells us by how much the effect differs but they do it in a multiplicative way (Buis, 2010: 87). Hence, the relevant odds ratio for annual fluctuation is obtained by multiplying its odds ratios with the coefficient of the interaction term (Buis, 2010).

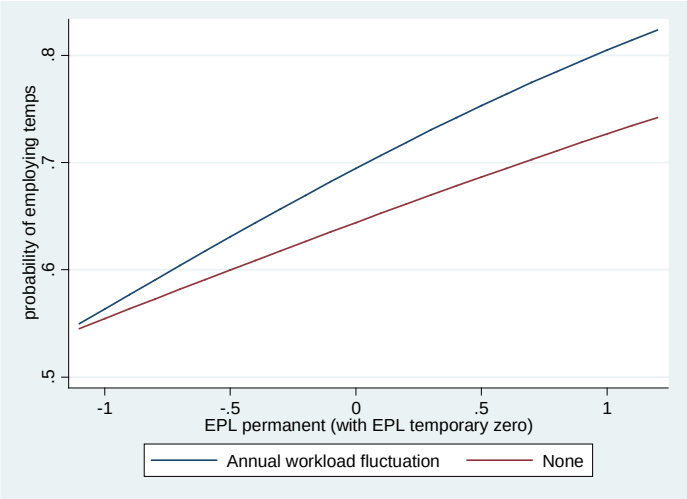
Table 1: Do workload fluctuations increase the probability of hiring temps?

	If any temporary worker		
	(1)	(2)	(3)
WF annual	1.329***	1.316***	1.241***
	(6.25)	(3.95)	(4.92)
WF weekly	1.148*	1.198*	1.076
	(2.07)	(2.26)	(1.22)
WF daily	0.895	0.857*	0.846**
	(-1.94)	(-2.16)	(-2.82)
EPL* WF annual	1.144*	1.283*	1.129*
	(2.13)	(2.35)	(2.21)
EPL		1.349	
		(0.9)	
Firm controls			
Freelancer	1.830***	1.814***	2.067***
	(7.08)	(4.51)	(7.83)
Works council	1.416***	1.833***	2.892***
	(5.1)	(3.74)	(13.62)
No. workers up	1.305***	1.350***	1.575***
	(7.48)	(7.14)	(12.2)
No. workers down	0.987	1.016	1.067
	(-0.25)	(0.26)	(1.15)
Absent	1.474***	1.624***	1.805***
	(5.87)	(5.33)	(8)
Gender share	1.004**	1.004**	1.006***
	(3.06)	(3.16)	(3.88)
High skilled share	1.001	1	1.003
	(0.48)	(0.05)	(1.81)
Flexible working time	1.206***	1.290***	1.204***
	(3.92)	(4.39)	(3.59)
Firm size	yes	yes	no
Sectors	yes	yes	no
Country dummies	yes	no	yes
Country variables	no	yes	no
Firms	18407	18407	18407
Countries	20	20	20
LL	-8612	-9213	-9299

Note: *** significant at 0.1 per cent, ** significant at 1 per cent, * significant at 5 per cent. WF stands for workload fluctuation; EPL is employment protection legislation. Odds ratios of logistic regression models with clustered standard errors, z-values in parentheses, continuous variables are centred. Institutions' controls: WF annual*EPL for temporary workers, WF annual*bargaining coverage, EPL for temporary workers, bargaining coverage, EPL*bargaining coverage, EPL for temporary workers*bargaining coverage.

To present the substantive effect of our explanatory variables, Figure 4 plots the average of predicted probabilities of employing at least one temporary worker at different values of EPL for permanent workers (broken down by firms with and without annual fluctuations).These predicted probabilities are based on Model (2) in Table 1. The figure confirms that the gap between the two types of firms increases with strictness of EPL and that this gap is relevant in substantive terms. In a flexible regime, such as in the United Kingdom, firms employ temporary workers to 59 per cent– the firm types do not differ. In rigid regimes, however, we find the probability of employing temporary workers to be 78 per cent for firms with annual fluctuations, while for firms without fluctuations, the probability is 70 per cent.

Figure 4: Do workload fluctuations increase the probability of hiring temps and does this relation even becomes stronger with an increase in EPL?



Note: average of predicted probabilities, Model (2), calculated at zero for all institutions, except EPL permanent.

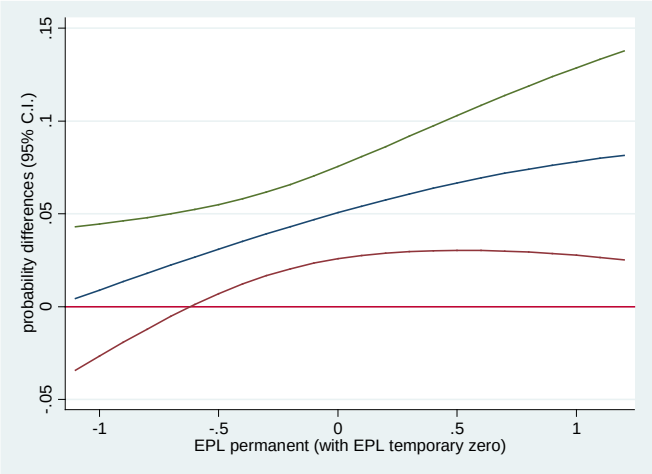
But are the differences between the two types of firms significant? To answer this question, we calculated differences in the average of predicted probabilities (DP) of hiring at least one temporary worker between the two types of firms and their confidence intervals:

$$DP = P\left(y_{ij} = 1 | WF = 1,\ EPL = x\right) \ - \ P\left(y_{ij} = 1 | WF = 0,\ EPL = x\right)$$

The results are plotted in Figure 5 against the level of EPL for permanent workers. Irrespective of the level of protection for temporary workers, the differences require a sufficient level of EPL for permanent workers in order to become significant. In rigid labour markets, the probability is 8 percentage points higher for firms with annual workload fluctuation fluctuations. In average regimes (such as in Finland), these two groups of firms still differ by 5 percentage points. In both cases, differences between firm types are significant. In flexible labour markets, however, workload fluctuations cease to make a significant difference in the

probability of hiring temporary workers. As the confidence intervals do not overlap, the difference in the difference at high and low levels of employment protection is significant.

Figure 5: Does the positive relation of fluctuation with the probability of employing temps differ significantly with EPL?



Note: difference in the average of predicted probabilities of firms with annual fluctuation against firms without fluctuation, Model (2), calculated at zero for all institutions, except EPL permanent and temporary.

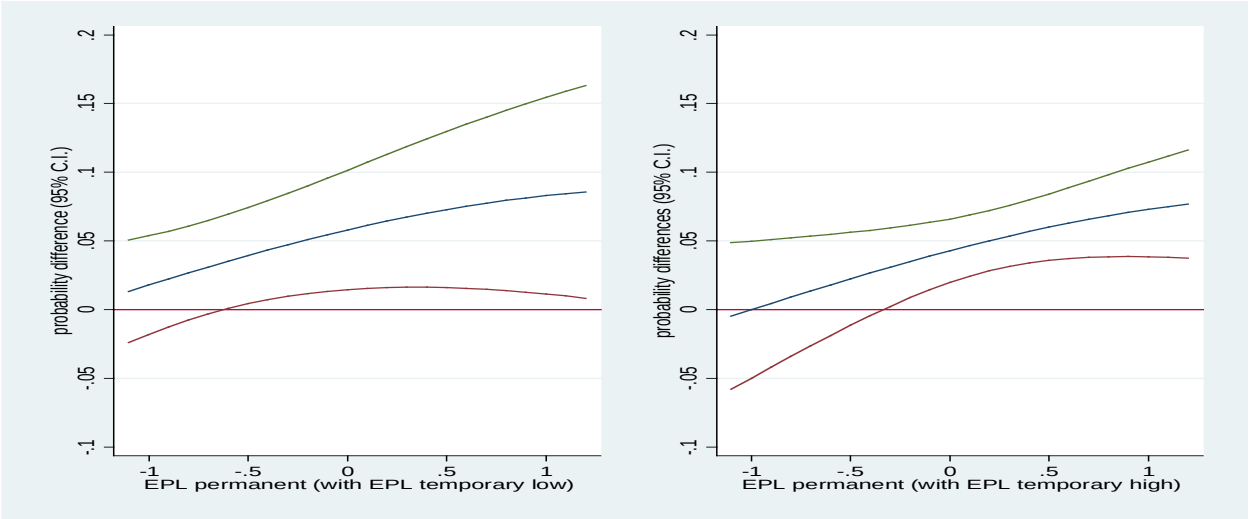
As marginal effects in logistic models depend on covariates, we calculated DP for low, average and high values (one standard deviation difference from the mean) of employment protection for temporary workers (Figure 6): increasing DP with EPL for permanent workers also holds for low and high employment protection for temporary workers. Interestingly, we find that the threshold for EPL for permanent workers, where DP becomes significantly different from zero, is higher when temporary work is strong regulated. Furthermore, DP becomes largest when EPL for temporary workers is low. Overall, this result is not surprising: the less it costs to hire and terminate temporary workers, the more often they are used in order to circumvent the numerical adjustment to production shocks by firing permanent workers.

Temporary workers can be distinguished between fixed-term contract (FTC) workers, temporary agency workers (TAWs) and others. We then examined the probability of employing at least one FTC or TAW in the firm. Theoretically, we do not expect any difference between these two subgroups concerning the impact of fluctuation at different levels of rigidity. The probabilities of employing TAWs or FTCs are significantly higher for firms with annual workload fluctuations given a sufficiently strong regulation for permanent workers[16] (Figure

[16] Estimation results are shown in Table 5 (Appendix).

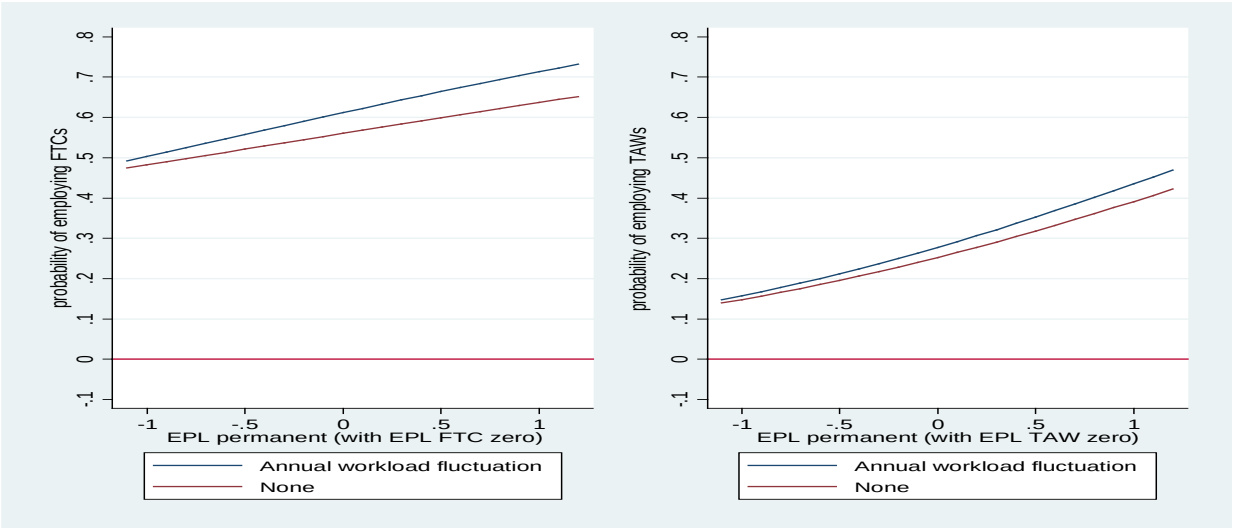
7).[17] We find the results quite robust across these subgroups for different levels of EPL for TAW and FTC.

Figure 6: Does the positive relation of fluctuation with the probability of employing temps differ significantly with EPL even for different values of EPL temporary?



Note: difference in the average of predicted probabilities of firms with annual fluctuation against firms without fluctuation, Model (2), calculated at zero for all institutions, except EPL permanent and temporary (+/- one standard deviation from zero).

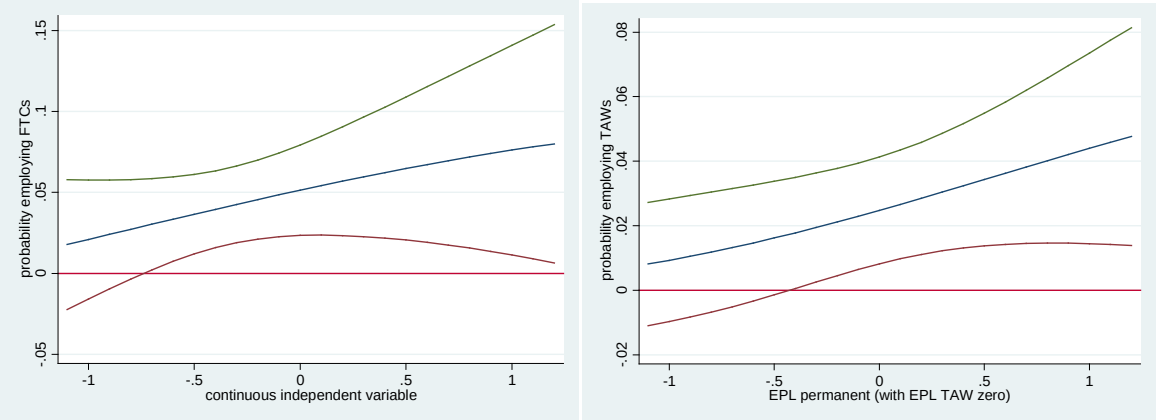
Figure 7: Do workload fluctuations increase the probability of hiring FTCs (or TAWs) and does this relation become even stronger with an increase in EPL?



Note: average of predicted probabilities of firms with annual fluctuation against firms without fluctuation, Model (5) and (7) in Table 5 (Appendix), calculated at zero for all institutions, except EPL permanent.

[17] We also estimated the percentages of FTCs as the dependent variable. We did not find robust and significant expected relationships between annual fluctuation, EPL and percentage of FTCs – which we found quite puzzling. But as we already argued, the use of the percentages in this context is problematic and therefore we cannot draw any conclusions from these results.

Figure 8: Does the positive relation of fluctuation with the probability of employing FTCs (or TAWs) differ significantly with EPL?



Note: difference in the average of predicted probabilities of firms with annual fluctuation against firms without fluctuation, Model (5) and (7), calculated at zero for all institutions, except EPL permanent.

Overall, we find that the effect of workload fluctuations on firms' demand for temporary workers depends on employment protection for permanent workers. This is in line with the results of Bentolila and Saint Paul (1992), who study whether the impact of sales shocks differs with the availability of temporary workers. They find that – similar to lower firing costs for permanent workers – an increased pro-cyclical response to sale shocks when temporary workers are available. Our study obviously differs on the dependent and independent variables. But institutions change the impact of variations in the workload (either sales shocks or expected workload fluctuations). In contrast, our findings differ in comparison to Nunziata and Staffolani (2007). They find a significant negative impact of recessions on the aggregated share of temporary employment, but employment protection for permanent workers does not change this effect. The divergence from our results is not very surprising. First, the micro-composition of the economy is not accounted for by macro-data. Second, we employed different concepts in the sense that we study the impact of expected workload fluctuations and not the impact of the current state of the economy.

Robustness checks and endogeneity

In summary, firms facing annual fluctuations are more likely to employ temporary workers, and the likelihood increases with EPL for permanent workers. But to what extent can we talk about causal relationships? Our identifying assumption is that workload fluctuation and employment protection legislation for permanent workers are pre-determined to the hiring behaviour of firms. There are historical facts and empirical studies which support that workload fluctuations and employment protection are exogenous.

First, concerning expected workload fluctuations, we interpret workload fluctuation as a characteristic of the product itself. For instance, farming fluctuates due to the limitation of the production to specific seasons, and hotels face workload fluctuation due to seasonal fluctuations in demand. The firm also might invest in another product but this is relatively costly compared to hiring and firing decisions. That workload variations determine and motivate the hiring of temporary workers and not reverse is also supported empirically by Houseman (2001). She finds that one main motive to employ temporary workers in American firms is expected variation in the workload (40 per cent on average). Therefore, we assume that reversed causality is not very likely.

Second, EPL for permanent workers influences the hiring decision of firms and not reverse. We claim this because EPL for permanent workers has been very stable over the last decades in the analysed countries. In contrast to EPL for permanent workers, EPL for temporary workers has been deregulated since the 1980s in European countries – so called two-tier reforms (e.g. Boeri 2011: 1196; Saint-Paul, 1996). However, we are interested in EPL for permanent workers and this has not been changed over time considerably which underlines our assumption that hiring decisions did not have an effect on EPL for permanent workers. This is supported by difference-in-difference analyses which find an effect of EPL for permanent workers on the behaviour of firms. For instance, Boockmann and Hagen (2001) employ programme evaluation techniques on a German EPL reform in 1996 and find that firms are less likely to employ FTCs after EPL for permanent workers was de-regulated.[18] Concerning unobserved heterogeneity at the country level, we control for relevant other factors. For instance, employment protection for permanent workers is often negatively correlated with the protection of temporary workers. Therefore, we include for the interaction between workload fluctuation and employment protection for temporary workers in our regressions. This rules out that the increase in the effect of workload fluctuation is not driven by low employment protection legislation for temporary workers.

Our results for annual workload fluctuation and the interaction term between fluctuation and EPL for permanent workers are quite robust with respect to different specifications, subsample estimations, individual country regressions and different estimators. Table 1 shows different specifications. Model (3) is nested in Model (1) while the former excludes firm size and sector dummies. In both models workload fluctuation within a year and the multiplied component are

[18] However, research employing within-country variation in order to study the impact of employment protection legislation on the employment of temporary workers at the firm level is relatively rare. The main dependent variable is worker flows (e.g. Martins, 2009; Kugler and Pica, 2008; Bauer et al., 2007; Boeri and Jimeno, 2005).

positive significant. While annual fluctuation is robust, this is not true for weekly and daily fluctuation. Firms with weekly (daily) fluctuation have a significant higher probability of employing temporary workers in Model (1) (Model (2) and (3)) but not in Model (3) (Model (1)). Overall, weekly and daily fluctuations are not robust. This is what we expected, as firms arguably adjust for weekly and daily fluctuations by part-time or working-time accounts. This pattern is also revealed in subsample estimations and individual country regressions which find robust positive coefficients for annual fluctuation but not for daily and weekly fluctuation.

Concerning different estimators, Model (1) includes country dummies and clustered standard errors; Model (2) does not control for country dummies but includes theoretical relevant controls on the country level, such as employment protection for permanent and temporary workers as well as union bargaining coverage. Comparing these two models, we find robust results for our main variables of interest: workload fluctuations within a year and the interaction term with EPL which are both significantly positive and similar in their magnitude. Model (1) is somewhat more conservative than Model (2). Furthermore, the results are also robust to a random effect model which is more conservative than (2) but less than (1).

Conclusions

The intention of our paper was to bring in the interaction between firm characteristics and institutions as an important element explaining the spread of temporary work in Europe. In line with recent theories, we have hypothesized a higher propensity to hire temporary workers if a firm is exposed to fluctuation in workload. But we have expected this effect to be conditioned by the regulatory framework. Fluctuations should matter only if dismissal costs for workers with permanent contracts are sufficiently high.

We constructed a novel data set combining firm level with institutional variables from 18,500 firms and 20 European countries. Using pooled, cross-country firm data, we were able to confirm our hypothesis across a number of robustness and endogeneity checks. Firms with an unstable workload are more likely to hire workers on temporary contracts, and the effect is conditional upon a certain level of employment protection legislation – our measure for firing costs. The results are not only statistically significant, but they also matter in substantive terms. While we do not observe a significant effect of workload fluctuations in flexible labour markets, the difference between firms with and without fluctuations is eight percentage points in heavily regulated labour markets. This is also true for the employment of fixed-term contract and temporary agency workers.

By and large, our results are in line with previous studies which have shown employment protection to matter at the aggregate or the individual level. We complement these findings by showing that labour market institutions mediate the effect of firm-characteristics. Bringing the different levels together is a fruitful task for future research. For instance, the effect of national economies' composition by firm type on the share of temporary contracts could be assessed in a macro-framework. The data for this would be readily available. More difficult, with regard to data requirements, would be analysing the link between institutions, firms and workers' characteristics. The improved availability of linked employer–employee data sets may make this possible in the future. More generally, our analysis suffers from various data limitations, particularly with regard to the dichotomous nature of the dependent and the main explanatory variable. Also here, progress will be conditional upon improved comparative data sources.

What are the broader implications of our study? We know that temporary work is associated with potentially negative effects on the well-being of affected workers. Hence, it is a relevant societal concern how to contain the spread of such contracts. Based on our results, we share well-known concerns that firing costs for permanent workers produce two-tier labour markets. As we show, such costs do encourage the use of temporary contracts for some firms. On the other hand, our results also indicate that the need for flexibility is inherent to some companies' production processes. Reforms ignoring the fundamental role of economic volatilities are likely to produce worse economic outcomes. A modest deregulation of employment protection may be considered to make it easier for firms to cope with uncertainty and productivity shocks, without making use of temporary work.

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Appendix

Table 2: Summary statistics of firm characteristics

	mean	sd	min	max	count
If any temp	0.68	0.47	0	1	18450
If any TAW	0.30	0.46	0	1	18450
If any FTC	0.60	0.49	0	1	18450
Share of FTC	14.94	22.81	0	100	10589
WF daily	0.30	0.46	0	1	18450
WF weekly	0.42	0.49	0	1	18450
WF annual	0.63	0.48	0	1	18450
Freelancer	0.22	0.42	0	1	18407
Works council	0.49	0.50	0	1	18450
No. of workers up	0.36	0.48	0	1	18450
No. of workers down	0.27	0.44	0	1	18450
Absent	0.17	0.38	0	1	18450
Gender share (centred)	-0.00	30.11	-41	59	18450
High skilled share (centred)	-0.00	28.31	-24	76	18450
Flexible working time	0.57	0.49	0	1	18450
Company size (1-10)	3.42	2.81	1	10	18450
NACE C-E	0.32	0.47	0	1	18450
NACE F	0.10	0.30	0	1	18450
NACE G	0.14	0.35	0	1	18450
NACE H	0.03	0.18	0	1	18450
NACE I	0.05	0.21	0	1	18450
NACE J	0.02	0.14	0	1	18450
NACE K	0.10	0.30	0	1	18450
NACE L	0.06	0.23	0	1	18450
NACE N	0.08	0.26	0	1	18450
NACE O	0.04	0.20	0	1	18450

Source: ECS 2009 (Eurofound, 2010a).

Table 3: Summary statistics for country-level variables

	mean	sd	min	max
EPL (centred)	-0.019	0.565	-1.193	1.147
EPL temp (centred)	0.060	1.166	-1.940	2.650
EPL FTC (centred)	0.013	1.367	-1.663	2.338
EPL TAW (centred)	0.108	1.337	-2.213	2.954
Bargaining coverage rate (centred)	0.857	28.784	-51.580	37.120
Unemployment rate (centred)	-0.014	1.949	-3.815	3.785
N	18450			

Source: See section “Stylized facts and data sources”.

Table 4: Are workload fluctuations associated with a higher probability of hiring temps and does this relation become even stronger with an increase in EPL?

	If any temporary worker		
	(1)	(2)	(3)
WF annual	1.329***	1.316***	1.241***
	(6.25)	(3.95)	(4.92)
WF weekly	1.148*	1.198*	1.076
	(2.07)	(2.26)	(1.22)
WF daily	0.895	0.857*	0.846**
	(-1.94)	(-2.16)	(-2.82)
EPL*WF annual	1.144*	1.283*	1.129*
	(2.13)	(2.35)	(2.21)
EPL		1.349	
		(0.9)	
Firm controls			
Freelancer	1.830***	1.814***	2.067***
	(7.08)	(4.51)	(7.83)
Works council	1.416***	1.833***	2.892***
	(5.1)	(3.74)	(13.62)
No. workers up	1.305***	1.350***	1.575***
	(7.48)	(7.14)	(12.2)
No. workers down	0.987	1.016	1.067
	(-0.25)	(0.26)	(1.15)
Absent	1.474***	1.624***	1.805***
	(5.87)	(5.33)	(8)
Gender share	1.004**	1.004**	1.006***
	(3.06)	(3.16)	(3.88)
High skilled share	1.001	1	1.003
	(0.48)	(0.05)	(1.81)
Flexible working time	1.206***	1.290***	1.204***
	(3.92)	(4.39)	(3.59)
Country controls			
EPL temp*WF annual		0.946	
		(-0.98)	
Bargaining*WF annual		0.996	
		(-1.26)	
Bargaining coverage		0.994	
		(-0.53)	
EPL*bargaining		1.016	
		-1.4	
Unemployment rate		0.859	
		(-1.45)	
EPL temp		0.704	
		(-1.26)	
EPL*EPL temp		0.745	
		(-0.91)	
EPL temp*bargaining		1.006	
		-1.45	

Firm size	yes	yes	no
Sectors	yes	yes	no
Country dummies	yes	no	yes
Firms	18407	18407	18407
Countries	20	20	20
LL	-8612	-9213	-9299

Note: *** significant at 0.1 per cent, ** significant at 1 per cent, * significant at 5 per cent. Odds ratios of logistic regression models with clustered standard errors, z-values in parentheses, continuous variables are centred.

Table 5: Are workload fluctuations associated with a higher probability of hiring FTCs (or TAWs) and does this relation become even stronger with an increase in EPL?

	If any FTC			If any TAW		
	(4)	(5)	(6)	(7)	(8)	(9)
WF annual	1.316***	1.319***	1.225***	1.126*	1.163**	1.078
	(6.11)	(3.73)	(4.91)	(2.07)	(3.01)	(1.21)
WF weekly	1.085	1.137*	1.018	1.05	1.116*	1.006
	(1.44)	(2.03)	(0.37)	(1.06)	(2.29)	(0.13)
WF daily	0.968	0.949	0.95	0.902	0.861*	0.802**
	(-0.56)	(-0.84)	(-0.86)	(-1.40)	(-1.96)	(-2.75)
EPL*WF annual	1.087	1.181	1.112	1.027	1.072	1.043
	(1.16)	(1.41)	(1.59)	(0.37)	(1.24)	(0.54)
EPL		1.515			2.16	
		(1.1)			(1.76)	
Firm controls						
Freelancer	1.596***	1.603***	1.747***	1.666***	1.503***	1.835***
	(6.54)	(4.92)	(8.2)	(7.32)	(4.43)	(8.21)
TAW	1.822***	2.020***	2.238***			
	(5.94)	(6.12)	(7.04)			
FTC				1.855***	2.011***	2.290***
				(5.57)	(6.02)	(7.02)
Works council	1.333***	1.563***	2.589***	1.281**	1.504***	1.961***
	(3.31)	(3.32)	(10.7)	(2.67)	(4.05)	(7.95)
No. workers up	1.208***	1.233***	1.398***	1.151***	1.165***	1.353***
	(4.2)	(4.51)	(7.42)	(3.6)	(3.99)	(8.489)
No. workers down	0.973	1.028	1.011	0.985	0.951	1.186**
	(-0.47)	(0.45)	(0.19)	(-0.27)	(-0.81)	(3.02)
Absent	1.346***	1.454***	1.613***	1.252***	1.288**	1.447***
	(5.02)	(5.66)	(7.21)	(3.32)	(2.79)	(5.58)
Gender share	1.007***	1.007***	1.011***	0.996*	0.995**	0.991**
	(5.64)	(6.15)	(7.72)	(-2.54)	(-2.99)	(-3.20)
High skilled share	1.001	1	1.004*	1.002	1.002	0.999
	(0.4)	(0.13)	(2.34)	(1.15)	(1.16)	(-0.35)
Flexible working time	1.210***	1.259***	1.211***	1.103	1.128*	1.173*
	(5.15)	(4.22)	(4.73)	(1.6)	(1.98)	(2.11)
Country controls						
EPL FTC*WF annual	0.984	0.989	1.019	1.031	1.022	1.034
	(-0.49)	(-0.23)	(0.58)	(0.6)	(0.42)	(0.65)
EPL TAW*WF annual	0.999	0.945	0.968	1.069	1.091*	1.062
	(-0.04)	(-1.26)	(-1.10)	(1.73)	(2.47)	(1.75)
Bargaining*WF annual	0.997	0.994*	0.997	0.999	0.997	0.999
	(-1.95)	(-2.14)	(-1.56)	(-0.54)	(-1.74)	(-0.42)
Bargaining coverage		0.999			1.030***	
		(-0.13)			(6.24)	
EPL*bargaining		1.038**			0.942***	
		(2.72)			(-3.69)	

Unemployment rate		0.862			1.02	
		(-1.49)			(0.25)	
EPL FTC		0.976			0.770*	
		(-0.15)			(-2.27)	
EPL TAW		1.097			0.705**	
		(0.59)			(-2.74)	
EPL*EPL FTC		0.589			4.441***	
		(-1.38)			(3.6)	
EPL*EPL TAW		0.775			1.268	
		(-1.23)			(1.45)	
EPL FTC*bargaining		1.007			0.997	
		(1.57)			(-0.87)	
EPL TAW*bargaining		0.996			1.007*	
		(-1.01)			(2.29)	
Firm size	yes	yes	no	yes	yes	no
Sectors	yes	yes	no	yes	yes	no
Country dummies	yes	no	yes	yes	no	yes
Firms	18407	18407	18407	18407	18407	18407
Countries	20	20	20	20	20	20
LL	-9060	-9601	-9703	-8340	-8623	-8880

Note: *** significant at 0.1 per cent, ** significant at 1 per cent, * significant at 5 per cent. Odds ratios of logistic regression models with clustered standard errors, z-values in parentheses, continuous variables are centred.