

# Why Hiring Temporary Workers?\*

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## **Abstract**

Hiring temporary workers can be viewed as a real option which allows firms to adjust labor input as economic conditions fluctuate and uncertainty about future demand increases. However, the “purchase price” of this real option may be, among other things, lower productivity. Using a panel of Italian manufacturing firms, along with a measure of demand uncertainty we test these two statements of the real option theory and we find supporting evidence for both. We conclude that, like financial options, temporary employment arrangements can be viewed as a costly instrument in terms of productivity, which however contributes to complete the market for risk.

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# 1 Introduction

Aimed at reducing unemployment rates, in the last decades, many European countries have undertaken a series of reforms in the labor market in order to increase flexibility “at the margin”. One strand of the literature focuses on the employment effect of such reforms trying to assess empirically if labor markets are segmented and/or whether a temporary employment is a stepping stone to find a suitable and permanent job in the future. Recently, increasing attention has been paid to the implications for the firms. Boeri and Garibaldi (2007) find a negative relationship between the share of closed-end contracts and firms’ productivity growth; they interpret this result in terms of a transitory increase in labour demand induced by the higher flexibility of temporary jobs, due to the fact that, under the decreasing marginal returns to labour hypothesis, firms hire increasingly less productive workers with this kind of contracts (the so-called “honeymoon effect”). They derive a model of labor demand with uncertainty, which encompasses a transition from a rigid to a two tier system. The introduction of the new regime, features a honeymoon effect that would involve an increase in the share of firms able to adjust their employment levels, a temporary positive effect on average employment, and a temporary negative effect on average productivity. They test their model’s predictions using on Italian data from the Work Histories Italian Panel (WHIP), the Labor Force Survey (LFS) and two consecutive waves of the Mediocredito-Capitalia surveys from 1995 to 2000 (the same used by Lucidi, 2006). The authors find a robust, negative relationship between the stock of temporary workers and the change in firm’s productivity. Dolado and Stucchi (2008) based on Spanish data, find that higher shares of temporary workers decrease firms’ total factor productivity. On a symmetric perspective, Bird and Knopf (2005) analyze the effects of wrongful-discharge protections on earnings, profitability and efficiency of the US banking sector. They find that a higher employment protection legislation raises wages, reduces profits and lowers productivity in this sector. Using time and geographical variation in employment protection legislation Autor, Kerr and Kugler (2007) find that for the US, the introduction of employment protection legislation reduces productivity by distorting production choices. A higher employment protection legislation would trigger an excessively intensive capital deepening (with respect to optimal production function). However, they also find that that labour productivity rose substantially following adoption of new employment protection legislation. Based on UK data, Michie and Sheenan (2003)

find that the use of temporary workers along with little training (the so-called “low-road” practices to human resource management) is negatively correlated with productivity growth. A similar result is found by Kleinknecht et al (2006) for the Netherlands: the employment growth in the Eighties and in the Nineties, occurred by means of temporary workers, is followed by a remarkable productivity slowdown. Similarly, Acharya, Baghai and Subramanian (2009) find that strong dismissal laws appear to have a positive effect on the innovative pursuits of firms and their employees.

The results of the literature, which all confirm the negative relationship between temporary work arrangements and labor productivity impose, however, two simple related questions. Why firms hire temporary workers? Why do policy makers allow for closed-end contracts if they negatively affect productivity and reduce employment protection? The contribution of this paper is to show that temporary workers are a sort of real option for firms. Since hiring permanent workers implies irreversible costs due to employment protection legislation, when demand uncertainty increases firm may find convenient to postpone the decision to hire workers permanently. This idea is not new. Dixit and Pindyck proposed it in their textbook ‘Investment under uncertainty’ edited in 1994. They argue that in 1993 after the recession of early 1990s permanent full-time hiring increased slowly because a high level of uncertainty about future demand, which forced US firms to wait before make the commitment involved in hiring permanent workers. In the meantime they preferred to exploit the current profit opportunities using less irreversible and more costly methods of production, like temporary work (mainly in the form of employment-agency placement). Foote and Folta (2002) explicitly claim that the low productivity associated to hiring temporary workers is the cost of the real option of a lower degree of irreversibility.

The contribution of our paper is to test these conclusion with an empirical analysis based on a panel of Italian firms for which we have a measure of perceived demand uncertainty, along with a measure of productivity. To our knowledge, this is the first time that the relationship between uncertainty, firms’ workforce composition and productivity is empirically investigated on microdata on firms.

First, we examine firm’s decision about the size and the composition of the workforce - permanent and temporary - depending on a measure of the firm’s perceived demand variability. This information is collected by the Bank of Italy’s Survey on industrial firms

with at least 20 employees (INVIND) and has been used, for instance, to show how capital investments respond to firm-specific uncertainty (e.g. Guiso and Parigi, 1999). We look at a panel of Italian industrial firms observed from 1999 to 2009. Second, we show that firms whose share of temporary workers on total workforce is higher are characterized by lower productivity, measured by the ratio between value added and total employment. Our empirical specification is particularly robust to model specifications and endogeneity issues, as we use also an instrumental variable approach, with two instruments for the choice of employing temporary workers, namely: (1) a fiscal incentive for hiring permanent workers established by Italian government from 2001 to 2006 with some time and geographical variability; (2) a measure of sectoral aggregate uncertainty. According to our estimates, because of the increase in uncertainty between the end of 2008 and the beginning of 2009, the share of temporary workers in total firm employees raised by 3 percentage points. This increase implied a reduction of labour productivity by 1 per cent. Thus, at least 0.25 per cent out of the 4 per cent decline recorded in the sample average productivity in 2008 can be attributed to the rise in the weight of temporary workers in total workforce.

## 2 Data and evidence

To test the impact of the use of closed-end contracts on firm's performance, we use Italian data from the yearly Survey on Firms (INVIND) conducted since 1986 by the Bank of Italy on a representative sample of Italian firms of the industrial and service sectors with 20 employees or more (50 employees before 2000). The survey collects information on investments, sales, ICT expenditure, price changes, firm's strategies, and reports also detailed information on employment, such as yearly average employment and the total number of employees at the end of the previous year, employment composition (permanent vs. temporary workers, available from 1999 onwards) at the end of the previous year and the total number of hires and job separations during the previous year. The survey does not provide measures of value added, but it can be easily recovered with a matching with balance sheet information included in CERVED, a database of detailed information on a large sample population of Italian companies. The INVIND survey is conducted each year between January and March. Together with information on the reference year, which is

the year prior to the survey, firms are also required to report their expectations for the current year, like the expected percentage increase of total turnover for the current year and the expected percentage price change. They are also required to confirm that the difference between the percentage change of nominal sales and the expected price change is a measure of their expected real demand change. Finally they are asked to report an upper and a lower bound for their expected real demand change. These bounds can be used to proxy the variability of the expected demand, which is bounded from above by the squared of the difference between the upper and the lower bounds. These will be our proxies for uncertainty.

We select only firms of the manufacturing industry and, combining subsequent waves of the surveys we build a panel for the 1999-2009 period. Figures 1 and 2 report the distributions of expected demand and our measure of uncertainty by the reference year of the interview but corresponds to expectations for the next year. They show that firms uncertainty remained slightly constant from 1999 to 2007 and then increased a lot in 2008 to decline again slightly in 2009. Table 1 reports the characteristics of the sample used in the empirical analysis and some statistics on the variables we use: total hiring, hirings of temporary workers, total workforce and labor productivity (the ratio of value added to total employment) The sample size ranges from about 900 firms in 1999 to roughly 2,000 in 2009 (Table 1). Data on uncertainty and expected demand have several missing values, but they are likely to be at random, according to a standard Kruskal-Wallis test of equality of the populations of respondent and non-respondent firms.<sup>1</sup>

Figure 3 plots the sample average of the total number of hires in a given year (on total workforce), the hirings of permanent workers on total workforce and uncertainty over the next year demand growth. The x-axis reports the reference year for hirings, while uncertainty refers to expectations on the next year. Figure 4 reports the share of temporary workers on total workforce (average) and uncertainty; similarly, Figure 5 reports the log of productivity (average) and uncertainty. First, average uncertainty remained roughly constant between 1999 and 2006, but doubled at the beginning of 2009 and decreased in 2010, to a level which was 90 per cent higher than the average of the period 1999-2006. Second, while Figure 3 and 5 do not show any striking correlation between uncertainty and hirings, Figure 4 reveals a very high correlation between uncertainty and the share

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<sup>1</sup> Test conducted on firms' total employment, sales, share of temporary workers.

of temporary workers. This piece of evidence is supportive of the real option theory.<sup>2</sup>

### 3 The impact of uncertainty on firms' workforce

In this section we present evidence to support the hypothesis that uncertainty on future demand conditions affects labour demand and discourage firms to hire permanent workers. In the presence of stringent employment protection legislation, hiring permanent workers can be compared to a irreversible investment, as they cannot be fired as demand conditions get worse. If this hypothesis holds true, we should find that firms' uncertainty is negatively correlated to total hirings and to hirings of permanent workers. Evidence on these finding is presented in sections 3.1 and 3.2. Instead, if temporary workers are hired to allow firms to exploit current demand opportunities in a context of high uncertainty on future demand, the correlation between uncertainty and the share of temporary workers in total workforce should instead be positive. This hypothesis is tested in section 3.3.

#### 3.1 Total hirings

Table 2 reports the estimates of the total number of hirings over total workers as a function of perceived uncertainty. We use a dynamic panel specification as a standard Sargan test supports the hypothesis that residuals have a first order autocorrelation. Our estimator is a standard Arellano-Bond GMM-type estimator.<sup>3</sup> The first column of Table 2 presents our basic specification. According to the real option theory, firms which face higher expected uncertainty tend to reduce total hirings. This is exactly what we find. All the coefficients are highly significant.

If product markets are fully competitive, output demand is exogenous and our estimates have a causal interpretation. However, under different assumptions, for instance monopolistic competition, firms may influence product demand and total hirings and uncertainty might be endogenously determined. In columns (2)-(5) we present GMM estimates which include instrumental variables. The first instrument we use is the standard deviation of the percentage change in value added between time  $t$  and  $t + 1$ . For each firm

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<sup>2</sup> In our sample the share of temporary workers in total workforce increases by slightly more than 1 percentage points between 2007 and 2009, and then decline by 2 percentage points in 2009. These changes are larger than the ones depicted by official statistics.

<sup>3</sup> We use lag 1 and 2 of the dependent variable and of our measure of uncertainty as instruments.

included in CERVED we have calculated the percentage change in value added between time  $t$  and  $t + 1$  and then, for each sector we have calculated the standard deviation. Because very large firms included in INVIND might still influence sectoral demand changes, sectors are broadly defined (ISIC 2-digit code). Our hypothesis is that aggregate expected risk affects firms' uncertainty but not hirings. Since we do not aggregate uncertainty at the sectoral level, we proxy it with a measure of demand variability between time  $t$  and  $t + 1$ .<sup>4</sup> The use of this instrument for firms' uncertainty does not affect the main findings: the total number of hirings is still negatively associated to uncertainty (column (2)). Finally in column (3) we include also expected demand percentage change (in real terms). Using the same approach followed in the estimates of column (2) we include a second instrument, i.e. the average of the percentage change in value added between  $t$  and  $t + 1$  (calculated, as before, for broadly defined sectors). As suggested by the real option theory, total hirings are positively correlated to expectations about demand growth and negatively with uncertainty (all the coefficients are highly significant). These results are robust to several robustness checks, carried out not only by including other controls like geographical and time dummies, but also by testing model specifications.<sup>5</sup>

According to our estimates, the increase in average uncertainty recorded between the beginning of 2008 and 2009 (from .015 to .025) implied a 2 percentage point reduction in the ratio between hirings and workforce. This translates in a 16 per cent reduction in total labour demand, a figure which is fully consistent with aggregate data on flows into employment coming from official statistics, like the Italian Labor Force Survey.

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<sup>4</sup> This instrument is added to lag 1 and 2 of the dependent and the independent variables. Since realized variance might have an autoregressive component, we have also carried out an additional exercise, in non-reported estimates we have also used the residual of expected variance in a regression including time and sectoral dummies. Results are unchanged.

<sup>5</sup> Since a GMM-type estimator imposes a lot of restrictions to the model, we have also carried out simple static panel estimates with fixed effects and static panel estimates with instrumental variables. All the models confirms the existence of a negative correlation between hirings and demand uncertainty. Results are available upon request. Other variables like investments per workers, which might affect hiring decisions, are not concluded in the main estimates as they are potentially endogenous to the size and the composition of the workforce. Their inclusion however does not have a impact on the estimated coefficient of uncertainty.

## 3.2 Hirings of permanent workers

The first 3 columns of Table 3 has the same structure of Table 2 and confirm the existence of a negative relationship between uncertainty and hirings of permanent workers. The magnitude of the effect is very similar to the one concerning total hirings. The fourth column of the Table reports an additional exercise which can be viewed as an indirect confirmation of the real option theory. According to this theory, which has been developed mainly to firms' investment decisions, fiscal incentives to invest aimed at reducing the costs of irreversibility are a good instrument to stimulate investments under uncertainty. In Italy in 2001 a similar policy was implemented for the hiring of permanent workers. Worried by the rapid increase of fixed term contracts following the reforms of 1997, in 2000 the Italian Government drastically reduced social contributions paid by firms for newly hired permanent workers aged no less than 25 and and not working with an open-end contract in the 24 months prior her/his hiring. This new tax credit applied to all new hires taking place from October 2000 on. A firm was eligible if the newly hired worker increased the overall number of permanent employees over the average recorded the previous year. Because of severe budget constraints, in 2003 the Italian government reduced the benefit and its automatism. In 2007 this benefit was completely turned off.

It is widely believed that this tax rebate was very generous, especially for firms located in Southern Italy, where the benefit was 50% higher than in other regions.<sup>6</sup> We define a variable equal to 0 in the years when the fiscal incentive was not in place and that it is equal to the tax rebate (by geographical area and normalized by the maximum value paid) from 2001 to 2006. Other things equal, fiscal incentives should positively affect hirings of permanent workers. This is what we find in the fourth column of Table 3, which includes also time and geographical dummies to isolate the effect of the fiscal incentives from area and time trends. The sign and the magnitude of our measure of uncertainty remain substantially unchanged. Also for these estimates we have carried out several robustness checks (see also footnote 5).

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<sup>6</sup> Cipollone and Guelfi (2003) show that firms used this subsidy to hire under open-end contracts primarily those workers who would have been hired under such a contract regardless the subsidy, even though after a short transition into temporary employment. Also their findings are consistent with real option theory. Under uncertainty on workers' skills, temporary work arrangements can be viewed as a call option which give to firms the right to hire a worker with an open-ended contract only after having observed their productivity. If the cost of irreversibility decreases substantially because of the fiscal incentives, firms might prefer to do not buy this option and hire workers with an open-end contract.



### 3.3 Total workforce composition

Table 4 reports the same estimates presented in the previous sections for the share of temporary workers over total workforce; it confirms the existence of a positive association between uncertainty and the use of a flexible workforce. According to the results, because of the increase in uncertainty at the beginning of 2009, the share of temporary workers in total firm employees raised by 3 percentage points. The second column of the Table reports the effect of fiscal incentives on the share of temporary workers employed by firms, which is positive and highly significant. As a first approximation one should expect the opposite sign.

In Column (3) the dependent variable is the number of hires of permanent workers normalized by the number of permanent employees the previous year. This regression confirms that the fiscal incentive to hiring permanent workers had a positive effect on the growth rate of number of permanent workers at the firm level. In Column (4) the dependent variable is the ratio between the hires of temporary workers over total temporary employees the previous year and consistently with column (2), the sign of the variable representing fiscal incentives is positive. To interpret this counterintuitive result one should keep in mind that the fiscal incentive was assigned to firms if they increased the number of permanent workers respect to the previous year, with no limits on workforce composition. The very high growth rate of temporary employment following the fiscal incentive to hire permanent workers can be explained if one assumes that firms, probably because credit constrained, used the tax rebate to increase the total workforce. Column (5) of the Table supports this hypothesis. Since INVIND includes information on credit constraints, it is possible to calculate a dummy equal to 1 if the firm would like to have higher bank debt than actual bank debt and 0 otherwise.<sup>7</sup> This variable is included in the estimates presented in Column (5), along with an interaction term between the fiscal incentive and the constrained status. The overall effect of fiscal incentives is negative as expected, but it is very high and positive for credit constrained firms. Column (5) helps then to interpret the findings reported in column (2). This evidence is compatible with aggregate figures on the development of permanent and temporary employment in Italy during the period 2001-2006. After the introduction of the fiscal incentive of 2001, the

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<sup>7</sup> The survey reports also motivations for the difference between actual and desired debt and it has been widely used as a measure of credit constraints, see Angelini and Generale (2008).

number of permanent workers begun to increase again after a 3-year period of a negative trend. However, also temporary employment kept rising and at the end of 2006, when the incentive was suspended, the share of temporary workers on total workforce was higher than in 2000. Both trends were stronger in the Southern regions, where the fiscal rebate was more generous. More importantly, Table 4 shows that the variable representing fiscal incentive is highly significant and it can be a valid instrument for modeling workforce composition, as we do in the following section.

## 4 Productivity

Are temporary workers an costly option? Recent literature has extensively coped with the relationship between temporary workers and productivity and their answer is positive. However, on the empirical side, results are mainly based on aggregate estimates on sectors or countries which undergone legislative changes in employment protection legislation (Autor, Kerr and Kugler, 2007). One of the main problem when carrying out estimates on microdata on firms is the endogeneity problem that arises because firm's decision on its workforce composition unquestionably affects productivity, but at the same time, this allocation is not independent of firm's characteristics. Moreover, from the firm's point of view, this decision implies an evident trade-off. On the one hand, this "external flexibility" may help firms to adjust labor rapidly and less costly to demand shifts, especially during economic downturns, so that the expected impact on productivity would be positive. On the other, firms may not find convenient to invest in on-the-job training of temporary workers preventing them to acquire those skills that are firm-specific (Acemoglu and Pischke, 1999), with negative effects on productivity.

In the previous section we showed that the use of temporary workers by firms grows as uncertainty about future demand increases. In this section we show that a rise in the share of temporary workers in total workforce reduces firms' productivity. The first column of Table 5 shows our baseline specification. Firm's labor productivity is a quite persistent phenomenon, as the coefficient is positive and highly significant. When we take into account the share of temporary workers (columns (2)-(4)), the negative relation between the use of closed-end contracts and productivity starts to emerge, and the coefficients are statistically significant. Columns (2)-(4) include the lagged value of the share of temporary

workers to control for possible autocorrelation in the dependent variable. The coefficient is positive but not significant (p-value around 20 per cent). Finally, alternative uses of the instruments, as in columns (3) and (4) do not affect these results. Our estimates suggest that, because of the 3 percentage points increase in the share of temporary workers led by the increase in uncertainty for demand in 2009, productivity declined by around 1 percentage point. In our sample, between the end of 2007 and the end of 2008, average productivity declined by 4 per cent. Our estimates suggest then that 0.25 per cent of this reduction is due to the rise in the weight of temporary workers in total workforce.

## 5 Conclusions

In this paper we tried to answer to a simple question? Why do firms hire temporary workers? What are the effects that those hirings on firm's performance? When employment protection legislation is stringent, hiring a permanent worker is like an irreversible investment. For the firm, opting for some degree of flexibility - hiring temporary workers - has with no doubt a cost: the other side of the coin is lower productivity.

At the time when closed-end contracts were first adopted, Europe witnessed high unemployment rates. These flexible job arrangements were successful in increasing employment. Nevertheless, firms may not find convenient to invest in on-the-job training of temporary workers, preventing them to acquire those firm-specific skills and employees subject to fixed term contracts are likely to exert a lower effort with respect to permanent workers performing the same task, unless they foresee a conversion of their contract into an open-end one. Now the economic landscape is different, but still characterized by a high degree of uncertainty, due to the increased level of competition, in particular from emerging countries. Firms need to preserve some margins of flexibility, but the presence of fiscal incentives to turn the closed-end contracts into permanent ones seem to be a viable way to address the "low-road" human resource management that bring about lower productivity (Michie and Sheenan, 2003) and the negative consequences for the worker of an unstable job arrangement.

Table 1: Sample characteristics in 1999, 2004 and 2009.

	1999	2004	2009
<b>(1) Total hires over workforce</b>			
Mean	0.126	0.120	0.078
St. dev.	0.134	0.144	0.129
Freq.	935	2842	2509
<b>(2) Hires of permanent w. over total workforce</b>			
Mean	0.061	0.061	0.038
St. dev.	0.288	0.107	0.135
Freq.	949	2922	2570
<b>(3) Hires of temporary w. over total hires</b>			
Mean	0.495	0.463	0.476
St. dev.	0.353	0.385	0.404
Freq.	902	2478	1877
<b>(4) Share of temporary workers</b>			
Mean	0.060	0.085	0.069
St. dev.	0.109	0.175	0.137
Freq.	949	2922	2570
<b>(5) Uncertainty</b>			
Mean	0.013	0.017	0.019
St. dev.	0.040	0.058	0.059
Freq.	672	1077	1437
<b>(6) Expected demand (perc. increase)</b>			
Mean	0.063	0.036	0.048
St. dev.	0.154	0.139	0.215
Freq.	870	1436	2032
<b>(7) Productivity</b>			
Mean	3.982	3.965	3.883
St. dev.	0.590	0.605	0.615
Freq.	722	2359	1962

Source: Authors' calculation on INVIND data. (1) Ratio between the number of hires during the reference year over total employment. (2) Ratio between the number of hires of permanent workers in the reference year over total employment in the same year. (3) Hires of temporary workers on total hires. (4) Ratio between the number of temporary workers in total workforce; (5) Squared of the difference between the upper and the lower bound for the real expected demand change in percentage terms. Sample averages. (6) Expected real demand change, in percentage terms sample average. (7) Log of the ratio between value added (derived form CERVED) and total employment.

Table 2: Total hirings and uncertainty. GMM estimates. Standard errors in brackets.

	<b>Ratio between total hirings and firm's workforce</b>		
	(1)	(2)	(3)
Dependent variable lag 1	0.451 (0.035)	0.376 (0.050)	0.414 (0.055)
Uncertainty	-0.242 (0.103)	-0.239 (0.137)	-0.227 (0.118)
Expected demand			0.069 (0.040)
Sector dummies	NO	YES	YES
IV:			
–Aggregate sectoral uncertainty	YES	YES	YES
–Aggregate sectoral demand	NO	NO	YES
No. Observations	9060	9060	9060
No. Groups	3452	3452	3452

Source: Authors' calculation on INVIND data. GMM estimates. In all models two lags of the dependent variable used as instruments, together with one lag of the independent variables. Uncertainty is equal to the squared of the difference between the upper and the lower bound for the real expected demand change in percentage terms. Expected demand is the firm's expectation of real demand change, in percentage terms. Sector dummies at ISIC 2-digits. Aggregate sectoral uncertainty equal to the standard deviation of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Aggregate sectoral demand equal to the average of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ .

Table 3: Hirings of permanent workers and uncertainty. GMM estimates. Standard errors in brackets.

	<b>Ratio between total hirings of permanent workers and firm's workforce</b>				
	(1)	(2)	(3)	(4)	(5)
Dependent variable lag 1	0.233 (0.026)	0.231 (0.037)	0.181 (0.034)	0.208 (0.026)	0.159 (0.032)
Uncertainty	-0.282 (0.100)	-0.216 (0.141)	-0.387 (0.103)	-0.207 (0.100)	-0.322 (0.096)
Expected demand			0.046 (0.027)		0.067 (0.024)
Fiscal incentives				0.024 (0.006)	0.031 (0.006)
Sector dummies	NO	YES	YES	NO	NO
Year dummies	NO	NO	NO	YES	YES
Geographical dummy: South	NO	NO	NO	YES	YES
IV:					
–Aggregate sectoral uncertainty	YES	YES	YES	YES	YES
–Aggregate sectoral demand	NO	NO	YES	NO	YES
No. Observations	9316	9316	7084	9316	9310
No. Groups	3528	3528	2729	3528	3518

Source: Authors' calculation on INVIND data. GMM estimates. In all models two lags of the dependent variable used as instruments, together with one lag of the independent variables. Uncertainty is equal to the squared of the difference between the upper and the lower bound for the real expected demand change in percentage terms. Expected demand is the firm's expectation of real demand change, in percentage terms. Sector dummies at ISIC 2-digits. Aggregate sectoral uncertainty equal to the standard deviation of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Aggregate sectoral demand equal to the average of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Fiscal incentives is a variable equal to 0 for the years of no fiscal incentive and equal to the fiscal incentive paid in the geographical area of the main branch of firm, normalized by the maximum incentive paid for the period 2001-2006.

Table 4: Hires of temporary workers, workforce composition, uncertainty and the effect of fiscal incentives. Standard errors in brackets.

	No. of temp. / total workforce		Hires perm. / total perm. previous year	Hires temp. / total temp. previous year	
	(1)	(2)	(3)	(4)	(5)
Dependent variable lag 1	0.303 (0.034)	0.246 (0.027)	0.042 (0.008)	-0.038 (0.0129)	-0.070 (0.016)
Uncertainty	0.382 (0.168)	0.305 (0.111)			
Expected demand					
Fiscal incentives		0.011 (0.004)	0.046 (0.017)	0.306 (0.156)	-0.348 (0.162)
Sector dummies	YES	NO	NO	NO	NO
Year dummies	YES	YES	YES	YES	YES
Dummy: South	NO	YES	YES	YES	YES
Dummy: Credit constrained					-0.024 (0.704)
Credit constr.* Fiscal inc.					1.649 (0.846)
IV:					
-Aggr. sect. uncertainty	YES	YES	NO	NO	NO
-Aggr. sect. demand	NO	NO	NO	NO	NO
No. Observations	9301	9301	9759	9759	9429
No. Groups	3525	3525	3312	3312	3255

Source: Authors' calculation on INVIND data. GMM estimates. In all models two lags of the dependent variable used as instruments, together with one lag of the independent variables. Uncertainty is equal to the squared of the difference between the upper and the lower bound for the real expected demand change in percentage terms. Expected demand is the firm's expectation of real demand change, in percentage terms. Sector dummies at ISIC 2-digits. Aggregate sectoral uncertainty equal to the standard deviation of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Aggregate sectoral demand equal to the average of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Fiscal incentives is a variable equal to 0 for the years of no fiscal incentive and equal to the fiscal incentive paid in the geographical area of the main branch of firm, normalized by the maximum incentive paid for the period 2001-2006.

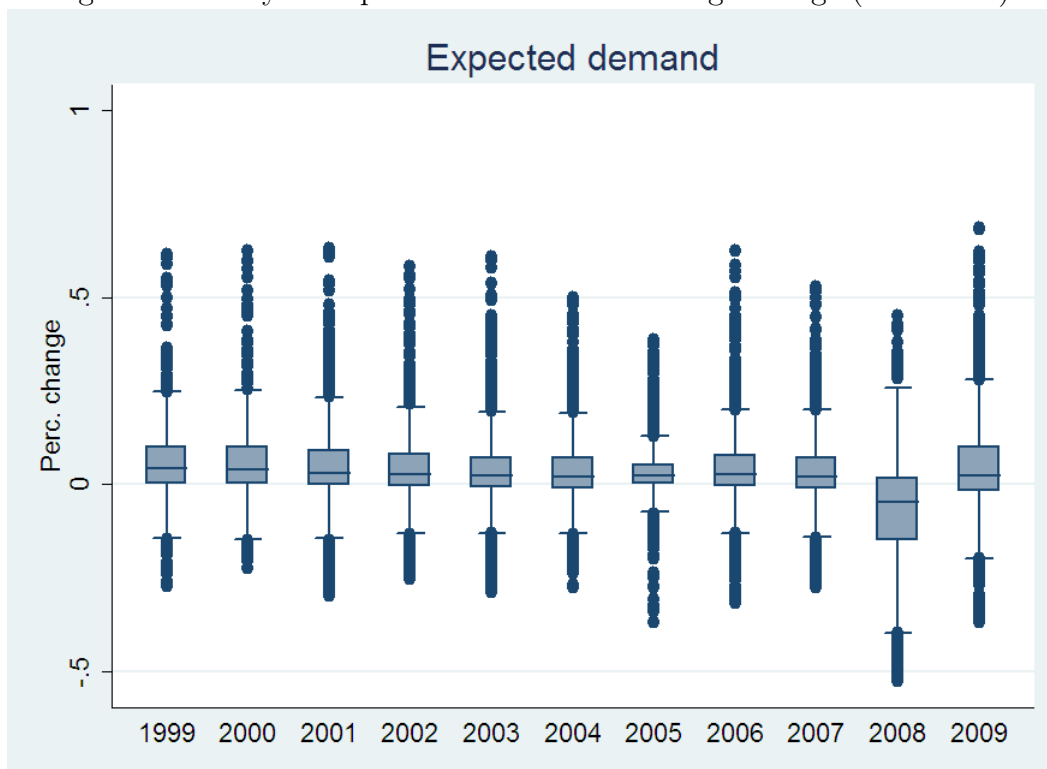
Table 5: Firm's productivity and temporary jobs (1999-2009). GMM estimates. Standard errors within brackets.

	<b>Productivity and share of temporary workers</b>			
	(1)	(2)	(3)	(4)
Dependent variable lag 1	0.433 (0.087)	0.322 (0.094)	0.339 (0.094)	0.339 (0.094)
Share of temporary workers	-0.232 (0.090)	-0.296 (0.104)	-0.289 (0.105)	-0.289 (0.105)
Share of temp. lag 1		0.048 (0.040)	0.047 (0.041)	0.047 (0.041)
Sector dummies	NO	NO	NO	YES
Year dummies	YES	YES	YES	YES
Geographical dummy: South	YES	YES	YES	YES
IV:				
–Fiscal incentives	NO	YES	YES	NO
–Aggregate sectoral uncertainty	NO	NO	NO	YES
No. Observations	14118	14113	14113	14113
No. Groups	3725	3725	3725	3725

Source: Authors' calculation on INVIND data. GMM estimates. In all models two lags of the dependent variable used as instruments, together with one lag of the independent variables. Uncertainty is equal to the squared of the difference between the upper and the lower bound for the real expected demand change in percentage terms. Expected demand is the firm's expectation of real demand change, in percentage terms. Sector dummies at ISIC 2-digits. Aggregate sectoral uncertainty equal to the standard deviation of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Aggregate sectoral demand equal to the average of the percentage change in value added of firms included in CERVED, by ISIC-2digits sector and at time  $t + 1$ . Fiscal incentives is a variable equal to 0 for the years of no fiscal incentive and equal to the fiscal incentive paid in the geographical area of the main branch of firm, normalized by the maximum incentive paid for the period 2001-2006.

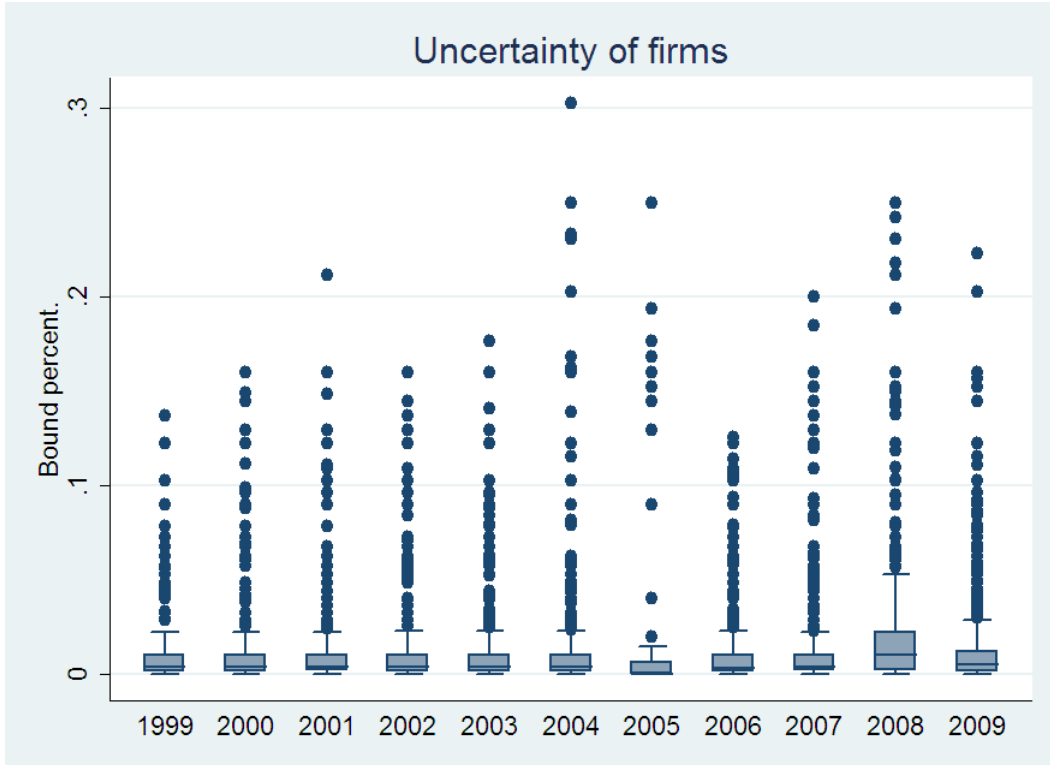


Figure 1: Next year expected demand. Percentage change (1999-2009).



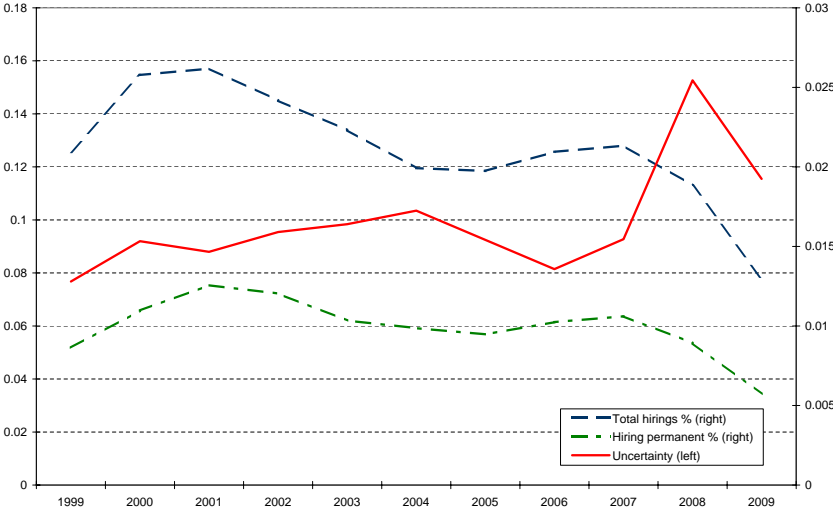
Source: Authors' calculations on INVIND data. The x-axis reports the reference year of the interview. Data on expected demand refer to the next year expectations. Expected real demand change, in percentage terms.

Figure 2: Next year expected uncertainty. Percentage change (1999-2009).



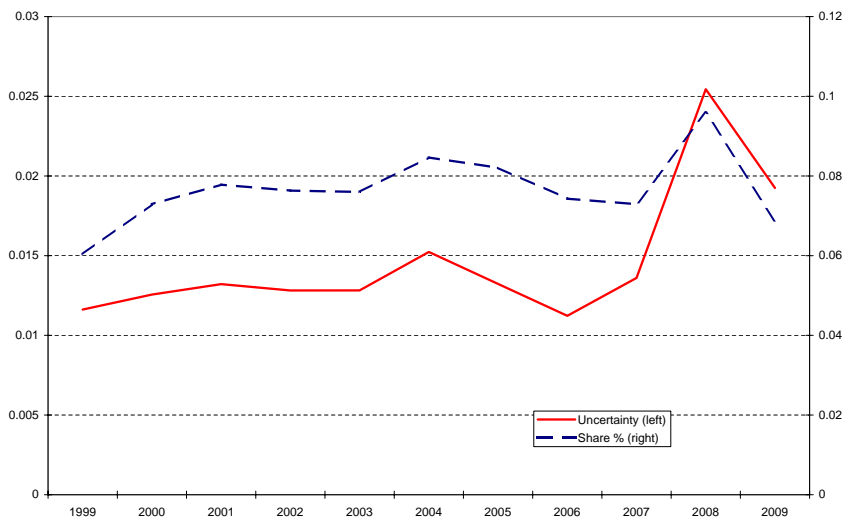
Source: Authors' calculations on INVIND data. The x-axis reports the reference year of the interview. Data on uncertainty refer to the next year expectations. Uncertainty is proxied by the squared of the difference between the upper and the lower bound for the real expected demand change, in percentage terms.

Figure 3: Total hirings on total workforce, Hirings of permanent workers on total workforce and uncertainty (1999-2009).



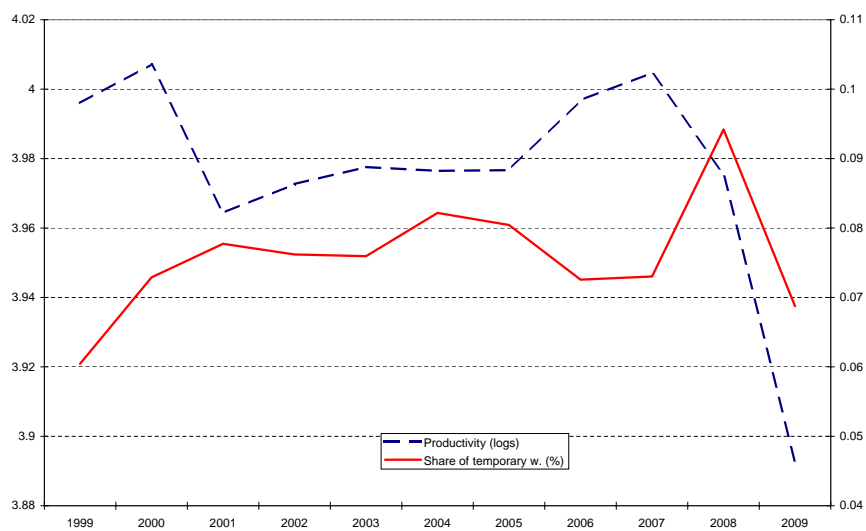
Source: Authors' calculations on INVIND data. The x-axis reports the reference year of hirings. Data on uncertainty refer to the next year.

Figure 4: Share of temporary workers on total workforce and uncertainty (1999-2009).



Source: Authors' calculations on INVIND data. The x-axis reports the reference year for data on employment composition. Data on uncertainty refer to the next year.

Figure 5: Productivity and share of temporary workers on total workforce (1999-2009).



Source: Authors' calculations on INVIND data. Productivity is measured as the log of the ratio between value added and total employment in the reference year. Uncertainty refer to the next year.