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FLEXIBLE WAGE CONTRACTS, TEMPORARY JOBS AND WORKER PERFORMANCE: EVIDENCE FROM ITALIAN FIRMS

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Abstract. This paper focuses on the effects of decentralized wage scheme and temporary form of employment on worker/firm performance. The effect of monetary incentives on worker effort and firm performance is a central topic in economics. According to the principal-agent paradigm, firms (the principal) have to link employees' remuneration scheme to any verifiable indicator of performance in order to avoid opportunistic behaviours. The effectiveness of incentives on workers' behaviour may vary significantly accordingly to the institutional/economic context in which the firms operate but in general the empirical evidence shows that financial incentives have the potential to exert strong effects on indicators of firm performance, such as productivity and worker absenteeism. Both from a theoretical and empirical point of view, the prediction on the effects of temporary forms of employment on effort and productivity is less neat. As a matter of fact, the effects of temporary forms of employment on workers effort crucially depend upon the reasons why employers use them. In light of these considerations, the aim of this paper is to provide further empirical evidence on whether and to what extent performance related pay and contract flexibility affects workers effort and in turn firm productivity for different type of workers (white collar vs. blue collar), working in workplaces characterized by different degree of uncertainty and risk and in firms operating in different economic and institutional settings using a sample of Italian firms. According to our results, wage flexibility appears to have a significant effect on effort and then on firm's productivity, white collars are more responsive to monetary incentives than blue collars and temporary contracts increases the feeling of precariousness inside the firm and reduce permanent workers' effort.

JEL Classification J22, J33, J38

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1. Introduction

The last two decades have witnessed a significant increase of the labour market flexibility in all European Countries. The most debated strand of macroeconomic literature considered under various channels the former rigidity as responsible of rise in unemployment (among the others Siebert, 1997, Blanchard and Wolfers, 2000, Burgess *et al*, 2000). In this paper we are interested in an empirical assessment of the effect of flexibility on workers effort and then on firm productivity. In particular we focus on two forms of flexibility identified in the literature: external (numerical) flexibility and wage (financial) flexibility. The former is related to the capacity of firm to adjust its labour force to changes in the economic conditions and it depends on the strictness of employment protection legislation and the availability of temporary forms of employment, while the latter concerns the responsiveness of wages to external shocks and changes in internal productivity and largely depends on the features of the wage setting institutions.[1]

In the last two decades, reforms aimed to increase firms' external flexibility were mainly focued in removing the obstacles to the use of temporary forms employment.. As a results, the number of temporary contracts has grown signiifcantly in a number of OECD countries raising concerns that temporary jobs may be crowding out more stable forms of employment, becoming an additional source of insecurity for workers. From a theoretical and empirical point of view, the predictions on the effects of temporary forms of employment on effort and productivity is ambiguous and mainly depends on the reasons why employers use them. For instance Boeri and Garibaldi (2007) found a positive temporary effect on employment and a permanent negative effect on productivity. Generally speaking, the use of temporary contracts as buffer stocks increases job instability and uncertainty inside the firm, reduce investment in training, lowers workplace cooperation and workers' motivations and harms long-run growth prospect. On the contrary, temporary contracts used as screening devices generate better growth prospects due to better learning about match quality. This may translate into better job matches and, therefore, more stable employer-employee relationships in the long run (Portugal and Varejao, 2009). We classify the different forms of temporary

[1]For a more detailed classification of flexibility see Beatson (1995).

contracts into three main types: fixed term contracts which are characterized by the same benefits as the permanent contracts, traineeship contracts which are generally entrance contracts for young inexperienced workers and external collaborations and agency contracts.

Considering the second dimension of flexibility, there is a large theoretical and empirical literature on the effects of wage incentive schemes on effort and productivity. The efficiency wage theory in the eliciting effort version (Solow 1979, Shapiro and Stiglitz,1984) shows how firms pay higher salary in order to motivate workers to work harder. A similar reason, else if in a dynamic setting inside the careers' profiles is the basis to design right schemes of incentives under tournaments (Lazear and Rosen, 1981). It means that in the face of asymmetric information, firms should tie the remuneration of employees to any verifiable (individual or collective) signal of performance. Based on such a theoretical prediction, a number of studies in recent years have shown that, when implemented wisely, financial incentives have the potential to exert strong effects on indicators of firm performance, such as productivity (Lazear, 2000; Gielen et al., 2010) and worker absenteeism (Wilson and Peel, 1991; Brown et al., 1999).

In Italy the period of labour market reforms aimed to decentralize wage determination started at the beginning of nineties with the tripartite agreements of 1992 and 1993 (signed by national trade unions, Government and industrial associations), which marked the end of the automatic wage indexation system (the so-called "scala mobile") . Moreover, the 1993 Agreement introduced a two stage bargaining system consisting of national-level bargaining (by economic sector) and local-level agreements. The task of the national level bargaining was to maintain the purchasing power of wages, while local bargaining (either at the regional or firm level) had to allow eventual rent sharing through performance-related pay schemes rather than fixed (usually irreversible) premiums. The variable wage component consists of a company-level wage increment (*superminimum*) bargained between the firm and the worker, a performance related bonus based on firm's performance, other bonus generally related to individual performance. Institutional reforms aimed at deregulate the Italian labour market through the introduction of various forms of temporary and atypical contracts have been gradually introduced since the middle nineties. The two principal reforms in this direction have been the Treu (1997) and Biagi (2003) reforms, which deregulated and extended the adoption

of fixed-term contracts, allowed the use of temporary agency workers, and introduced new 'atypical contractual arrangements.

To describe how Italian labour market has evolved with respect to the other industrialized countries and how Italy places in terms of both external and wage flexibility relative to the averaged industrilized country, we may have a first idea, simply by looking to the Employment Protection Lagislation (EPL) indicators. In 2008 EPL index in Italy has a value close to the OECD mean (1.89 versus 1.94) and Italy is ranked 25th out of 40 countries. In 1990 Italy was ranked 4th out of 26 countries in same decreasing order of protection. A similar picture emerges if we considere the EPL on temporary contracts: in the 90s Italy ranked 1st out of 26 countries, while in 2008 Italy occupies the 13th position out 42 countries. In the same period the share of temporary workers has increased of 5 percentage points, passing from a 6% of workers employed with a fixed term contract in the 90s to a 11% of workers in the last 5 years. About wages, Clar *et al.* (2007) rank Italy 12th out of 18 OECD countries in a meta-analysis concerned on the real wage flexibility, by confirming the previous results obtained by Heylen (1993).

The aim of the paper is to empirically assess whether and to what extent decentralized wage scheme on one hand and temporary forms of employment on the other affect workers' effort using a sample of Italian firms. We try also to disentangle the specific contribution of wage and employment flexibility to firm productivity. Finally, we use white and blue collars as different labour inputs in the production functions to see if they are affected in different ways from flexibility practises.

The remainder of the work is the following: in section 2 we present the datasets we use and the composition of the sample. In section three we exploit our empirical strategy and briefly describe the methodologies we will use. Then in section 4 we present and discuss the results of the empirical analysis. Conclusive considerations follow.

2. Empirical strategy and measurement issues

In order to assess the impact of wage and numerical flexibility on productivity, our empirical model takes into account the simultaneous interactions between workers effort and firms performance on the one hand and workers' effort and effort determinants on the other hand. One of

the main issue is how to define and measure workers' effort. Despite there is a large consensus on the fact that the commitment and effectiveness with which workers apply themselves to their assigned tasks is relevant in explaining labour productivity, nevertheless neither the theoretical nor the empirical literature provide a unique, widely accepted definition of this concept. The empirical investigators have operationalised the idea of effort in a number of different ways that may be classified in two main categories. On the one hand, there is a large empirical literature which uses observable indicators of effort (or negative effort) such as absenteeism (Barmby et al., 1991, Winckelmann, 1999; Bradley et al. 2007) or disciplinary dismissals (Cappelli and Chauvin ,1991). On the other hand, self reported measures of effort/motivation that may be collected from employees surveys are often used.

Our approach is twofold. Firstly we use an observable proxy of effort (negative absenteeism) and estimate a model in which workers effort and firm productivity are both observable and endogenous. Secondly, we consider effort as a unobservable (latent) variable and use the Structural equation modeling (SEM) in order to capture the relationship between the unobserved latent variable effort and firms productivity.

About this strategy we may appreciate how while in the first estimation we use a potentially restrictive variable, because absenteeism is not the only dimension of effort. On the other hand, the second type of estimation use a very broad concept that in principle could be larger than effort. It means that, with the lack of a generally accepted proxy for effort, using these two measures, should supply us respectively a lower and an upper bound for the role of it, so to make more robust our conclusions.

2.1. **Simultaneous equation estimation with observable effort.** Our basic framework is a standard Cobb-Douglas production function for a representative firm with only two inputs: effective labour (E) and capital(K)

$$Y_i = A_i K_i^{\alpha} E_i^{\beta} exp^{u_i} \tag{1}$$

$$E_i = e_i \hat{L}_i \tag{2}$$

$$e_i = f(Z_i) \tag{3}$$

where E is a broad concept of work input factor including effort (equation 2). In particular e_i is the average effort of the labour force in firm i and $\hat{L}_i$ the number of workers employed in full-time equivalent units adjusted for quality (human capital), type of contracts (temporary vs. permanent) and qualification (blue collars vs. white collars). Effort e_i is proxied by an indicator of (negative) absenteeism measured as the ratio between actual hours worked and workable hours .In turn effort level is influenced by a number of variables in the vector $\mathbf{Z}_i$, which contains:

- Wage structure variables such as the performance related pay (as a share of total remuneration)[2], other production premia/bonuses, superminimum differentials[3], seniority differentials.
- Numerical (external) flexibility indicators such as the share of temporary contracts (fixed-term contracts and other "atypical" contracts), conversion rates (from temporary to permanent jobs), turnover rate, hiring policies (temporary vs. permanent), displacement risk.
- Institutional factors such as union rates and an indicator for employment protection inside the firms.
- Workers outside opportunities: unemployment rate (that is a measure of the situation in the local labour market), activity rate, presence of industrial districts, metropolitan area.
- Labour force and firm characteristics: human capital, age structure, gender composition.

We allow workers heterogeneity by distinguishing between temporary and permanent workers, skilled and unskilled workers and white and blue collar. [4]

[2]This component of the wage is based on previous year performance results.

[3]Superminimum are company-level wage increments added to the contractual minimum on a permanent basis.

[4]In equation (11), $\frac{\phi_T}{\beta}$ represents the productivity premium of a temporary worker relative to a permanent worker, $\frac{\phi_H}{\beta}$ represents the productivity premium of a high-schooled worker relative to a low-schooled worker, and $\frac{\phi_W}{\beta}$ represents the productivity premium of a white collar relative to a blue collar (Konings and Vanormelingen, 2009). Unfortunately we do not observe the number of high-schooled and low-school workers, nor the number of temporary and permanent workers for each employee type. This forces us to make some simplifying assumptions similar to other studies that divide the labor force among several dimensions (Van Biesebroeck, 2007 ; Konings and Vanormelingen 2009). First,

The empirical specification is the following:

$$\ln Y_i = \alpha \ln K + \beta \ln eL + \phi_T \frac{L_T}{L} + \phi_H \frac{L_H}{L} + \phi_w \frac{L_W}{L} + u \tag{4}$$

$$\ln e = \gamma' Z + \epsilon \tag{5}$$

Finally, relaxing the assumption that blue collars and white collars are perfect substitutes also in effort level we obtain[5]:

$$Y_i = A_i K_i^{\alpha} E_{W,i}^{\beta_W} E_{B,i}^{\beta_B} exp^{u_i} \tag{6}$$

$$E_{W,i} = e_{W,i} \hat{L_{W,i}} \tag{7}$$

$$E_{B,i} = e_{B,i} \hat{L_{B,i}} \tag{8}$$

$$e_{W,i} = f(Z_{W,i}) \tag{9}$$

$$e_{B,i} = f(Z_{B,i}) \tag{10}$$

The corresponding empirical equations are the following:

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we have to assume that the relative differences in marginal productivity between two workers that differ by one characteristic are the same irrespectively of what their other characteristics are. Second we restrict the proportion of one type of workers to be constant across other groups defined by the other characteristics.

[5]Allowing white and blue collar worker to be imperfectly substitutable has the drawback that we have to exclude all observations where there are only blue collar or white collar workers. Although we could also observe the number of managers in a firm, including them as a separate category in the production function would imply to exclude too many observations because only a small percentage of firms report the number of managers. We count the number of managers as white collar workers instead.

$$\ln Y_i = \alpha \ln K + \beta_W \ln e_W L_W + \beta_B \ln e_B L_B + \phi_T \frac{L_T}{L} + \phi_H \frac{L_H}{L} + u \tag{11}$$

$$\ln e_j = \gamma' Z_j + \epsilon_j \tag{12}$$

with $j = B, W$ and B is for blue collars and W is for white collars.

These two systems of equations are estimated by 3 stage least squares techniques, given the simultaneity of the work variables in the production and in the effort functions.

2.2. **Structural Equation Modeling (SEM) with unobservable effort.** .

The potential shorthcoming of the simultaneous equation approach described in the previous paragraph, is in the fact that as we already stressed, effort may be poorly observed. In order to have a benchmark estimation we use a large definition of effort as an observed variable, so that we may observe variables that are correlated with effort but we use these to describe our latent variable. In order to do this, we employ the tool of simultaneous equation modelling[6]. As we highlighted before, here will not use a specific variable for the effort, but we will model it as a latent variable. In this case we may observe exogenous or endogenous variables as the variables that are in the production function equation in both the sides, or in the right hand side of the effort equation. We know that there is a variable that can affect production and that has a correlation with exogenous observed determinants.

This means that we will have a *measurement* model with the relationship among latent and observed exogenous, that is given by the set of equations that in our case, given one endogenous and -j exogenous variables is:

$$\mathbf{x}_j = \varphi_i \xi_j + \omega_j \tag{13}$$

[6]For a description see Bollen, 1989 or Corbetta, 2002.

$$y_1 = \lambda_1 \eta_1 + \beta_k \mathbf{x}_k + \epsilon_1 \tag{14}$$

Where y is productivity, φ_i, λ_1 are the impact coefficients of the relationships and ω_j are error terms of each equation. The x vector is partioned in x_j and x_k, the former is a vector of exogenous variables affecting indirectly y through the factors ξ_j, while the latter variables affect directly y, respectively labour, human and physical capital inputs. ω_j and ϵ_1 are the error terms of the measurement model. Secondly, we have a *structural* model with an equation that is:

$$\eta_1 = \gamma_1 \xi_1 + \gamma_2 \xi_2 + \gamma_3 \xi_3 + \nu \tag{15}$$

η_1 is the latent endogenous variable effort; ξ_1, ξ_2, ξ_3 are the latent exogenous wage flexibility, numerical flexibility and firm characteristics respectively and ν is the error term of the structural equation. We also need to have the correlation matrices[7] among variables and to put a constraint for each equation containing a latent variable in order to identify the system (that is the scale of latent variables), as we will show later in the results. The measurement model has a framework that is similar to the 3SLS model we already estimated, except for the fact that we have endogenous latent variables on the right hand side with coefficients ξ,η and error terms different from zero. If we have identity equations among y and η and $\mathbf{x}$ and ξ then all the x variables influence directly y as in a standard estimation. This more general model is estimated through maximum likelihood, while in order to find latent variables of the structural part of the model we use confirmatory factor analysis to extract latent factors unobserved from observed variables. Figure n.1 in the appendix shows us what are the supposed link among latent and manifest or observed variables. This second estimation may be thought as an additional robustness check for our standard system; it means that passing from a quite restrictive effort definition as the absenteeism, to a quite general one, as

[7]All the exogenous variables have the same properties because are expressed in deviation from the means. This way we have a correlation matrix instead of a covariance matrix.

this latent variable, is possible to observe if effort and variables affecting it have still a role to play in influencing production function.

3. Data Presentation

The empirical analysis is based on a sample of about 800 Italian firms. The data are derived from the annual survey carried out by the Italian Manufacturing and Service Industries Association. Though the survey is conducted annually information on the wage structure and absenteeism is only available for the year 2008. The questionnaire consists of three main sections. The first section asks questions on the employment composition of the firm (by sex, type of contract,education and qualification), employment flows (hires by type of contract, number of fixed-term contracts converted to permanent, separation by reason). The second part of the questionnaire asks questions on working time (including overtime and hours of absence by reason). Finally the third part of the questionnaire reports detailed information on wage structure by qualification including the variable pay component disentangled in performance premium (generally based on firms performance) and other individual premium and bonus (generally related to individual and team performance). The data from the Confindustria Survey are matched with information on balance sheets data, provided by AIDA database, information on the conditions and characteristics of the local labour market[8] collected by the Italian National Institute of Statistics (ISTAT) and union membership by sector of activity and localization obtained from the Italian trade union confederations.

As already stressed in the previous paragraph, five sub-sets of variables are used in the empirical analysis: (i) variables related to the flexibility of wage structure; (ii) variables related to the degree of flexibility of labour utilization inside the firms; (iii) characteristics of the firm labour force ; (iv) variables representing the degree of protection inside the firm; (v) variables representing workers' outside options and characteristics of the local labour market;

[8]Italy's Local Labour Systems (Sistemi Locali del Lavoro) are defined as self-contained labour markets with respect to daily commuting trips. The Italian territory is partitioned into 686 local labour systems using the Population Census of 2001.

4. Results

The basic results are reported in Table 1 and Table 2 which show the estimated coefficients for the production function and for the effort equation respectively. The Cobb-Douglas production function fits well the data: the coefficients have the expected signs and the CRS hypothesis is not rejected.[9] The fact that the coefficient of labour is higher than the textbook expectation is usually explained in the growth accounting tradition by the fact that we should consider also human capital together with physical capital stock[10] and it is in line with previous empirical works at firm level (Konings and Vanormelingen, 2009). Moreover, our specification of labour as effort augmented is not rejected by the data so that labour input measured as number of workers in full-time equivalent units and effort indicators have the same coefficients.[11] The presence of more qualified workers (either as schooling requirements or as qualifications) has a positive effect on productivity with a productivity premium of being high skilled worker of about 50 percent. In line with previous empirical works, firms with a higher share of temporary workers are characterized by a lower productivity .

TABLE 1 AROUND HERE

The results of the regression for effort are presented in Table 2. In general wage flexibility has a positive impact on the average level of effort inside the firm thought there are differences in the effectiveness of incentivating policy on blue collars and white collars, with blue collars being less sensitive to monetary incentives This is in line with the theoretical literature which shows that risk aversion, average ability and the sensitivity to incentives are correlated with skill levels (Prendergast, 1999). In particular, our results shows that the presence of a wage premium related to performance has a positive effect on workers average effort when the premium is paid to white collars while the same wage scheme applied to blue collars appears to have a disincentive effect

[9] In the reported estimation of the Cobb-Douglas production function, both capital and labour are treated as exogenous. We also estimated the same specification using past value of labour and capital as instruments for labour input and capital input. The results are almost unchanged and are available from the authors.

[10] See for instance Caselli, 2005.

[11] The restriction is tested and then imposed in the model.

on effort with a reduction in the average hours worked inside the firm. The presence of other premium/bonus has no significant effect on workers' effort. On the other hand, firms which pay a larger supermimum (relative to firms which operate in the same sector of activity) induce lower levels of absenteeism. This last result confirms the theoretical conclusions of the efficiency wage models which predict a positive correlation between the level of wages and the workers' effort.

TABLE 2 AROUND HERE

Considering the effect of flexibility of labour utilization inside the firms on permanent workers' effort, we can see that the level of absenteeism increases with the share of temporary workers employed by the firms, thought the negative effect reduces (and eventually becomes positive) in firms where there is a high probability for a temporary worker of obtaining a permanent position at the current employer. Since our measure of effort concerns permanent workers only, this result seems to suggest that a high degree of job instability and uncertainty inside the firm leads to a deterioration in the working environment inside the firm, reduces works cooperation and undermines workers' motivations and effort. A high rate of new hirings has a positive effect on effort if new workers are hired on permanent basis. On the contrary, temporary hirings have a negative impact on effort.

In order to control for the effect of internal protection on workers' shirking behaviour, we use two indicators. A dummy variable which assumes value 1 for firms with a number of employees larger than 15 captures the effect of employment protection legislation, firing costs being significantly lower in firms below 15 employees in Italy. Secondly we construct an indicator of union density at provincial and sector of activity given the unavailability of information on union strength at firm level. After controlling for firm size, the coefficient of the dummy variable for EPL strictness is negative (more protection implies lower effort and then more shirking) but not significant at the conventional level. Considering the impact of size on effort, the absenteeism increases with the firm size at a decreasing rate. The negative size-effect can be both due to differences in the degree of workers protection but also to difficulties of monitoring performance in large firms. The presence

of strong unions does not appear to have any effect of workers' effort. Seemingly workers' outside option and the characteristics of the local labour market do not have any significant impact of average absenteeism inside the firm.

Finally, considering the labour force characteristics, higher absenteeism is related to a large share of part-time workers, a large share of women (this result is in line with Ichino and Moretti, 2010) and a large share of blue collar workers.

In the second part of the empirical analysis we remove the assumption of perfect substitutability between white and blue collar workers and we estimate separately the effort equation for the two types of workers.

TABLE 3 AROUND HERE

The results of the production function confirm substantially the conclusion reported in the previous set of regression. Considering the effort equation of white collar workers, a flexible wage structure has a positive and significant effect on workers' effort and reduces absenteeism. Moreover all the variable related to external flexibility are negatively signed, suggesting that instability is detrimental to workers' effort. Finally the coefficients on the unemployment rate in the local labour market is positive and significant, implying an increase in effort when the outside option are less favourable. The results for the blue collar effort equation are qualitatively similar, with some differences in the magnitude and significance of the estimated parameters. A quite strong result is that blue collars' effort is not affected by monetary incentive, all the controls for wage flexibility being not significant in the blue collar effort equation. As for white collar workers, numerical flexibility indicators, and in particular the share of temporary workers inside the firm, has a negative and significant impact on blue collars' effort.

TABLE 4 AROUND HERE

TABLE 5 AROUND HERE

Finally we consider effort is a unobservable (latent) variable, through the framework we described in the previous section. In this case the number of observation is slightly larger, because we don't need to observe absenteeism for each firm in our sample. It allows us to recover some observations[12]. Table 6 describes our results. In this case we don't have separate tables for each equation but aggregate results for the whole system [13].

TABLE 6 AROUND HERE

We may appreciate as the fit of the regression is good and as the production function has coefficients very close to the 3SLS estimation, but in this case we may model the latent effort. Firstly, this variable is significant and has a positive correlation with productivity. Secondly, we observe as the latent exogenous variables we link with this latent endogenous productivity determinant have different signs[14]. The results show that monetary incentives have a positive impact on effort and hence, on the production function, while the opposite result appears for job characteristics, especially looking to the impact of flexibility variables.

5. Conclusions

Some final considerations may be drawn from our work: firstly, wage flexibility appears to have a significant effect on effort and then on firm's productivity. It holds either with a standard proxy as the absenteeism, or with a more general concept as that of using a latent variable to describe effort. Secondly, white collars are more responsive to monetary incentives than blue collars. Finally we found that variables as the temporary contracts increases the feeling of precariousness inside the firm and reduce permanent workers' effort. Through the framework of production function we used, this reduce firm productivity.

[12]We also tried with the smaller sample of 570 observations we have in the 3SLS regressions and results are very close.
[13]We use the R package called sem, by Fox, 2006.
[14]We need to fix a constraint, for each equation containing a latent variable, otherwise the system is not identified.

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TABLE 1. Production function: 3SLS results*

Dependent variable: Value Added 2008

	Coefficient	Standard error
Labour input (E=eL)	0.841***	0.027
Physical Capital Stock	0.181***	0.018
Share temporary workers	-0.600**	0.268
Share white collars	0.436***	0.106
Share graduate workers	0.445**	0.181
Sectorial dummies		yes
Macro-regional dummies		yes
Observations		570
R^2		0.91
P-value CRS		0.17
P-value l=e		0.13

***,* indicate sign. at 1, 5 and 10%.

FIGURE 1. Estimation Outputs

TABLE 2. Effort equation*

Dependent variable: worker absenteeism 2008

	Coefficient	Standard error
Wage Flexibility		
Share variable wage premium white collars	0.134***	0.068
Share variable wage premium blue collars	-0.178***	0.078
Share other wage premium white collars	0.042	0.050
Share other wage premium blue collars	-0.008	0.048
Superminimum differentials	0.004*	0.002
Seniority differentials	-0.004	0.003
Numerical Flexibility		
Risk of dismissals	-0.026	0.027
Hirings	0.015**	0.007
Temporary hirings	-0.017***	0.006
Share of dependent workers 2007	-0.081**	0.036
Share of dependent workers 2007*Transitions to permanent	0.260***	0.098
Share of apprenticeship workers 2007	-0.023	0.044
Share of interinal workers 2007	0.000	0.005
Labour Force and firm characteristics		
Share of part time workers 2007	-0.043**	0.022
Presence of supervisors	0.002	0.005
Share women 2007	-0.046***	0.012
Share of white collars 2007	0.027***	0.010
Firm size 2008	-0.020***	0.008
Firm size squared 2008	0.001*	0.001
Institutional characteristics		
Dummy art. 18	-0.002	0.007
Unemployment rate 2006	0.0001	0.0001
Union rate	0.000	0.000
Sectorial dummies		yes
Macro-regional dummies		yes
Observations		570
R^2		0.19

***,* indicate sign. at 1, 5 and 10%.

TABLE 3. Production function with two labour inputs: 3SLS results*

Dependent variable: Value Added 2008

	Coefficient	Standard error
Labour Input$_{WHITE}(E = eL)$	0.495***	0.031
Labour Input$_{BLUE}(E = eL)$	0.295***	0.031
Physical Capital Stock	0.218***	0.020
Share temporary workers	-0.124	0.300
Share graduate workers	0.449*	0.260
Sectorial dummies		yes
Macro-regional dummies		yes
Observations		470
R^2		0.88
P-value CRS		0.78
P-value l=e		0.18

***,* indicate sign. at 1, 5 and 10%.

TABLE 4. Effort equation with two type of workers $1^{st}part$

Wage flexibility	Effort white collars 2008		Effort blue collars 2008	
	Coefficient	Standard error	Coefficient	Standard error
Share variable wage premium	0.127*	0.076	-0.112	0.080
Share other wage premium	0.140**	0.062	0.003	0.065
Super minimum differential	0.005*	0.003	0.002	0.003
Seniority differential	-0.006	0.004	-0.005	0.004
Numerical flexibility	Effort white collars		Effort blue collars	
	Coefficient	Standard error	Coefficient	Standard error
Risk of dismissions	-0.120***	0.043	-0.073*	0.042
Hiring rate	0.001	0.009	0.012	0.009
Share of temporary hiring	-0.007	0.008	-0.011	0.008
Turnover rate	-0.021	0.024	-0.014	0.023
Share of temporary workers	-0.107**	0.045	-0.142**	0.045
Share of temporary workers*transitions	0.430***	0.129	0.329***	0.128
Share of apprenticeship workers	-0.029	0.059	-0.028	0.059
Share of apprenticeship workers*transitions	0.077	0.379	-0.192	0.277
Share of collaborators	0.014	0.030	0.017	0.029
Share of interinal workers	-0.003	0.006	0.001	0.006

***,* indicate sign. at 1, 5 and 10%.

TABLE 5. Effort equation $2^{nd} part$

Institutional characteristics	Effort white collars		Effort blue collars	
	Coefficient	Standard error	Coefficient	Standard error
Art. 18	-0.011	0.009	-0.010	0.009
Union rate	0.001	0.001	0.001	0.001
Unemployment rate	0.004**	0.002	0.002	0.002
Metropolitan area	-0.003	0.006	-0.006	0.006
Presence of an industrial district	0.001	0.007	0.002	0.007
Dummy Centre	0.018	0.014	-0.011	0.014
Dummy North	0.027**	0.012	-0.004	0.012
Labour force and firm characteristics	Effort white collars		Effort blue collars	
	Coefficient	Standard error	Coefficient	Standard error
Share of part-time workers	-0.036	0.035	-0.062**	0.034
Presence of a supervisor	-0.002	0.007	-0.006	0.007
Share of women	-0.028*	0.017	-0.015	0.016
Share of white collars workers	-0.018	0.015	0.056***	0.015
Share of graduate workers	-0.012	0.025	-0.011	0.025
Firm size	-0.019*	0.011	-0.019*	0.011
Firm size^2	0.001	0.001	0.000	0.001
Sectorial dummies		yes		yes
Observations		470		470
R^2		0.15		0.18

***,* indicate sign. at 1, 5 and 10%.

TABLE 6. Production function: SEM results*

Dependent variable: per worker productivity 2008		
	Coefficient	Standard error
Stock of Labour	0.697***	0.021
Physical Capital Stock	0.264***	0.021
Share graduate workers	0.070***	0.015
Effort	0.093***	0.027
Effort determinants		
Wage flexibility	0.814**	0.372
Numerical flexibility	-0.467*	0.285
Labour force and firm characteristics	1.000	constraint
Wage flexibility exogenous observed variables		
Seniority differentials	0.218**	0.069
Superminimum differentials	0.171**	0.068
Share of variable wage premium	0.205**	0.068
Share of other variable premium	1.000	constraint
Numerical flexibility exogenous observed variables		
Share of fixed term workers	0.288***	0.060
Share of part-time workers	0.141**	0.071
Share of apprenticeship	1.000	constraint
Share of collaborators	0.044	0.072
Share of atypical workers	-0.076	0.071
Share fired or dismissed workers	-0.118*	0.070
Labour force and firm characteristics exogenous observed variables		
Share of white collars	1.000	constraint
Share of women	0.495***	0.057
Observations		758
Goodness of fit index		0.75
P-value model χ^2		0.000

***,* indicate sign. at 1, 5 and 10%.

SEM with latent effort