

The Effect of Product Market Competition on Job Instability

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Abstract

This paper assesses the impact of product market competition on job instability. Product market competition is measured by the price-cost margin, and job instability is proxied by the intensity of the use of temporary contracts. Using both worker data from the Spanish Labor Force Survey and firm data from the Spanish Business Strategies Survey, I show that job instability rises with competition. In particular, a one standard deviation increase in the level of competition decreases the probability that a temporary worker is made permanent in a given year by more than 40%. The effect is identified by means of exogenous shifts in competition within sectors brought about by changes in legislation.

JEL codes: J24, M51, C41, C33, C35, J6, L1

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1 Introduction

Product markets in Europe have become more competitive in recent years. The increase in competition is explained by several economic changes including globalization, market integration and privatization. According to the Eurobarometer, a European Union opinion survey, 52% of EU-15 citizens believe that globalization has a negative effect on employment in their countries, and 56% of them consider that the EU accession of 10 Central and Eastern European countries has contributed to job losses in their countries. Additionally, the privatization of traditionally protected firms has been associated with strikes in almost all countries¹.

In the economics literature, product market competition has been shown to increase employment and wages². If that is the case, why do citizens and trade unions so strongly oppose globalization, market integration and privatization? I propose an explanation based on the possibility that higher product market competition induces higher job instability. In particular, under more competition, workers are hired under less secure labor contracts that lead to more job instability.

In most European countries, labor contracts are either temporary (fixed-term) or permanent (open-ended). Fixed-term contracts are characterized by having a pre-determined duration, negligible firing costs and a maximum for the amount of time a worker can be sequentially hired under that type of contract. After that period expires, the firm has to discard the worker or offer her a permanent position. In contrast, permanent contracts have unlimited duration and higher firing costs. Then, the use of fixed-term contracts is a key indicator of job instability because they are not only associated with the actual probability of becoming unemployed, but also with a worker's perception of instability while employed which connects it directly to workers' welfare. Throughout this paper, I focus

¹See the reports from the European Industrial Relations Observatory which are available online at: <http://www.eurofound.europa.eu/eiro/index.htm>

²See for instance Nicoletti & Scarpetta (2005), Griffith et al. (2007) and Fiori et al. (2008) for empirical country-level analysis on the incidence of product market competition on employment and wages. For theoretical studies on the interactions between product market competition, employment and wages, see Blanchard and Giavazzi (2003) and Ebell and Haefke (2005).

on type of labor contract as an observable measure of job instability and complement the analysis with the study of transitions to unemployment.

The use of fixed-term contracts in Spain is the highest in Europe. Moreover, having a fixed-term contract is the main determinant of losing a job in Spain during the current economic crisis. In fact, this type of labor contract is found to be much more relevant than educational attainment, age, gender or nationality³. Additionally, De la Rica and Iza (2005) show that holding a fixed-term contract leads to a delay in marriage and parenthood. Thus, the quantitative and qualitative importance of type of labor contract in Spain justifies its use as a benchmark case.

After the creation of fixed-term contracts in 1984, there was a rapid increase in the proportion of fixed-term workers over total salaried workers in Spain. This proportion stabilized around 1992. Since then, the incidence of fixed-term contracts has remained relatively stable at around one third of salaried workers⁴ (see figure 1), despite the fact that the Spanish government has promoted several laws to reduce their use. Only under the recent economic crisis, the incidence of fixed-term contracts has decreased as a consequence of the overall reduction in employment, which has affected mainly temporary workers. Hence, the understanding of the determinants of the use of fixed-term contracts is of essential policy interest.

The apparent stability of the overall proportion of fixed-term contracts does not hold, however, when disaggregating the proportion of fixed-term contracts across sectors. Figure 2 displays the evolution of the proportion of fixed-term contracts over time for five different sectors, corresponding to the key percentiles of the distribution of the proportion of fixed-term contracts by industry. The sectors with the lowest and highest proportion of fixed-term over total workers are mining (10%) and agriculture (60%). Moreover, not only is there considerable variation in the average across sectors, there is also great variation in

³These conclusions are reflected in the quarterly bulletins of the Spanish Labor Observatory of the Crisis (Observatorio Laboral de la Crisis): <http://www.fedea.es/observatorio/>

⁴The average proportion of fixed term workers over total number of contracted workers in the European Union is 15%, according to data from Eurostat.

their time trends. For instance, between 1996 and 1997, while the recycling and medical equipment sectors experience a rise, the electronic material sector suffers a decrease in the proportion of temporary workers. This indicates that there is likely to be some factor varying across sectors and over time that affects the use of fixed-term contracts.

In this paper, I show that product market competition is an important factor behind the observed variation across sectors because product market competition has a causal impact on job instability as measured by the incidence of fixed-term contracts. The results show that a one standard deviation increase in the level of competition reduces the probability that a temporary worker becomes permanent in a given year by more than 40%, and it increases the probability of becoming unemployed by more than 3%. Additionally, I find that the elimination of barriers to entry such that one market transitions from legal monopoly to free entry induces a decrease of 17.8% in the probability of becoming permanent for workers hired under temporary contracts. These results are robust to the use of different individual databases as well as firm level data. They are also consistent across different measures of competition.

This paper is related to the literature on the impact of product market competition on labor market outcomes. It has been shown that product market competition induces certain improvements in the functioning of the labor market, mainly in outcomes related with efficiency. In particular, product market competition⁵ boosts productivity (Griffith, 2001), increases employment (Bertrand and Kramarz, 2002), increases executive incentives (Cuñat and Guadalupe, 2006), reduces gender discrimination (Heyman et al., 2008) and lowers race discrimination (Levine et al., 2008). In contrast, product market competition is

⁵Here I refer to product market competition. However, one must acknowledge that the concepts of product market competition differ greatly across studies. Griffith (2001) uses the implementation of the European Union Single Market Program as a quasi-experiment. Bertrand and Kramarz (2002) make use of changes in entry regulation as a source of increase in competition. Cuñat and Guadalupe (2006) study the effect of foreign competition as measured by import penetration. Levine et al. (2008) take advantage of bank deregulation to identify an exogenous intensification of competition. Heyman et al. (2008) use firms' takeovers as a determinant of increases in competition. Bertrand (2004) makes use of changes in exchange-rate movements to generate exogenous variation in import competition. Guadalupe (2007) applies two quasi-experiments based on an exogenous and sudden appreciation and the implementation of the European Union Single Market Program.

thought to have negative effects on labor market outcomes related to workers' welfare and inequality. Specifically, competition has been found to decrease wage insurance against the business cycle provided to workers by firms (Bertrand, 2004) and increase wage inequality (Guadalupe, 2007). The closest paper to this one is Goldberg et al. (1999). They study whether exchange-rate movements as inductors of changes in the competitiveness of US firms have an impact on job turnover as measured by the probability of job switching and the probability of industry switching. Their findings suggest no significant effect of dollar movements on job turnover. This paper is, to the best of my knowledge, the first to empirically address the effect of product market competition on job instability as measured by the type of labor contract as well as the first to study the interactions of type of labor contracts and product market competition in the context of a theoretical model.

In order to illustrate the importance of the question addressed here, I first propose a theoretical model that sheds light on the channels through which product market competition may affect transitions from fixed-term to permanent employment. When deciding on which workers to make permanent and which ones to keep as temporary, firms face a trade off between higher productivity and higher firing costs (permanent contracts allow the firm to keep the most productive workers but makes separation more costly)⁶. The degree to which firms are willing to pay more aggregate severance pay in exchange for higher productivity depends on the prevailing level of competition. This explains why competition may have an impact on the type of contract used by a firm. This model is, to the best of my knowledge, the first one to combine product market competition and type of labor contract. It takes into account the different dimensions of product market competition, namely, market size, product differentiation and entry cost, and includes important aspects of fixed-term contracts like: (i) their usefulness as screening device, (ii) the fact that fixed-term workers face a higher probability of separation from the firm,

⁶This trade off has been studied by Blanchard and Landier (2002). They claim that the difference in firing costs between permanent and temporary contracts is the reason why firms may be willing to sacrifice gains in productivity learned through screening.

and (iii) the difference in dismissal costs with respect to permanent contracts. The model predicts that in equilibrium, when the number of transitions to permanent contracts is low (high), more competition induces more (less) transitions. This can be interpreted as product market competition moving the transition rate towards some intermediate efficient value. Thus, empirical analysis is needed to clarify which is the direction of the impact of product market competition on the use of fixed-term and open-ended contracts in a specific setting.

The empirical estimation focuses on three related outcomes. Firstly, transitions from fixed-term to permanent contracts, which are particularly relevant because the vast majority of permanent contracts are acquired only after a period under a fixed-term contract in the same firm. Güell and Petrongolo (2007) find that more than 90% of new labor contracts registered in the Spanish National Employment Office are fixed-term contracts and Bover and Gomez (2004) report that exit rates from unemployment into temporary employment are ten times larger than exit rates into permanent employment. Secondly, the estimation of transitions from fixed-term to permanent contracts is complemented by an specification where the dependent variable is the proportion of fixed-term workers in the firm. Thirdly, transitions to unemployment constitute a complementary object of interest.

The causal impact of product market competition on job instability is identified by means of exogenous changes in legislation. In particular, I apply an instrumental variable strategy based on the impact of changes in anti-competitive legislation in key input sectors. Additionally, I also propose a quasi-natural experiment based on the implementation of the European Union Directives enhancing competition in Spain.

The remainder of the paper proceeds as follows. Section 2 presents the theoretical model that relates product market competition and transitions from fixed-term to permanent employment and which provides a framework for the empirical analysis. Section 3 presents the empirical methodology used, i.e., the instrumental variable approach and the quasi-experiment. Section 4 describes the databases in use, the construction of the

variables and the sample included in the analysis. Section 5 summarizes the empirical results and includes some robustness checks and extensions. Section 6 concludes.

2 Theoretical model

2.1 Setup

I propose a model that illustrates how the type of labor contract may be affected by product market competition. I focus on the use of temporary contracts as workers' screening devices. The possibility of using temporary contracts as a mechanism to screen the worker induces interactions of competition and type of contracts different from the ones between competition and employment.

This model interacts the product and labor markets through the cost function of the firm in the spirit of Raith (2003). There are two periods. In the first period, workers are hired under a fixed-term contract, production takes place, the firm learns the productivity of its matches with workers, firms compete in prices and profit realizes. In the second period, the firm decides which workers to make permanent and which ones to keep as fixed-term, exogenous separations occur, production takes place, firms compete in prices and second period profit realizes.

2.1.1 Product market

Labor is the only production input. The product market is modelled à la Salop. Firms are positioned symmetrically around a circle of circumference one. The circle is populated by consumers with a mass of m . Each consumer buys one unit of the good. Consumers prefer the variety closer to them and they incur in a transportation cost which is a proportion d of the distance between them and the firm they buy from. This transportation cost represents product differentiation. Firms enter the market freely up to the payment of a fixed cost, F . The unit cost is defined as $c_t = \bar{c} - a_t$ for each firm, where t reflects the period. This implies that in both periods there is a fixed unit cost \bar{c} that is reduced

according to a_t , the average productivity of workers employed in the firm in that period.

The model is solved by backward induction. Firstly, the profit function is optimized to get the optimal prices as in the ordinary Salop model. Secondly, the profit function conditional on choosing the optimal price is maximized with respect to the proportion of permanent contracts in the second period, to obtain the optimal contracting rule. The focus is on the decision on the type of labor contract that occurs in the second period. After computing the optimal prices and plugging them into the profit function, it results in:

$$\Pi = \pi_1 + \beta\pi_2 - F$$

where F is the entry cost, and first period profits, π_1 , are given by:

$$\pi_1 = \frac{md}{n} \left\{ \frac{1}{n} + \frac{n}{2d}(E(c) - \bar{c} + a_1) \right\}^2$$

where m stands for market size as defined above, d denotes product differentiation, n is the number of firms, $E(c)$ represents the expected value of other firms' costs, \bar{c} is a fixed unit cost, and a_1 denote the average labor productivity in period 1.

Similarly, second period profits, π_2 , are given by:

$$\pi_2 = \frac{md}{n} \left\{ \frac{1}{n} + \frac{n}{2d}(E(c) - \bar{c} + a_2) \right\}^2 - P$$

where a_2 denote the average productivity in period 2 and, P represents severance pay which is defined in the next subsection.

Note that profit increases with the difference between the expected value of other firms' costs and firm's unit costs. The extent to which this happens depends on the parameters of competition.

The level of competition in this framework is defined according to the value of market size, m , product differentiation, d , and entry cost, F . In particular, an increase in the level of competition occurs if market size, m , increases, product differentiation, d , decreases or the fixed cost, F , is reduced. The number of firms, n , is endogenous to the level of

competition.

2.1.2 Labor market

There are two types of employer-employee matches, high productivity and low productivity ones. Each of them induces a unit cost of $\bar{c} - \alpha_1$ or $\bar{c} - \alpha_2$, respectively, where $\alpha_1 > \alpha_2$. Actual unit cost is a linear combination of the unit cost induced by each type of worker with weights equal to the proportion of each type of worker in the firm. Each worker's productivity is unknown a priori. Workers are drawn from a discrete distribution of types such that the employer-employee match has productivity α_1 with probability p and productivity α_2 with probability $1 - p$.

There are two types of labor contracts, namely, temporary and permanent contracts. In the first period all workers have temporary contracts and in the second period, both types of contracts coexist. Workers leave the firm according to the exogenous separation rates l and s , for temporary and permanent workers, respectively, where $l > s$. This assumption tries to capture that permanent contracted workers are less likely to leave the firm, and hence firms can use permanent contracts to keep the most productive workers.

When a permanent worker leaves the firm, the firm has to provide her a severance pay. Let S stand for total severance pay if all workers were hired permanently and then replaced. Actual severance pay, P , is a proportion of S that depends on the proportion of high productivity matches, p , the proportion of high productivity matches which are offered a permanent contract, τ , and the separation rate for high productivity workers, s . In the event of a separation, a new worker is drawn from the same distribution of types as in the first period.

2.2 Finding the optimal contract rule

Which workers will be kept under a fixed-term contract and which ones will be offered an open-ended contract in the second period?. There are two potential optimal strategies for the firm:

1. Selection on high productivity matches: All low productivity workers are kept under temporary contracts and the firm decides on the proportion of high productivity workers to offer permanent contracts.
2. Selection on low productivity matches: All high productivity workers are offered permanent contracts and the firm decides on the proportion of low productivity workers to keep under permanent contracts.

Any case between those two would be suboptimal for the firm⁷. Hiring a high productivity worker using a temporary contract while hiring a low productivity worker under a permanent contract implies that expected productivity decreases while expected severance pay stays constant, with respect to the case where the high productivity worker is hired using a permanent contract and the low productivity worker is hired using a temporary contract.

Selection on high productivity matches is more profitable than selection on low productivity matches. In this case, more permanent contracts imply higher productivity but also higher expected severance pay. Some papers have addressed the existence of a causal link between productivity and fixed-term contracts. For the case of Spain, Dolado and Stucchi (2008) find that high conversion rates from temporary to permanent contracts increase a firm's productivity, while high shares of temporary contracts decrease it. Similar conclusions are reached by Boeri and Garibaldi (2007) for Italy and Engellandt and Riphahn (2005) for the Swiss case. Thus, we focus on case 1.

2.2.1 Solving the model

The proportion of high productivity matches employed under permanent contracts in period 2, τ , is our object of interest. When this proportion gets higher, productivity increases and so does severance pay. In particular, productivity and severance pay depend on τ according to the following expressions:

⁷Cipollone and Guelfi (2003) show that permanent workers are selected to be the most productive ones. This assumption has been also used in Cuñat and Caggese (2006).

$$E(a_2) = p\alpha_1 + (1-p)\alpha_2 + p(1-p)(l-s)(\alpha_1 - \alpha_2)\tau$$

$$P = p\tau sS$$

In this case, more high productivity workers with permanent contracts induces higher productivity because less high productivity matches will be replaced but it also induces higher total severance pay because more workers will be entitled to severance pay.

Substituting these expressions in the profit function, deriving with respect to τ and solving for τ , we obtain the value for the optimal proportion of permanent over total high productivity workers:

$$\tau = \frac{\left(\frac{1}{2} - p\right) (\alpha_1 - \alpha_2) + \frac{2d}{n^2} \left(1 - \frac{psS}{\frac{m}{n}p(1-p)(l-s)(\alpha_1 - \alpha_2)}\right)}{p(1-p)(l-s)(\alpha_1 - \alpha_2)}$$

Under perfect competition, d goes to zero and n goes to infinity. Hence, the efficient proportion of permanent high productivity workers is defined as:

$$\tau^e = \frac{\left(\frac{1}{2} - p\right) (\alpha_1 - \alpha_2)}{p(1-p)(l-s)(\alpha_1 - \alpha_2)}$$

Let A denote the ratio between the expected severance pay for a high productivity worker and the relative expected gain in productivity derived from hiring a high productivity worker under a permanent instead of a temporary contract. Analytically, this can be written as: $A = \frac{sS}{\frac{m}{n}(1-p)(l-s)(\alpha_1 - \alpha_2)}$. Note that, under perfect competition, the equilibrium proportion of permanent high productivity workers, τ , does not depend on A . However, when the market is not perfectly competitive, A bigger than one is associated with values of the proportion of permanent high productivity workers, τ , that are lower than the efficient value, τ^e , and A smaller than one is associated with values of the proportion of permanent high productivity workers, τ , that are higher than the efficient value, τ^e .

How do changes in product market competition affect the proportion of permanent high productivity workers, τ , when the market is not perfectly competitive?. Comparative statics with endogenous number of firms show that the impact of competition on the

proportion of high productivity workers hired under a permanent contract depends on the value of A according to the following table:

	$\frac{d\tau}{dC_d}$	$\frac{d\tau}{dC_m}$	$\frac{d\tau}{dC_F}$
$A < \frac{1}{2}$	-	-	-
$\frac{1}{2} \leq A < 2$	+	+	-
$A \geq 2$	+	+	+

where C_d , C_m and C_F represent the different aspects of competition as defined by d , m and F , respectively⁸.

To sum up, comparative statics show that product market competition increases the proportion of high productivity workers with permanent contracts, τ , if one of the following two conditions is satisfied: (i) $A < \frac{1}{2}$, i.e., severance pay is very low compared to the gain from retaining high quality workers or (ii) $\frac{1}{2} \leq A < 2$, i.e., severance pay is relatively low, and the increase in competition is driven by a reduction in entry costs. In all other cases, i.e., either if severance pay is very high, or if it is relatively high and the increase in competition is driven by a decrease in product differentiation or an increase in market size, more competition decreases job instability.

Therefore, low values of A imply high values of the proportion of permanent high productivity workers, τ , and are associated to more competition inducing a rise in the proportion of permanent high productivity workers, τ . In contrast, high values of A imply low values of the proportion of permanent high productivity workers, τ , and are associated to more competition inducing a fall in the proportion of permanent high productivity workers, τ . Intermediate values of A are associated to more ambiguous prediction. However, note that changes in competition also influence the value of A . In particular, A decreases with competition if it is induced by d or m , and increases with competition if it is induced by F . This implies that A low and high are the only stable values.

⁸This notation is introduced to ease interpretation. One can assume $C_d = -d$, $C_m = m$ and $C_F = -F$. And then, $\frac{d\tau}{dC_d}$, $\frac{d\tau}{dC_m}$ and $\frac{d\tau}{dC_F}$ represent the change in the proportion of permanent over total high productivity workers as a consequence of a marginal change in competition induced by d , m and F , respectively.

2.3 Implications

The theoretical framework makes explicit the trade off between productivity and severance pay that firms face when deciding whether to hire workers using fixed-term or open-ended contracts under heterogeneity in the quality of the employer-employee matches. In particular, all low productivity workers are kept under fixed-term contracts, while the firm decides on which high productivity workers to make permanent. Then, more permanent contracts induce more productivity and higher severance pay.

This model not only illustrates the channels through which product market competition may impact the use of labor contracts, it also provides some insights that help to interpret empirical facts. If in estimation, competition is found to reduce the proportion of high productivity workers that transition from fixed-term to open-ended contracts, this would be consistent with the case where $A < \frac{1}{2}$. In this case, the expected cost of having a permanent vs. a temporary worker is below half the relative expected loss in productivity of hiring a high productivity worker under a temporary instead of a permanent contract. Under this condition τ is relatively high. On the contrary, when $A \geq 2$, the equilibrium τ is relatively high and more competition induces more permanent contracts.

In general, the analysis of how the proportion of fixed-term workers that transition to open-ended contracts changes according to the parameters of competition, shows that competition is moving the transition rate τ towards some intermediate efficient value⁹. This is consistent with the general consensus on the existence of some steady-state composition of employment in terms of temporary and permanent employees as argued in Dolado et al (2002). Empirical analysis is needed to disentangle which is the situation that applies in practice.

⁹In particular, as competition goes to infinity, i.e., market size goes to infinity, unit transportation costs go to zero and entry costs go to zero, and then, the proportion of permanent high productivity workers approaches the value: $\tau^{opt} = \frac{(\frac{1}{2}-p)}{p(1-p)(l-s)}$

3 Empirical strategy

The aim of the empirical analysis is to address the direction and magnitude of the causal relationship between product market competition and job instability. In the main specification, transitions of individuals from temporary to permanent contracts are estimated as a function of variables measuring competition and a set of individual-level controls using the Spanish Labor Force Survey. This specification is complemented by another in which the proportion of permanent contracts in a firm is estimated as a function of variables measuring competition and a set of firm-level controls using the Business Strategies Survey.

3.1 Individual level analysis of transitions from temporary to permanent contracts

For the analysis performed at the individual level, the effect of competition on transitions from temporary to permanent contracts is estimated by means of a linear duration model where the equation of interest can be written as follows:

$$P(y_{ijt} = 1) = \beta_0 + \beta_1 C_{jt} + \beta_2 X_{ijt} + \beta_3 W_{jt} + \beta_4 V_j + \beta_5 Z_t + \varepsilon_{ijt} \quad (1)$$

where y_{ijt} is equal to one if individual i working in sector j transitions from fixed-term to permanent contract at year t , $P()$ represents the probability of the event in brackets happening, and C_{jt} is a measure of competition (see section 3.3 for details). With respect to controls, X_{ijt} includes individual characteristics, namely, age, a married indicator, a household head binary variable, a high school graduate and a university graduate dummy, number of coworkers, and fixed-term contract duration dummies (in years), W_{jt} stands for the sector-time average difference in wages between permanent and temporary workers, V_j represents a set of sector dummies, Z_t includes year and quarter dummies. Finally, ε_{ijt} is the residual.

The dependent variable varies at the individual, sector and time levels, while the

measure of competition varies only by sector and time. This could lead to misleading standard errors due to the fact that the identifying variation is lower than the variation existing at the individual level. To avoid this, standard errors are clustered at the sector-time level. In section 5.4, two-dimensional clustering is alternatively applied.

A shock in the level of product market competition may induce some indirect effects in addition to the direct impact of competition on job instability. In particular, competition may induce indirect effects by affecting the composition of the pool of workers in the industry, the degree to which workers switch between sectors and the sector composition of the economy.

Product market competition may induce changes in the composition of the sector's labor force in terms of observable as well as unobservable characteristics, and firms may then decide on the type of labor contract accordingly. In order to remove this indirect effect, several individual controls account for changes in workers' observed characteristics. Moreover, individual fixed effects are added in some specifications in order to average out the effect of individual unobserved time invariant traits. Individuals with "good" unobserved characteristics tend to transition to permanent employment first. Hence, the pool of workers that at each point in time are observed holding a fixed-term contract are the "worse" ones in terms of unobserved characteristics. This implies that stronger shocks to competition would be needed in order to alter their labor contracts and thus, ignoring this fact would result in weaker estimates.

Additionally, changes in product market competition may induce workers to switch across sectors, and sector switching may induce changes in type of labor contract. In particular, sector switching is often associated with a new fixed-term contract. In order to avoid this confounding effect on the results, the sample is restricted to individuals that do not switch sectors during the observation period. However, in section 5.4 I also report one specification that illustrates the differential impact of competition on switcher versus non-switchers.

Finally, competition may induce some general equilibrium effects that may ultimately

have an impact on type of labor contract. Workers may move across sectors as a result of competition shocks and therefore, the relative importance of each sector in the economy may change with the degree of competition. If the sectors that provide less permanent jobs expand (shrink), this leads to a decrease (increase) in the average transition rate. To prevent this from affecting my results, I weigh each observation using the ratio between the number of workers in the sector during the same quarter of the previous year and the number of workers at the time of the interview, in fact keeping the size of this sector unchanged¹⁰.

3.2 Firm level analysis of the proportion of permanent contracts

For the analysis performed at the firm level, the equation of interest is the following:

$$P_{fjt} = \beta_0 + \beta_1 C_{jt} + \beta_2 X_{fjt} + \beta_3 V_j + \beta_4 Z_t + U_f + \varepsilon_{fjt} \quad (2)$$

where P_{fjt} is the proportion of permanent over total contracted workers in firm f operating in sector j at year t , C_{jt} stands for a measure of competition. Regarding controls, X_{fjt} includes a set of firm controls, namely, number of workers, percentage of engineers and college graduates (separating long and short degrees), percentage of part-time permanent workers, ratio between blue and white collar workers, wages over production, workers training expenditures over production, severance pays over production, a dummy for merged firm, a dummy for split firm, a dummy for individual entrepreneur, R&D over production and percentage of public capital, V_j represents sector dummies, Z_t stands for year dummies, U_f includes firm fixed effects. Finally, ε_{fjt} is the residual.

Again the measure of competition varies at a higher level of aggregation than the dependent variable, hence estimated standard errors are clustered at the sector and time levels.

Product market competition may have an impact on the characteristics of the pool

¹⁰Theoretically the average of the weights should be close to one. In my sample, it is 0.985.

of firms that operate in a sector at each point in time. Hence, together with several firm characteristics, firm fixed effects are added to account for firm-specific time invariant features.

Analogously to the individual level regression, each observation is weighted according to the ratio between the number of workers in the sector during the previous year and the number of workers in the sector in the year of the interview and thus, the size of each sector remains constant.

3.3 Measuring competition

The measure of competition used in the main specification is the price-cost margin or Lerner Index. This is a standard measure of competition defined as the difference between price and marginal cost as a fraction of price. A higher magnitude of the price-cost margin is associated with lower product market competition.

The price-cost margin was shown by Boone (2001) to perform relatively well as a reflection of the level of product market competition under a variety of theoretical setups. In fact, this measure of competition fits well the theoretical characterization of competition used in this paper. In particular, in the context of the model, the price cost margin is decreasing in market size and increasing in product differentiation and entry costs. Moreover, this measure is found by Boone (2001) to be preferable to most other commonly used measures of competition like the concentration ratio or the inverse of the number of firms.

However, the price-cost margin presents one drawback. It implicitly assumes the existence of constant returns to scale in production. In particular, the measure is biased downward (upward) in the presence of increasing (decreasing) returns to scale. The inclusion of sector dummies in the empirical analysis mitigates the consequences of different levels of returns to scale between sectors since it is unlikely that the sector structure changes very quickly over time. Additionally, the year dummies would account for the existence of such changes at the economy level. In section 5.4, I provide evidence that

the main results still hold when using the concentration index as an alternative measure of competition.

3.4 Identification strategies

One of the main challenges that arise when estimating the impact of product market competition on the use of permanent contracts is the potential endogeneity of the competition measure. Endogeneity may be present for two reasons. Firstly, the use of permanent contracts in a sector may influence the entry of other firms, which modifies the level of competition in the sector (this would be endogeneity induced by reverse causality). Secondly, unobserved variables like technology may influence both the use of permanent contracts and the extent of competition in the sector (in this case, endogeneity would be motivated by omitted variables). To address endogeneity concerns I propose two different strategies, an instrumental variable approach and a quasi-experiment. Both are based on changes in legislation that induce arguably exogenous changes in competition.

3.4.1 Instrumental variables: The Regulatory Impact measure

As argued above, using the price-cost margin as a measure of competition is subject to a potential endogeneity problem. I propose the Regulatory Impact indicator provided by the OECD as an instrument for the price-cost margin in a sector.

The Regulatory Impact indicator measures the extent to which anti-competitive legislation in some intermediate goods sectors (namely, energy, transport, communications, retail distribution, business services and finance), impacts manufacturing final products sectors. The effect on each final products sector depends on the extent to which it uses the output produced by the intermediate goods sectors as inputs. The construction of this index is done in two steps: Firstly, information on barriers to entry, public ownership, vertical integration, market structure and price controls is collected for the energy, trans-

¹⁰The data on the Regulatory Impact indicator is publicly available at the Indicators of Product Market Regulation Homepage: http://www.oecd.org/document/1/0,3343,en_2649_34323_2367297_1_1_1_1,00.html

port, communications, retail distribution, business services and finance sectors. Then, the information is aggregated at the manufacturing sector level by using the intensity of use of each of those sectors as weights. The list of sectors for which this information is available is displayed in Table 1. A more detailed description of this indicator can be found in Conway and Nicoletti (2006). See Table 2 for descriptive statistics on the Regulatory Impact measure.

The idea underlying the use of this instrument is that the decrease in the costs associated with making the product available to more consumers (transportation, communication, etc.) has a key role in the increase in competition in recent years. Moreover, the decrease in those costs may have affected each of the final products sectors differently depending on the relative importance of these types of inputs in its production process. This is the source of the cross-sector variation of the instrument.

The decline in anti-competitive regulation in the above-mentioned intermediate goods sectors had a positive impact on competition as measured by the price-cost margin in the final products sectors¹¹. This goes in line with the previous argument. Still, this may seem contradictory because less regulation in an intermediate goods sector induces a fall in the price of output in that sector and therefore decreases the final products sectors' costs which will lead to higher price-cost margin, looking like less competition. However, firms adjust prices to changes in costs, and the extent of the adjustment of price-cost margin to changes in costs would capture precisely the intensity of competition.

Overall, changes in anti-competitive regulation have a substantial impact on the sectors to which the regulation applies. However, changes in regulation in a sector may still be endogenous when explaining the use of the different types of labor contracts within that sector if the government targets both the labor and product markets in one sector simultaneously. In contrast, changes in regulation in a sector are more likely to be exogenous with respect to the use of the different types of labor contracts in other sectors.

Additionally, changes in legislation in the intermediate goods sectors were motivated

¹¹This will be shown in the first stage regression displayed in Table 5.

by a worldwide trend towards economic liberalization of traditionally protected sectors and it is unlikely that the number of fixed-term vs. permanent contracts by final products sector and time in Spain was somehow correlated with these changes.

Moreover, the intensity of use of the outputs of the intermediate goods sectors as inputs by final products sectors is kept fixed over time at the initial level. Hence, we rule out that endogenous changes in the use of transport, communication, distribution services, etc. across sectors may be driving the results.

3.4.2 Quasi-experiment: The application of EU Directives in Spain

At the end of the 1990's, the Spanish government, following the indications of the European Union, promoted several laws to liberalize economic activity in sectors such as energy, post, telecommunications, road and rail transport, ports, and tobacco. The aim was to apply structural reforms to promote competition as well as to improve the quality of regulation. In practice, these reforms implied important reductions in the legal barriers to entry in the affected sectors.

The energy sector experienced very important legislative changes in 1997. A new law takes into account EU rules on the electricity single market and lays the foundations for a free market for electric power generation. Additionally, new laws in the gas sector eliminated some regulations concerning distribution at the retail level. Specifically, the percentage of the retail market open to consumer choice goes from 0 to 20 from 1996 to 1997.

The road and rail sector went through an increase in the level of competition from 1997 to 1998. The rail sector continues to be fully owned by public capital. However, the administration is divided into two different entities that compete in the same rail district in the passenger and freight transports markets and that are required to be more profitable because the EU Directive forces the government to reduce subsidies.

The post and telecom sector was subject to big competition legislation changes between 1998 and 1999. In 1997 a law was promoted intending the full liberalization of the

telecommunications sector in December 1998. However, it was not until January 1999 that the new law was enforced. The 1997 EU Directive on the liberalization of the postal services sector translated into the 1998 Spanish Law that liberalized some postal services starting in 1999. The OECD entry regulation indicator shows that the telephone markets became fully competitive in terms of entry regulation starting in 1999.

The total magnitude of the change in competition in these sectors can be approximated by the OECD indicator on barriers to entry¹². The barriers to entry decreased by 96.2% in the energy sector from 1996 to 1997, by 53.3% in the rail and road sector from 1997 to 1998 and by 85.9% in the post and telecom sector from 1998 to 1999. On the other hand, the airlines and retail distribution are reported to experience absolutely no change in their barriers to entry during the period of study. Therefore, they are chosen as control sectors¹³.

Then, using the changes in barriers to entry in the energy, rail and road and post and telecom sectors as exogenous measures of changes in product market competition, the resulting specification is equivalent to the one described in equation (1) where the vector denoted C_{jt} has three components, i.e., C_{jt}^1 , a dummy equal to one if an individual is employed in the energy sector in 1997 or after, C_{jt}^2 , a dummy equal to one if the individual is employed in the rail and road sector in 1998 or after and C_{jt}^3 , a dummy equal to one if the individual is employed in the post and telecom sector in 1999 or after. Positive coefficients associated to these three variables are interpreted as more competition inducing a higher probability of transition to a permanent contract. Additionally, the quasi-experiment specification allows me to control for individual fixed effects¹⁴.

As argued in section 3.1, the change in competition in the treated sectors indirectly

¹²The data on the barriers to entry by sector is publicly available at the Indicators of Product Market Regulation Homepage: http://www.oecd.org/document/1/0,3343,en_2649_34323_2367297_1_1_1_1,00.html

¹³There is no information on barriers to entry for the rest of sectors of the economy. As it is not possible to be sure whether each other sector belongs to the treatment or the control group, they are excluded from the sample.

¹⁴It is not possible to control for individual fixed effects in the instrumental variables approach due to lack of variation in the instrument.

affected other sectors in the economy, including the airlines and retail distribution sectors. Thus, the magnitude of the estimated impact is a lower bound for the total actual impact.

The timing of these reforms was unexpected. For instance, the OECD Annual Report (2001) asserts that "full liberalization in this sector [telecommunications] came in December 1998, eleven months after the EU target date but in advance of the extended deadline that Spain had negotiated". Additionally, incumbents in some sectors were unaware of the real extent of their application. "In early 1999, the Tribunal assessed substantial fines against the previous public monopoly, Telefónica – 580 million and 750 million Pesetas [8 million euros] – for abuse of dominance in basic and mobile telephony", OECD (2001). However, in the robustness checks section, I perform some placebo tests to illustrate that the effect of the reforms was not anticipated.

The exogenous nature of this quasi-experiment is originated in the Spanish government's resistance to the application of the EU anti-competitive Directives. The argument used by the Spanish government was that the Spanish economic structure was not ready for this sudden liberalization. However, external political pressures forced the government to promote the corresponding competition-enhancing laws ahead of schedule.

4 Data and descriptive statistics

4.1 Databases

Given the nature of the empirical question, it is necessary to combine information at the individual or firm level, at which the decisions on type of labor contracts are taken, with information at the sector level, at which product market competition operates.

i) The Spanish Labor Force Survey

The Spanish Labor Force Survey (Encuesta de la Población Activa) provides information on individual labor market status, type of labor contract, duration of current labor market status, duration of labor contract and many other personal and job characteristics

(excluding wage). This survey is collected on a quarterly frequency. It intends to be representative of the whole Spanish population. The initial sample size is 65000 families by quarter. In practice, this is reduced to 60000 effectively interviewed families that include approximately 180000 people.

Since 1987, the survey has a rotating panel structure where each family is interviewed a maximum of six consecutive quarters. The panel structure of the data is of key interest for the study of transitions. However, the panel version of the survey does not include information on industry at the 2-digits level. Therefore, I use the panel data resulting from the match of the cross-sections by means of the algorithm described in Jimenez and Peracchi (2002). This algorithm matches the cross-sections of the Spanish Labor Force Survey from 1993 to the second quarter of 2001. This matching procedure replicates the panel version of the Spanish Labor Force Survey perfectly and allows the researchers to have information on variables that are included in the cross-section but not in the panel.

The main drawback of the Labor Force Survey is that it does not include wages. To address this issue, average wages from the Continuous Sample of Working Histories are assigned to the individuals in the Spanish Labor Force Survey, as described next.

ii) Continuous Sample of Working Histories

The Continuous Sample of Working Histories (Muestra Continua de Vidas Laborales) includes register data for almost 1.1 million individuals that were in contact with the Social Security Administration at the time of the survey. In this paper, I use the 2004 wave, which includes individuals that were working, receiving benefits or pensions in 2004. It provides information on the entire working life histories of the selected individuals back to 1967. Information refers to individual, job and employer characteristics, including wages, which I use to construct average wage by sector, time and type of labor contract. These are then matched to the individuals in the Spanish Labor Force Survey. For a more detailed description of this data base and its application to transition analysis see García (2008).

iii) Business Strategies Survey

The Business Strategies Survey (Encuesta sobre Estrategias Empresariales) is an annual survey on a representative sample of Spanish manufacturing firms. The reference population are firms with 10 or more workers operating in the Spanish territory. It has a panel structure that covers the period from 1990 to 2006. In the base year, firms were chosen according to a sampling procedure that assigned weights depending on size. The composition of the sample has been maintained in all the subsequent years. Newly created firms have been added each year with the same sampling criteria as in the base year. Firms are followed even if they split or merge to another firm. The Business Strategies Survey includes information on 4355 firms with an average number of years in the sample of 12. It provides data on average characteristics of workers in the firm, firm characteristics, accounting data, economic sector and some competition measures.

This dataset allows me to complement the analysis at the individual level with an analysis at the firm level, as well as to compare the results using different measures of competition.

iv) Industrial Enterprise Survey

The Industrial Enterprise Survey (Encuesta de Empresas Industriales) is available since 1993. It includes information on firms whose main activity has an industrial nature and which are located in the Spanish territory. Its purpose is to collect information on structural and productive characteristics of the manufacturing sectors. The firms included in the sample are representative of the corresponding sector and size cell. It includes information on employment, revenues, costs, investment and other features at the sector level.

The accounting information provided in this survey is used to construct the price-cost margin by sector and year which is used as the main measure of competition in the empirical analysis.

v) OECD database

The OECD has developed a wide range of indicators that measure product market regulation by sector. They cover the period 1975-2003 and summarize the status of product market regulation for 36 different sectors in 21 OECD countries. The indicators collect information on several aspects of anti-competitive regulation. As Conway and Nicoletti (2006) state it, "these indicators measure the extent to which policy settings promote or inhibit competition in areas of the product market where competition is viable". In particular, they include information on barriers to entry, public ownership, vertical integration, market structure and price controls as well as the impact of anti-competitive regulation in some sectors on other sectors.

This information is used to identify changes in legislation that generate exogenous variation in the level of competition, which is essential for the empirical strategy.

4.2 Construction of variables

Transitions

The analysis focuses on workers' probability of transitioning from a fixed-term to an open-ended contract. The dependent variable is constructed using the Spanish Labor Force Survey and is equal to one if the worker transitions from a fixed-term to an open-ended contract during a given year and zero if the worker remains with a fixed-term contract. There is no contract identifier hence, it is not known whether two subsequent contracts are held in the same firm or not. For this reason, transitions are defined within sector instead of within firms. Additionally, there appears to be some measurement error because some contracts exceed the maximum legal duration of three years. I treat those observations as censored at the legal limit. This solution was also adopted by Güell and Petrongolo (2007).

Price-cost margin

The price-cost margin is defined as price over marginal cost divided by price. However, in practice there is no data on marginal costs. The standard solution is to proxy

the marginal cost using unit cost. In particular, the price-cost margin is computed as production revenue (price by quantity) minus production costs (unit cost by quantity) divided by production revenue. As quantity appears as common factor in the numerator and denominator, this is equivalent to price minus unit cost divided by price. I use the accounting data aggregated by sector and year provided in the Industrial Enterprise Survey to compute this variable.

Wages

In Spain, the majority of wages are set by collective bargaining and temporary contracts allow the employer to pay lower wages. Hence, it is important to control for average wage by year, sector and type of labor contract to avoid confounding lower wages and lower job security.

The Continuous Sample of Working Histories does not include actual wages but a top and bottom-coded version of wages. The limits correspond to the minimum and maximum wages subject to taxes each year. I use the algorithm described in Boldrin et al. (2004) to recover actual wages. The estimation of actual wages relies on the assumption that the true distribution of the logarithm of earnings is a normal distribution where the mean is a linear function of observed individual and job characteristics¹⁵. The censored values are replaced by the estimated conditional mean of wages.

4.3 Sample definition and descriptive statistics

The sample obtained from the Spanish Labor Force Survey includes men aged 16 to 64. For each individual, only the first and fifth interviews are kept in order to match the frequency of the data on product market competition, i.e., each individual is included at the time when she is first interviewed and in the same quarter of the following year.

For the specification estimating transitions from temporary to permanent employment, I keep only those workers observed having a fixed-term contract at some point in time.

¹⁵I include as individual characteristics age, and dummies for male, nationality, sector, temporary contract, region and year.

Additionally, I select only those individuals that do not switch sectors since switching may be endogenous to competition.

For the specification estimating transitions to unemployment, I keep only those individuals observed having a job at some point in time.

Table 1 displays the descriptive statistics of the sample from the Spanish Labor Force Survey used in the instrumental variable estimation. It shows that 7% of total observations are transitions from fixed-term to open-ended contracts. The average price-cost margin is 0.067 with a standard deviation of 0.031. The average Regulatory Impact is 0.16 with a standard deviation of 0.45. Table 2 represents the analogous descriptive statistics for the sample used in the quasi-experiment analysis. It shows that 6% of total observations are transitions from fixed-term to open-ended contracts and that 18.6% of total observations are treated.

The sample extracted from the Business Strategies Survey includes all firms whose degree of diversification does not exceed the two-digit level of sector aggregation which represent 91.63% of the sample. This is done for purely practical reasons in order to be able to assign each firm exclusively to one sector.

Table 3 displays the descriptive statistics of the sample from the Business Strategies Survey. The average proportion of salaried workers having a permanent contracts is 78.6%. The average price-cost margin is 0.366 with a standard deviation of 0.059. The average Regulatory Impact is 0.147 with a standard deviation of 0.059.

5 Empirical results

The theoretical model shows that there is an efficient value of the transition from fixed-term to open-ended contracts and that product market competition will induce more (less) transitions if the actual transition rate is lower (higher) than the efficient value. The objective of the empirical exercise is to provide an estimate for the causal impact of product market competition on the use of temporary versus permanent labor contracts.

Two different estimation strategies are proposed in order to overcome endogeneity, an instrumental variable strategy and a quasi-experiment. The instrumental variables analysis is performed using individual data from the Spanish Labor Force Survey as well as with firm level data from the Business Strategies Survey, while the quasi-experiment is performed only using individual data from the Spanish Labor Force Survey¹⁶. Additionally, some robustness checks are provided, and some extensions give further insights on the nature of the impact of competition on job instability.

5.1 Instrumental variables results

I estimate equation (1), by both OLS and IV using the Regulatory Impact as instrument for the price-cost margin. The dependent variable is equal to one if the individual transitions from a fixed-term to a permanent contract in a given year and zero otherwise.

The standard OLS results are displayed in Table 4. The price-cost margin is the variable used to measure the level of product market competition. When included in the regression, the price-cost margin is multiplied by minus one to ease interpretation in terms of competition. Results point at a positive but statistically insignificant relationship between competition and transitions from temporary to permanent employment.

The instrumental variable specification uses the price-cost margin as measure of competition and the Regulatory Impact indicator as instrument. The first stage (Table 5) reflects a negative correlation between regulation in the input-producing sectors and competition in the industries making use of those inputs¹⁷. Table 6 includes the second stage results.

Comparison of Table 4 and Table 6 evidences the necessity of accounting for endogeneity in this set up. OLS induced a positive bias in the coefficient that is coherent with the two potential sources of endogeneity. Firstly, industries where transitions from fixed-term

¹⁶The quasi-experiment is not performed using the Business Strategies Survey because the sectors affected in the quasi-experiment are not covered by the Business Strategies Survey.

¹⁷All regressions fulfill the criterium that the F-statistic of the excluded instruments is bigger than ten so the instrument is not weak.

to permanent employment often occur may be targeted by potential entrants that plan to compete by using cheaper labor contracts. Secondly, the introduction of technology that standardizes the production process may induce less transitions to permanent employment as well as less competition because the necessary investment in technology acts as a barrier to entry of new firms.

Comparing the columns in Table 6, the sequential introduction of time dummies and sector dummies highly modifies the coefficient towards more negative values. This gives us some intuition on the importance of accounting for common time trends as well as time invariant industry characteristics in this context. The application of the weights has only a small impact on the magnitude of the coefficient. If anything, the estimation using weights reflects a slightly weaker negative impact. This happens because the industries where the identifying variation occurs expand¹⁸.

The coefficient from the most complete specification including time dummies, sector dummies and weights (column 4) indicates that a one standard deviation increase in the level of product market competition decreases the probability of becoming permanent for a fixed-term worker by more than 40%¹⁹.

In the estimation performed using the Business Strategies Survey, the OLS results displayed in the first panel of Table 7 point at a negative impact of competition on the proportion of fixed-term contracts. When comparing those results with those from the instrumental variable estimation (second panel), one observes that the OLS results induce a bias towards zero. The magnitude of the effect becomes stronger when time and sector dummies are included. Therefore, the magnitude of the coefficient and the direction of

¹⁸This is coherent with the results obtained in the previous literature that shows that competition induces higher employment.

¹⁹The standard deviation of the price-cost margin is 0.031. Multiplied by the coefficient, -0.944, this gives the average absolute change in the proportion of permanent workers, which is -0.029. This is equivalent to a decrease of 42.029% in the average probability of transition.

This is a lower bound for the true effect because we expect that the estimated effect becomes stronger once we include individual fixed effects. This occurs because the omission of individual time invariant unobserved characteristics in the group of controls biases the coefficients for the other controls towards zero. Some evidence on this fact is discussed in section 5.2. Note that it is not possible to include individual fixed effects in the instrumental variable specification because the instrument weakens significantly once individual fixed effects are included.

the different biases are coherent with the specification using the Labor Force Survey. When firm fixed effects are included (column 5), the magnitude of the impact gets weaker although it is still negative and very significant²⁰.

The coefficient for the most complete estimation including time dummies, sector dummies, weights and firm fixed effects (column 5) indicates that a one standard deviation increase in the level of product market competition decreases the proportion of permanent workers in the firm by more than 18%²¹.

The effects of individual controls on the probability of transitioning from fixed-term to open-ended contracts are shown in Appendix B. They are fairly standard, and consistent with previous studies using logit estimates (see Alba, 1998) as well as competing risks duration model (see Güell and Petrongolo, 2007). Likewise Güell in Petrongolo (2007), results show two pronounced spikes at one and three years duration, coinciding with the legal limit for fixed-term contracts.

5.2 Quasi-experiment results

The results obtained by taking advantage of the quasi-experiment based on the application of competition-enhancing EU Directives are displayed in Table 8. The estimated coefficients for the impact of a rise in competition motivated by a decrease in legal barriers to entry on the probability of transiting from temporary to permanent employment are consistent across the three different treated sectors as well as with the instrumental variable specification. The introduction of time and sector dummies move the coefficients towards a stronger negative impact. However, the sign of the changes when weighting the observations is mixed.

²⁰However, the most complete specification (column 5) is the only one for which the instrument is not weak according to the Stock and Yogo test. In this case, the first stage is showing a positive correlation between the price-cost margin and the Regulatory Impact. This is coherent with the results obtained with individual data.

²¹The standard deviation of the price-cost margin is 0.059. Multiplied by the coefficient, -2.464, this gives the average absolute change in the proportion of permanent workers, which is 0.145. This is equivalent to a decrease of 18.45% in the average proportion of permanent workers.

As predicted, the estimation including individual fixed effects increases the magnitude of the coefficients substantially. This happens because individuals with "negative" unobserved characteristics would not become permanent even if the level of competition was very low. Moreover, individuals with very good unobserved characteristics would not stay under a fixed-term contract even if the level of competition was very high. Hence, controlling for individual specific characteristics results in a stronger estimate for the negative impact of product market competition on the probability of the transition from temporary to permanent employment. This suggests that the final coefficient obtained in the instrumental variables specification is a lower bound of the true effect.

In order to interpret the magnitude of the results, I also estimate an equation in which the competition measure is the interaction of a dummy for working in a treated sector in the post-treatment period with the proportion of removed legal barriers to entry in each sector according to the OECD²². This leads to a coefficient of -0.178, which indicates that the elimination of legal barriers to entry (the change from legal monopoly to free entry) induced a decrease of 17.8% in the probability of becoming permanent for workers hired under temporary contracts.

5.3 Unemployment results

The probability that a worker becomes unemployed is another dimension of job instability. It is also very related to the type of labor contract because fixed-term contracts are associated with a higher probability of job separation. However, keeping a worker under a fixed-term contract and discarding the worker could potentially be substitute strategies for the firm. Therefore, the impact of product market competition on unemployment is unknown a priori. The specification of interest is very similar to the one described by equation (1) where the outcome of interest, y_{ijt} , is now equal to one if individual i working in sector j at time t becomes unemployed in a given year. The set of individual

²²Barriers to entry decrease by 96% in the energy sector, by 86% in the post and telecom sector and by 53% in the rail and road sector, according to the OECD indicator on barriers to entry.

characteristics, X_{ijt} , includes, in addition to the controls in equation (1), a dummy for fixed-term contract and, in substitution of fixed-term contract duration dummies, job duration dummies in years. W_{jt} stands for sector-year average wages (instead of the difference in average wage between permanent and temporary labor contracts) in order to reflect the opportunity cost of keeping the worker.

The results obtained from the instrumental variable specification are shown in table 9²³. More product market competition induces a rise in the probability of becoming unemployed. An increase of competition in one standard deviation provokes a rise in the probability of becoming unemployed over 44%²⁴.

This conclusion is in line with the theoretical model proposed by Amable and Gatti (2004) in which an increase in product market competition boosts the separation rate, thus inducing a rise in unemployment.

5.4 Robustness checks and additional specifications

This section gives further evidence on the validity of the previous results as well as further insights on the nature of the effect of product market competition on the use of each type of labor contract²⁵.

Using the Continuous Sample of Working Histories instead of the Labor Force Survey

I perform a separate analysis of the transitions from fixed-term to open-ended contracts using the Continuous Sample of Working Histories. This specification improves on the one using the Spanish Labor Force Survey in that it is possible to study transitions within

²³When estimating the probability of job separation, there is no specification using the weights because job separation is one channel through which the sector composition of the economy changes. Hence, we are already addressing sector composition changes explicitly.

²⁴The standard deviation of the price-cost margin is 0.04. Multiplied by the coefficient, -0.211, this gives the average absolute change in the proportion of permanent workers, which is 0.008. This is equivalent to an increase of 44.44% in the average probability of job separation.

²⁵In addition to the specifications that are shown in this section, I have explored the existence of heterogeneity in the effect of product market competition on transitions to permanent employment across levels of education. The results point at a stronger effect of competition on the highest level of education. However, the difference in the impact of competition between education levels is not statistically significant.

the same firm instead of only within the same sector. However, information on type of labor contract is missing for a large proportion of individuals in the early years of the sample and this reduces the reliability of the estimates²⁶. Nevertheless, point estimates are very similar to the ones obtained using the Spanish Labor Force Survey²⁷.

Using alternative measures of competition

The price-cost margin has been chosen as the reference measure of competition because it has been shown to perform well under a variety of theoretical settings and moreover, it goes in line with the characterization of competition in the model. However, this measure presents two main drawbacks. Firstly, it is very difficult to compute the marginal cost that enters the formula of the price-cost margin and it needs to be approximated by the unit cost. And secondly, it assumes constant returns to scale. Hence, in order to assure that measurement error in the price-cost margin is not driving the results, an alternative measure of competition is used.

The level of product market competition has traditionally been measured using concentration indices. Those are defined as the proportion of the market served by the biggest firms. A higher magnitude of the index is associated with less competition. However, one should be careful when interpreting this measure. Although it is true that when markets differ in size or entry costs, higher concentration is associated to less competition, when markets differ in product differentiation, higher concentration indicates more competition. Some evidence on this fact can be found in Sutton (1991) and Symeonidis (2000).

The Business Strategies Survey includes information on a concentration index defined as the proportion of the market served by the four biggest firms in the sector²⁸. Table 10 displays the results from a regression of the proportion of permanent contracts in a firm on the concentration ratio and the same set of controls as specified in equation

²⁶The F of the excluded instruments in the first stage is 8.7. Hence it does not reach the threshold of 10 which is considered as a minimum requirement to reject the existence of weak instruments.

²⁷Results are available from the author upon request.

²⁸Unfortunately, the sector definitions are different for the Business Strategies survey and the Labor Force Survey. Hence, it is not possible to use the concentration index measure in the estimations using the individual data from the Labor Force Survey.

(2). Estimation results are analogous to the ones obtained using the price-cost margin as measure of competition (shown in Table 7).

Two dimensional cluster

Bertrand, Duflo and Mullainathan (2004) state that, in the presence of serial correlation in the outcome of study, difference-in-differences standard errors may understate the standard deviation of the estimated treatment effects. The transitions studied in this paper are very likely to be correlated across time because, for each individual, they are defined depending on the state of the individual in the previous period. A widely used alternative is to cluster the standard errors at the sector level instead of at the sector and time levels. However, in many cases, like this one, it is not feasible due to the small number of sectors. I propose instead two-dimensional cluster where one dimension is sector-time cells and the other one is the individual. This takes into account the correlation of errors within individuals over time as well as the correlation within sector-time cells which is the level of aggregation of the competition measures. Results are reflected in Table 11. They show that there is essentially no change in the level of significance of the estimates.

Validity of the quasi-experiment

As Imbens (2004) suggests, in the context of the difference-in-differences approach it is essential to provide some support for the validity of two assumptions: (i) overlap in the covariate distributions and (ii) exogeneity or unconfoundedness assumptions. The overlap in the covariate distribution assumption is checked by comparing the distributions of the covariates for the subgroups of treated and non-treated individuals. The unconfoundedness assumption states that the trend in the treated and control groups would have been the same in the absence of the treatment.

To address (i), Table 2 shows that the values of the covariates are not statistically different for workers employed in the treated and untreated sectors. With respect to (ii), Graph 3 presents some evidence that the pre-treatment trend was quite similar between treated and untreated sectors. The unconfoundedness assumption is usually tested by estimating regressions for alternative treatments that should result in a null effect. Thus,

I estimate the treatment effect on a pre-treatment variable. In particular, the regressions address the impact of the treatment on transitions from fixed-term to permanent contract a year before the treatment actually took place. The results of this placebo test are displayed in Table 12. The "placebo" effect is not significant on average.

Impact of competition on type of labor contract of individuals switching sector

I find that the level of product market competition increases the proportion of fixed-term contracts that are not converted into open-ended ones for workers that stay in the same sector. This is the closest we can set to a "pure" competition effect. However, competition may have an indirect impact on type of labor contract by inducing some individuals to move between sectors. As moving to a new sector is usually associated with a new fixed-term contract, this effect can be attributed to the change in competition in the sector of origin. I thus present an additional specification in which each individual is assigned to the sector where they are initially hired under a fixed-term contract, irrespective of whether they later switch sector or not. This allows to shed some light on the relative importance of the direct effect with respect to the indirect effect through sector switching. A dummy for switchers and an interaction of switcher and the competition measure are added to the original specification.

As shown in Table 13, the impact of competition is not statistically different between the group of switchers and non-switchers. If anything, the impact of competition is stronger in the group of switchers. Switching sectors reduces the probability of getting a permanent contract in the period immediately after the switch. Hence, in general, the probability of getting a permanent contract after a fixed-term contract is lower for switchers.

6 Conclusion

There is a very active literature on the impact of product market competition on labor market outcomes. This paper contributes to this literature by estimating the impact of

competition on job instability as measured by the probability of holding a permanent contract.

I propose a theoretical model that is, to the best of my knowledge, the first one to shed light on the relationship between competition and type of labor contract. In the context of the model, competition is characterized by market size, product differentiation and the cost of entry. Permanent contracts differ from fixed-term contracts in the probability of separation and the cost of dismissal. The model has a number of predictions that are consistent with the data: (i) Fixed-term and permanent contracts coexist in all sectors, (ii) Permanent workers are more productive than fixed-term workers, and (iii) Product market competition alters the degree of use of fixed-term and permanent contracts. In particular, when the transition rate to permanent contracts is low (high), more competition induces a rise (decrease) in the proportion of fixed-term contracts.

The empirical analysis focuses on Spain, which is the country with the highest incidence of fixed-term contracts in Europe. Combining data from the Spanish Labor Force Survey, the Continuous Sample of Working Histories, the Business Strategies Survey and the Industrial Enterprise Survey, job instability is shown to rise with competition. The result is robust to the use of different estimation strategies, databases, and measures of competition.

The empirical strategy makes use of changes in legislation as a source of exogenous variation in the level of product market competition in order to overcome endogeneity concerns. Exogeneity originates in (i) The impact of deregulation in some key sectors on the rest of the economy, and (ii) The enforcement of the EU Directives enhancing competition in Spain.

Overall, the results show that product market competition has a significant impact on job instability. In particular, one standard deviation increase in product market competition as measured by the price-cost margin induces a fall in the probability of a worker transiting from a fixed-term to a permanent contract in a given year over 40%, and an increase in the probability of a worker becoming unemployed of over 3%. The estimated

impact of competition on the type of labor contract is likely a lower bound on the true total effect. This happens because competition can also lead to changes in the type of labor contract for individuals who are induced to switch sector. As switching induces a lower probability of transiting to a permanent contract, the total effect would be higher.

Thus, the evidence is consistent with a direct contemporaneous causal effect of product market competition on job instability. However, the long run effects of changes in competition may be different from the ones found for the short run. For instance, if higher job instability induced by increases in competition allows firms to better screen the most productive workers, those may enjoy more stable positions in the long run. This question is left for future research.

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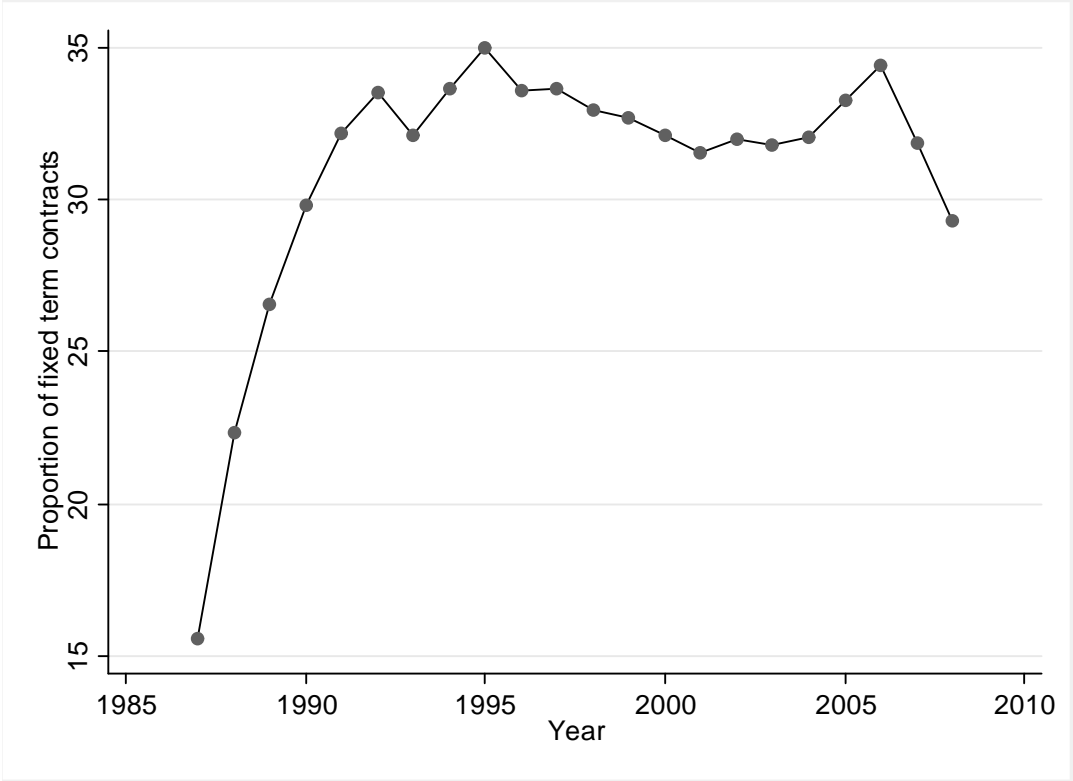
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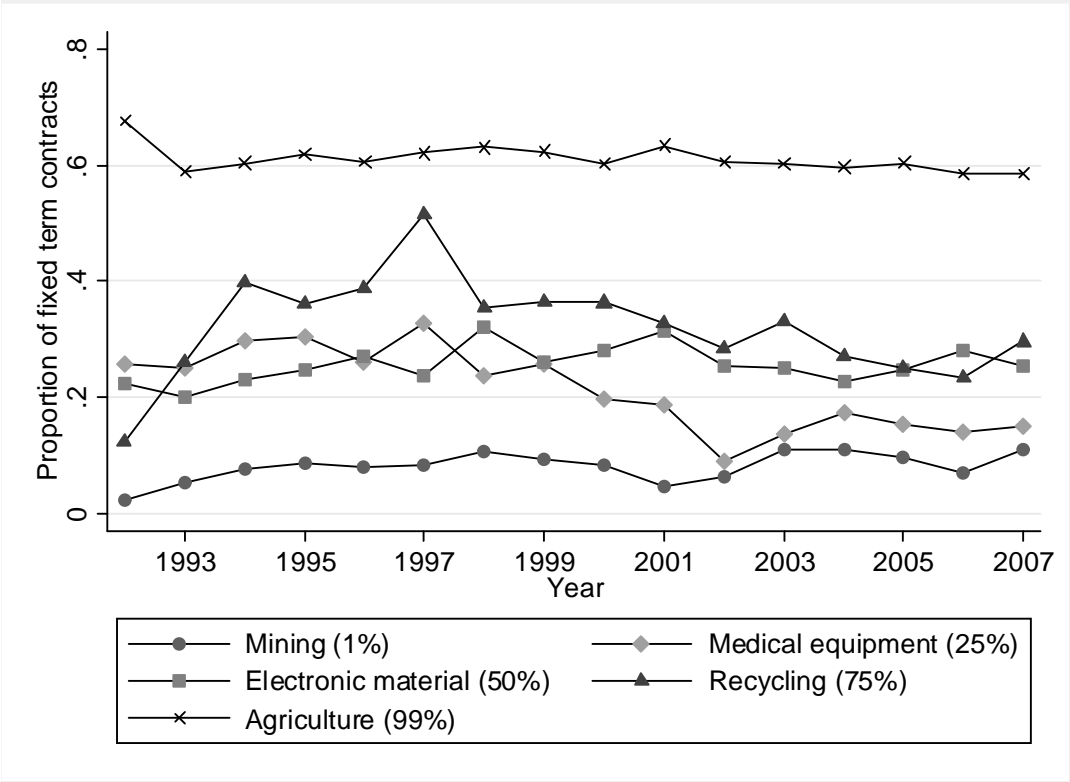
Figures

Figure 1: Proportion of fixed-term contracts over time in Spain



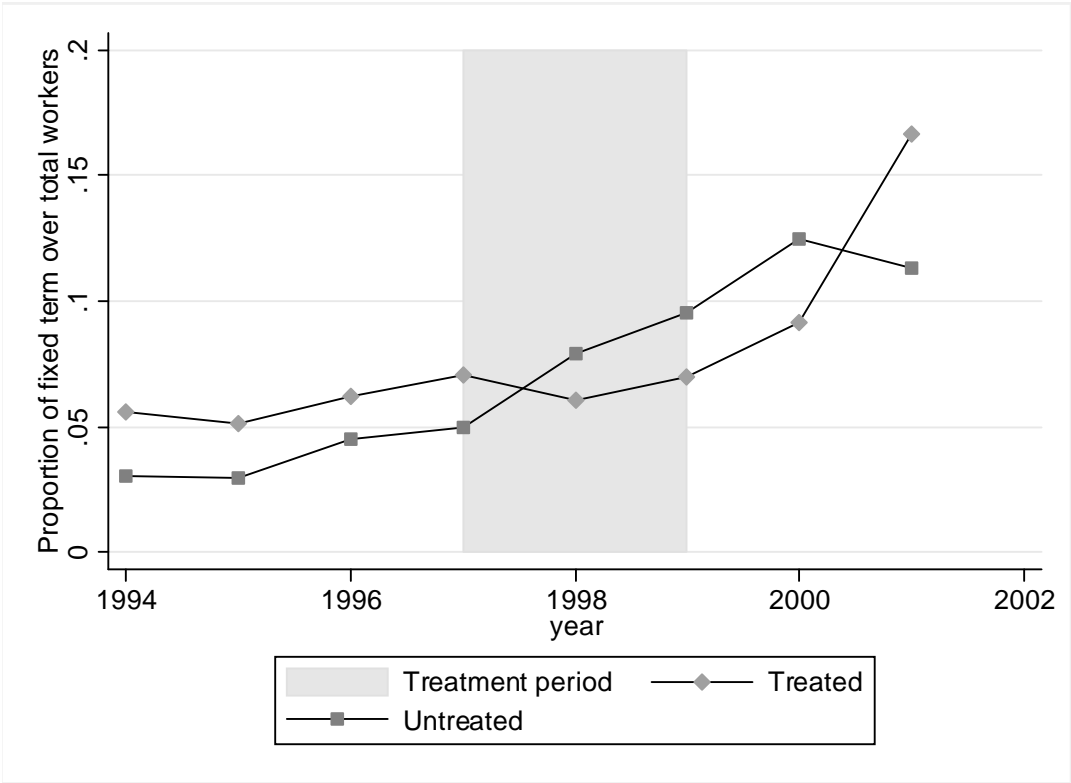
This graph plots average proportion of fixed term contracts over total number of labor contracts by year in Spain. Data is draw from the Eurostat. The period included is 1987-2007.

Figure 2: Proportion of fixed-term contracts over time by industry in Spain



This graph displays the evolution of the average proportion of fixed term contracts over time in five sectors. These five sectors represent the key percentiles of the distribution of average proportion of fixed term contracts by sector. Data is drawn from the Spanish Labor Force Survey. The sample includes contracted workers in the mining, medical equipment, electronic material, recycling and agriculture sectors from 1992 to 2007.

Figure 3: Time trends in the proportion of fixed-term over total employment for the treated and untreated sectors in the quasi-experiment using the Spanish Labor Force Survey



This graph displays the time trends for the average proportion of fixed term contracts over total number of labor contracts in the treated and the untreated sectors in the quasi-experiment estimation using the Spanish Labor Force Survey. The treated sectors are energy, rail&road and post&telecom and the untreated sectors are airlines and retail distribution. Data is drawn from the Spanish Labor Force Survey. The sample includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs (the sample sample that is used in the quasi-experiment estimation).

Tables

Table 1: Descriptive statistics for the instrumental variables estimation (Labor Force Survey)

	Mean	Sd	Min	Max
Transition to permanent contract	0.069	0.253	0	1
- Price-cost margin	-0.067	0.031	-0.269	0.045
- Regulatory Impact	-0.16	0.045	-0.546	-0.106
Age	29.102	9.734	16	64
Married	0.342	0.474	0	1
Household head	0.325	0.469	0	1
High school grad	0.7	0.458	0	1
University grad	0.06	0.238	0	1
Number of coworkers	53.039	35.995	1	100
One year fixed-term contract duration	0.329	0.47	0	1
Two years fixed-term contract duration	0.085	0.279	0	1
Three years fixed-term contract duration	0.022	0.147	0	1
Permanent vs. fixed-term wage difference	48506.77	16759.17	112.1641	129953.3
Region	6.571	4.363	1	18
Quarter	2.46	1.118	1	4
Year	1996.934	2.177	1993	2001
Sector	25.981	6.976	1	25

The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs. It comprises the period from 1993 to the second quarter of 2001. The industries included are listed in table B.1.

Table 2: Descriptive statistics for the quasi-experiment (Labor Force Survey)

	Full sample		Treated sectors		Control sectors	
	Mean	Sd	Mean	Sd	Mean	Sd
Transition to permanent contract	0.062	0.242	0.067	0.249	0.059	0.236
Energy after 1997	0.019	0.138	0.044	0.204	0	0
Rail&road after 1998	0.032	0.175	0.071	0.258	0	0
Post&telecom after 1999	0.135	0.342	0.305	0.461	0	0
Age	29.491	9.434	33.072	9.848	26.643	8.022
Married	0.357	0.479	0.518	0.5	0.228	0.42
Household head	0.332	0.471	0.489	0.5	0.207	0.405
High school grad	0.715	0.451	0.643	0.479	0.773	0.419
University grad	0.061	0.239	0.056	0.231	0.064	0.245
Number of coworkers	39.048	36.682	42.749	34.39	36.104	38.156
One year fixed-term contract duration	0.305	0.46	0.326	0.469	0.289	0.453
Two years fixed-term contract duration	0.088	0.283	0.092	0.29	0.085	0.279
Three years fixed-term contract duration	0.018	0.131	0.019	0.137	0.016	0.127
Permanent vs. fixed-term wage difference	49490.97	21557.95	58653.57	25745.05	42201.81	13687.55
Region	7.443	4.639	7.144	4.505	7.68	4.729
Quarter	2.454	1.112	2.48	1.117	2.434	1.108
Year	1996.826	2.222	1996.96	2.253	1996.719	2.191
Sector	55.316	5.247	59.17	5.692	52.251	1.564

There are 7798 in total, 4359 observations in the untreated sectors and 3467 in the treated sectors. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The industries included are energy, rail&road, post&telecom, airline and retail. The airline and retail industries serve as controls.

Table 3: Descriptive statistics for the instrumental variables estimation (Survey of Business Strategies)

	Mean	Sd	Min	Max
Proportion of permanent workers	0.786	0.247	0	1
- Price cost margin	-0.366	0.059	-0.504	-0.179
- Regulatory Impact	-0.147	0.021	-0.2	-0.099
Number of workers	225.885	546.304	1	14390
Percentage of university grads (long degree)	3.82	6.358	0	88
Percentage of university grads (short degree)	5.096	7.945	0	100
Percentage of part-time workers	1.602	6.75	0	100
Blue over white collar workers	0.37	2.823	0	216
Wages over production	0.287	0.239	0.013	12.569
Training expenditures per worker	17.593	100.917	0	3838.965
Worker compensations over production	0.287	0.239	0.013	12.569
Merged firm	0.016	0.126	0	1
Split firm	0.011	0.103	0	1
Individual entrepreneur	0.393	0.488	0	1
R&D over production	0.007	0.023	0	0.637
Public capital over total capital	1.588	11.463	0	100
Year	1997.542	3.341	1992	2003
Sector	9.661	5.371	1	19

The number of observations is 18370. The sample is drawn from the Survey of Business Strategies and includes firms whose level of diversification does not exceed one industry as defined by the 2-digit classification over the period 1992 to 2006. The industries included are listed in table C.1.

Table 4: Estimation by ordinary least squares (Labor Force Survey)

	baseline	year	sector	weights
Dep var: Transition to permanent	(1)	(2)	(3)	(4)
- Price-cost margin	-0.049	0.034	0.026	0.039
	(0.079)	(0.064)	(0.139)	(0.139)
Number of observations	17156	17156	17156	17156
R^2	0.126	0.135	0.137	0.137

The dependent variable is equal to one if the individual transits from a fixed term to permanent employment in a given year, and zero otherwise. The measure of competition is the price-cost margin multiplied by minus one. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies) The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The industries included are listed in table B.1. The price-cost margin is obtained from the Industrial Enterprise Survey. Errors are clustered by sector-year.

Table 5: First stage (Labor Force Survey)

	baseline	year	sector	weights
Dep var: - Price-cost margin	(1)	(2)	(3)	(4)
- Regulatory Impact	0.396	0.452	0.255	0.26
	(0.061)***	(0.065)***	(0.072)***	(0.072)***
Number of observations	17156	17156	17156	17156
R^2	0.369	0.473	0.892	0.892
F test of excluded instruments	42.08	48.43	12.57	12.91

The dependent variable is minus the price-cost margin. The instrument for which the coefficient is displayed is minus the Regulatory Impact Indicator. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The price-cost margin is obtained from the Industrial Enterprise Survey. The Regulatory Impact Indicator is obtained from the OECD database. The industries included are listed in table B.1. Errors are clustered by sector-year. According to the standard interpretation of the Stock and Yogo (2005) criteria, a value of the F test of excluded instruments over ten indicates that the instrument is not weak.

Table 6: Estimation by instrumental variables (Labor Force Survey)

	baseline	year	sector	weights
Dep var: Transition to permanent	(1)	(2)	(3)	(4)
- Price-cost margin	0.404 (0.13)***	0.078 (0.077)	-.989 (0.494)**	-.944 (0.472)**
Number of observations	17156	17156	17156	17156
R^2	0.123	0.135	0.135	0.135

The dependent variable is equal to one if the individual transits from fixed term to permanent employment in a given year, and zero otherwise. The measure of competition is the price-cost margin multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The price-cost margin is obtained from the Industrial Enterprise Survey. The Regulatory Impact is obtained from the OECD database. The industries included are listed in table B.1. Errors are clustered by sector-year.

Table 7: Business Strategies Survey results*Estimation by Ordinary Least Squares*

	baseline	year	sector	weights	firm fe
Dep var: Proportion of permanent	(1)	(2)	(3)	(4)	(5)
- Price-cost margin	-0.205	-0.252	-0.377	-0.371	-0.366
	(0.062)***	(0.058)***	(0.118)***	(0.119)***	(0.104)***
Number of observations	17705	17705	17705	17705	17705

Estimation by Instrumental Variables

	baseline	year	sector	weights	firm fe
Dep var: Proportion of permanent	(1)	(2)	(3)	(4)	(5)
- Price-cost margin	3.623	1.322	-5.098	-5.999	-2.464
	(17.341)	(0.881)	(3.567)	(4.884)	(1.199)**
Number of observations	17705	17705	17705	17705	17417

The dependent variable is equal to proportion of permanent over total contracted workers. The measure of competition is average the price-cost margin in the industry multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on workers and firm characteristics (number of workers, percentage of engineers and college graduates, percentage of workers with intermediate education, percentage of partial time permanent workers, ratio of blue over white collar workers, wages over production, workers training expenditures over production, workers compensations over production, a dummy for merger, a dummy for separation, a dummy for individual entrepreneur, R&D over production and percentage of public capital). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Column 4 displays the results when firms are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. Finally, column 5 is estimated using firm fixed effects. The sample is drawn from the Survey of Business Strategies and includes firms whose level of diversification does not exceed one industry as defined by the 2-digit classification over the period 1992 to 2006. The industries included are listed in table C.1. The price-cost margin is obtained from the Survey of Business Strategies. The Regulatory Impact is obtained from the OECD database. Errors are clustered by sector-year. The F of the excluded instrument in the first stage corresponding to the last column estimation is 25.38.

Table 8: Quasi-experiment (Labor Force Survey)

	baseline	year	sector	weights	individual fe
Dep var: Transition to permanent	(1)	(2)	(3)	(4)	(5)
energy after 1997	0.007 (0.015)	-.037 (0.013)***	-.060 (0.024)**	-.064 (0.023)***	-.142 (0.065)**
rail&road after 1998	0.005 (0.011)	-.026 (0.006)***	-.036 (0.005)***	-.036 (0.005)***	-.056 (0.013)***
post&telecom after 1999	0.041 (0.024)*	-.022 (0.018)	-.016 (0.02)	-.018 (0.019)	-.123 (0.06)**
Number of observations	7798	7798	7798	7798	5881
R^2	0.14	0.146	0.146	0.147	0.241

The dependent variable is equal to one if the individual transits from fixed term to permanent employment in a given year, and zero otherwise. The measures of competition are a dummy for working in the energy sector in 1997 or after, a dummy for working in the rail&road sector in 1998 or after and a dummy for working in the post&telecom sector in 1999 or after. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. Finally, column 5 adds individual fixed effects. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The industries included are energy, rail&road, post&telecom, airline and retail. The airline and retail industries serve as controls. Errors are clustered by sector-year.

Table 9: Probability of becoming unemployed (Labor Force Survey)

Estimation by ordinary least squares

	baseline	year	sector
Dep var: Transition to unemployment	(1)	(2)	(3)
- Price-cost margin	-0.008 (0.011)	0.003 (0.009)	0.081 (0.031)***
Number of observations	75168	75168	75168
R^2	0.122	0.124	0.125

Estimation by instrumental variables

	baseline	year	sector
Dep var: Transition to unemployment	(1)	(2)	(3)
- Price-cost margin	-0.053 (0.013)***	-0.002 (0.012)	0.211 (0.1)**
Number of observations	75168	75168	75168
R^2	0.122	0.124	0.125

The dependent variable is equal to one if the individual becomes unemployed in a given year, and zero otherwise. The measure of competition is the price-cost margin multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the job, a dummy for having a fixed term contract, average wage by sector-year and quarter dummies) The second column adds year dummies to the baseline regression. Finally, the third column includes, in addition to the variables in column 2, dummies for industry of employment. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a job, who do not switch across industries and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The price-cost margin is obtained from the Industrial Enterprise Survey. The Regulatory Impact is obtained from the OECD database. The industries included are listed in table B.1. Errors are clustered by sector-year. The F of the excluded instrument in the first stage corresponding to the last column estimation is 19.31.

Table 10: Business Strategies Survey results measuring competition with the Concentration Index

Estimation by ordinary least squares

	baseline	year	sector	weights	firm fe
Dep var: Proportion of permanent	(1)	(2)	(3)	(4)	(5)
- Concentration ratio	-0.098 (0.03)***	-0.113 (0.029)***	-0.018 (0.03)	-0.012 (0.03)	0.002 (0.027)
Obs.	17705	17705	17705	17705	17705

Estimation by instrumental variables

	baseline	year	sector	weights	firm fe
Dep var: Proportion of permanent	(1)	(2)	(3)	(4)	(5)
- Concentration ratio	0.137 (0.153)	-0.476 (0.222)**	-1.733 (0.978)*	-2.520 (2.078)	-0.761 (0.458)*
Number of observations	17705	17705	17705	17705	17417

The dependent variable is equal to proportion of permanent over total contracted workers. The measure of competition is the average concentration ratio in the industry multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on workers and firm characteristics (number of workers, percentage of engineers and college graduates, percentage of workers with intermediate education, percentage of partial time permanent workers, ratio of blue over white collar workers, wages over production, workers training expenditures over production, workers compensations over production, a dummy for merger, a dummy for separation, a dummy for individual entrepreneur, R&D over production and percentage of public capital) The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Column 4 displays the results when firms are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. Finally, column 5 is estimated using firm fixed effects. The sample is drawn from the Survey of Business Strategies and includes firms whose level of diversification does not exceed one industry as defined by the 2-digit classification over the period 1992 to 2006. The industries included are listed in table C.1. The concentration ratio is obtained from the Survey of Business Strategies. The Regulatory Impact is obtained from the OECD database. Errors are clustered by sector-year. The F of the excluded instrument in the first stage corresponding to the last column estimation is 20.87.

Table 11: Estimation by instrumental variables and quasi-experiment with two dimensional cluster (Labor Force Survey)

Estimation by instrumental variables

	baseline	year	sector	weights
Dep var. Transition to permanent	(1)	(2)	(3)	(4)
- Price-cost margin	0.404 (0.124)***	0.078 (0.067)	-.989 (0.434)**	-.944 (0.461)**
Number of observations	17156	17156	17156	17156
R^2	0.123	0.135	0.135	0.135

Quasi-experiment

	baseline	year	sector	weighted	individual fe
Dep var: Transition to permanent	(1)	(2)	(3)	(4)	(5)
energy after 1997	0.007 (0.012)	-.037 (0.007)***	-.060 (0.014)***	-.064 (0.022)***	-.142 (0.065)**
rail&road after 1998	0.005 (0.011)	-.026 (0.008)***	-.036 (0.006)***	-.036 (0.005)***	-.056 (0.013)***
post&telecom after 1999	0.041 (0.024)*	-.022 (0.016)	-.016 (0.015)	-.018 (0.019)	-.123 (0.06)**
Number of observations	7798	7798	7798	7798	5881
R^2	0.14	0.146	0.146	0.147	0.241

The dependent variable is equal to one if the individual transits from fixed term to permanent employment in a given year, and zero otherwise. The measure of competition is the price-cost margin multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The price-cost margin is obtained from the Industrial Enterprise Survey. The Regulatory Impact is obtained from the OECD database. The industries included are listed in table B.1. Errors are clustered in the sector-year and individual dimensions.

Table 12: Placebo quasi-experiment (Labor Force Survey)

	baseline	year	sector	weighted	individual fe
Dep var: Transition to permanent	(1)	(2)	(3)	(4)	(5)
energy after 1996	0.009 (0.013)	-.026 (0.012)**	-.054 (0.022)**	-.054 (0.022)**	0.022 (0.049)
rail&road after 1997	0.007 (0.011)	-.013 (0.01)	-.021 (0.009)**	-.021 (0.009)**	0.052 (0.015)***
post&telecom fater 1998	0.042 (0.02)**	-.010 (0.016)	-.0003 (0.015)	-.0002 (0.015)	-.025 (0.035)
Number of observations	7798	7798	7798	7798	5881
R^2	0.14	0.145	0.146	0.146	0.24

The dependent variable is equal to one if the individual transits from a fixed term to permanent employment in a given year, and zero otherwise. The measures of competition are dummies for working in a treated sector one year before the treatment actually takes place. That is, a dummy for working in the energy sector in 1996 or after, a dummy for working in the rail&road sector in 1997 or after and a dummy for working in the post&telecom sector in 1998 or after. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds to the baseline regression dummies for year. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The industries included are energy, rail&road, post&telecom, airline and retail. The airline and retail industries serve as controls. Errors are clustered by sector-year.

Table 13: Estimation by instrumental variables including switchers (Labor Force Survey)

	baseline	year	sector	weighted
Dep var: Transition to permanent	(1)	(2)	(3)	(4)
- Price-cost margin	0.404 (0.131)***	0.097 (0.078)	-.943 (0.473)**	-.893 (0.454)**
- Price-cost margin by switcher	0.021 (0.258)	-.029 (0.235)	-.078 (0.232)	-.105 (0.238)
Switcher	-.024 (0.02)	-.033 (0.019)*	-.037 (0.019)**	-.040 (0.019)**
Number of observations	19176	19176	19176	19176
R^2	0.117	0.127	0.127	0.127

The dependent variable is equal to one if the individual transits from fixed term to permanent employment in a given year, and zero otherwise. The measure of competition is the price-cost margin multiplied by minus one. This is interacted with a dummy indicating if the individual is a industry switcher. The variable in the third row is a dummy equal to one if the individual is an industry switcher. The instrument used is the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The price-cost margin is obtained from the Industrial Enterprise Survey. The Regulatory Impact is obtained from the OECD database. The industries included are listed in table B.1. Errors are clustered by sector-year. The F statistic of the excluded instruments in the equation in which the dependent variable is - Price-cost margin is 6.51 and in the equation in which the dependent variable is - Price-cost margin by switcher is 15.33. These numbers refer to the last equation. The overall effect of - Price-cost margin for industry switchers is statistically significant (p-value is 0.059).

Appendix A: The theoretical model

This section is devoted to show some intermediate derivations of the results of the theoretical model addressed in section 2.

Each firm maximizes expected profits with respect to the proportion of permanent out of high productivity workers, τ . The formula for the expected profits is:

$$\begin{aligned} E(\Pi) &= E(\pi_1) + \beta E(\pi_2) = \\ &= E(\pi_1) + \beta \left[\begin{aligned} &\frac{md}{n} \left\{ \frac{1}{n} + \frac{n}{2d} (E(c) - \bar{c}) \right\}^2 + \left\{ \frac{m}{n} + \frac{mn}{2d} (E(c) - \bar{c}) \right\} E(a_2) \\ &+ \frac{mn}{4d} E(a_2^2) - p\tau sS \end{aligned} \right] \end{aligned}$$

where τ is implicitly included in the expressions for $E(a_2)$ and $E(a_2^2)$ which are:

$$\begin{aligned} E(a_2) &= p\alpha_1 + (1-p)\alpha_2 + p(1-p)(l-s)(\alpha_1 - \alpha_2)\tau \\ E(a_2^2) &= p\alpha_1^2 + (1-p)\alpha_2^2 + p(1-p)(l-s)(\alpha_1^2 - \alpha_2^2)\tau \end{aligned}$$

Maximizing expected profits with respect to τ , one obtains the following first order condition:

$$\left\{ \frac{m}{n} + \frac{mn}{2d} (E(c) - \bar{c}) \right\} [-p(1-p)(l-s)(\alpha_1 - \alpha_2)] + \frac{mn}{4d} [-p(1-p)(l-s)(\alpha_1^2 - \alpha_2^2)] + psS = 0$$

where:

$$E(c) - \bar{c} = -E(a_2) = -p\alpha_1 - (1-p)\alpha_2 - p(1-p)(l-s)(\alpha_1 - \alpha_2)\tau$$

Solving for τ , we get the expression for the optimal proportion of fixed-term out of high productivity workers:

$$\tau^* = \frac{\frac{2d}{n^2} + \left(\frac{1}{2} - p\right) (\alpha_1 - \alpha_2) - \frac{2d}{mn} \frac{psS}{p(1-p)(l-s)(\alpha_1 - \alpha_2)}}{p(1-p)(l-s)(\alpha_1 - \alpha_2)}$$

I do not consider the case where all high productivity matches get permanent contracts while the firm decides on the proportion of low productivity matches to give permanent contracts. The reason is that the optimal profits in that case are lower than the profits obtained when all low productivity matches are kept under temporary workers and the firm applies the previous conversion rate, τ^* , to permanent matches.

The comparative statics analysis assumes that the number of firms is endogenous. In order to know how the optimal proportion of permanent over total high productivity workers changes according to the level of product differentiation, d , one needs to expand the following expression:

$$\frac{d\tau^*}{dd} = \frac{\partial\tau^*}{\partial d} + \frac{\partial\tau^*}{\partial n} \frac{\partial n}{\partial d} = \frac{\partial\tau^*}{\partial d} + \frac{\partial\tau^*}{\partial n} \left(-\frac{\frac{\partial\Pi}{\partial d}}{\frac{\partial\Pi}{\partial n}} \right)$$

where the first equality holds because of the chain rule of derivation and the second holds because of the implicit function theorem and the fact that $\Pi = 0$ because of free entry.

Computing the relevant derivatives and substituting its value on the previous expression, one reaches the following conclusion:

$$\text{sign} \left(\frac{d\tau^*}{dd} \right) = \text{sign} \left(\frac{m}{n} - 2 \frac{psS}{p(1-p)(l-s)(\alpha_1 - \alpha_2)} \right) \quad (3)$$

This implies that an increase in competition through a decrease in product differentiation would decrease the proportion of permanent workers if and only if the above function is positive and the reverse is true.

The same reasoning as for the incidence of changes in product differentiation, d , applies for the incidence of market size, m , on τ . And we learn the sign of the total derivative is the opposite for both parameters. That is,

$$\text{sign} \left(\frac{d\tau^*}{dm} \right) = \text{sign} \left(2 \frac{psS}{p(1-p)(l-s)(\alpha_1 - \alpha_2)} - \frac{m}{n} \right)$$

This shows that an increase in competition through a rise market size would reduce the proportion of permanent workers if and only if the above function is negative and the reverse is true. Note that when the expression above is positive equation (3) is negative and vice versa.

Finally, the expression for the total change in the optimal proportion of fixed-term over total high productivity workers caused by changes in entry costs is:

$$\frac{d\tau^*}{dF} = \frac{\partial\tau^*}{\partial n} \frac{\partial n}{\partial F} = \frac{\partial\tau^*}{\partial n} \left(-\frac{\frac{\partial\Pi}{\partial F}}{\frac{\partial\Pi}{\partial n}} \right)$$

where the sign of the derivative above depends on the parameters of the model according to:

$$\text{sign} \left(\frac{d\tau^*}{dF} \right) = \text{sign} \left(\frac{m}{n} - \frac{1}{2} \frac{psS}{p(1-p)(l-s)(\alpha_1 - \alpha_2)} \right) \quad (4)$$

This means that an increase in competition through a decrease in entry costs reduces the proportion of permanent contracts if and only if expression (4) is positive. When this happens, an increase in competition always leads to a reduction in the proportion of permanent contracts. On the contrary, an increase in competition through a decrease in entry cost rises the proportion of permanent contracts if an only if expression (4) is negative. However in this case, an increase in competition always leads to a rise in the proportion of permanent contracts if expression (3) is negative.

Appendix B: The instrumental variable estimation using the Spanish Labor Force Survey

Table B.1: List of industries included in the sample

Industries included in the instrumental variables specification	
1	Food products and beverages
2	Tobacco
3	Textile
4	Textile elaborated products and leather
5	Leather elaborated products and footwear
6	Wood except furniture
7	Pulp, paper and paper elaborated products
8	Printing and publishing
9	Coke, refined petroleum products
10	Chemicals
11	Rubber and plastics products
12	Other non-metallic mineral products
13	Basic metals
14	Fabricated metal products, except machinery and equipment
15	Machinery and equipment
16	Office, accounting and computing machinery
17	Electrical machinery and apparatus
18	Radio, television and communication equipment
19	Medical, precision & optical instruments, watches and clocks
20	Motor vehicles
21	Other transport equipment
22	Furniture
23	Recycling
24	Electricity and gas
25	Water supply

This is the list of industries for which there is information on the price cost margin and on the Regulatory Impact so that they can be included in the instrumental variables estimation.

Table B.2: Estimation by instrumental variables displaying controls (Spanish Labor Force Survey)

	baseline	year	sector	weights
	(1)	(2)	(3)	(4)
Age	0.0002 (0.0003)	-.00003 (0.0003)	0.00002 (0.0003)	1.00e-05 (0.0003)
Married	0.0006 (0.009)	0.006 (0.009)	0.005 (0.009)	0.005 (0.009)
Household head	0.01 (0.008)	0.011 (0.008)	0.012 (0.008)	0.011 (0.008)
High School Graduate	0.011 (0.004)***	0.005 (0.004)	0.005 (0.004)	0.004 (0.004)
University Graduate	0.033 (0.009)***	0.02 (0.009)**	0.019 (0.009)**	0.019 (0.009)**
Number of coworkers	0.0002 (0.00006)***	0.0002 (0.00006)***	0.0002 (0.00006)***	0.0002 (0.00006)***
One year fixed-term contract duration	0.178 (0.009)***	0.171 (0.008)***	0.171 (0.008)***	0.171 (0.008)***
Two years fixed-term contract duration	0.049 (0.008)***	0.036 (0.01)***	0.037 (0.01)***	0.038 (0.01)***
Three years fixed-term contract duration	0.289 (0.024)***	0.266 (0.023)***	0.267 (0.023)***	0.265 (0.022)***
Permanent vs. fixed-term wage difference	9.86e-09 (1.62e-07)	3.25e-07 (1.55e-07)**	-1.25e-07 (3.46e-07)	-1.51e-07 (3.38e-07)

The dependent variable is equal to one if the individual transits from fixed term to permanent employment in a given year, and zero otherwise. The measure of competition is the price-cost margin multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Finally, column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs over the period 1993 to the second quarter of 2001. The price-cost margin is obtained from the Industrial Enterprise Survey. The Regulatory Impact is obtained from the OECD database. The industries included are listed in table B.1. Errors are clustered by sector-year.

Appendix C: The instrumental variable estimation using Business Strategies Survey

Table C.1: List of industries included in the sample

Industries included in the instrumental variables specification	
1	Meat products
2	Food products and tobacco
3	Beverages
4	Textile and textile elaborated products
5	Leather, leather elaborated products and footwear
6	Wood except furniture
7	Pulp, paper and paper elaborated products
8	Printing and publishing
9	Chemicals
10	Rubber and plastics products
11	Other non-metallic mineral products
12	Basic metals
13	Fabricated metal products, except machinery and equipment
14	Machinery and equipment
15	Office, accounting and computing machinery
16	Electrical machinery and apparatus
17	Motor vehicles
18	Other transport equipment
19	Furniture

This is the list of industries for which there is information in the Business Strategies Survey

Table C.2: Estimation by instrumental variables displaying controls (Survey of Business Strategies)

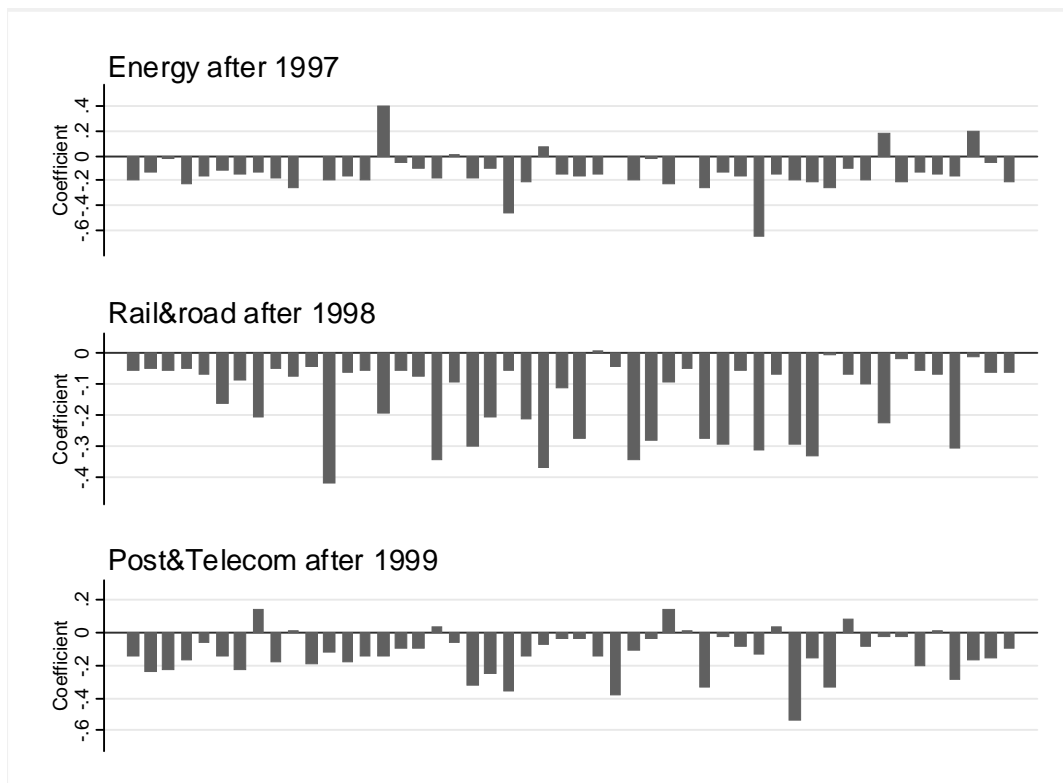
	baseline	year	sector	weights	firm fe
	(1)	(2)	(3)	(4)	(5)
Number of workers	0.00002 (2.99e-06)***	0.00002 (2.94e-06)***	0.00002 (2.81e-06)***	0.00002 (2.93e-06)***	-.00002 (8.99e-06)*
Percentage of university grads	0.004 (0.0005)***	0.004 (0.0005)***	0.002 (0.0005)***	0.002 (0.0005)***	-.001 (0.0005)**
Percentage of high school grads	0.001 (0.0002)***	0.001 (0.0002)***	0.0006 (0.0002)***	0.0006 (0.0002)**	0.0002 (0.0003)
Percentage of part-time workers	0.0005 (0.0004)	0.0005 (0.0004)	0.0007 (0.0004)*	0.0006 (0.0004)*	0.003 (0.0005)***
Blue over white collar workers	0.001 (0.0002)***	0.001 (0.0002)***	0.0006 (0.0003)**	0.0006 (0.0003)**	0.0007 (0.0006)
Wages over production	0.031 (0.016)*	0.039 (0.015)***	0.021 (0.014)	0.021 (0.014)	0.037 (0.01)***
Training expenditures per worker	0.00005 (1.00e-05)***	0.00002 (1.00e-05)	8.80e-06 (1.00e-05)	9.43e-06 (1.00e-05)	-.00004 (1.00e-05)***
Worker compensations over production	0.552 (0.039)***	0.588 (0.04)**	0.549 (0.039)***	0.55 (0.038)***	0.118 (0.033)***
Merged firm	0.024 (0.01)**	0.024 (0.01)**	0.023 (0.01)**	0.022 (0.01)**	0.002 (0.008)
Split firm	0.059 (0.013)***	0.064 (0.014)***	0.062 (0.013)***	0.052 (0.015)***	0.018 (0.01)*
R&D over production	0.115 (0.07)*	0.174 (0.066)***	0.065 (0.063)	0.101 (0.067)	-.101 (0.078)
Public capital over total capital	0.0007 (0.00009)***	0.0008 (0.0001)***	0.001 (0.0001)***	0.0009 (0.0001)***	0.0007 (0.0002)***

The dependent variable is equal to proportion of permanent over total contracted workers. The measure of competition is average the price-cost margin in the industry multiplied by minus one. This is instrumented using the Regulatory Impact. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%. The baseline regression includes controls on workers and firm characteristics (number of workers, percentage of engineers and college graduates, percentage of workers with intermediate education, percentage of partial time permanent workers, ratio of blue over white collar workers, wages over production, workers training expenditures over production, workers compensations over production, a dummy for merger, a dummy for separation, a dummy for individual entrepreneur, R&D over production and percentage of public capital). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Column 4 displays the results when firms are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. Finally, column 5 is estimated using firm fixed effects. The sample is drawn from the Survey of Business Strategies and includes firms whose level of diversification does not exceed one industry as defined by the 2-digit classification over the period 1992 to 2006. The industries included are listed in table C.1. The price-cost margin is obtained from the Survey of Business Strategies. The Regulatory Impact is obtained from the OECD database. Errors are clustered by sector-year. The F of the excluded instrument in the first stage corresponding to the last column estimation is 28.45.

Appendix D: The quasi-experiment

The number of degrees of freedom in the quasi-experimental regressions is 44 but for the panel regression in which is 39. This could raise some concerns about whether the number of clusters is small to provide reliable estimates. To address perform bootstrap over clusters and show the coefficients arising from each iteration in figure D.1. The estimates are consistently negative and their magnitudes are very similar. This assures that no particular observations are leading the results.

Figure D.1: Bootstrap estimated coefficients for the quasi-experiment using the Spanish Labor Force Survey



This graph represents the estimated coefficients resulting from 50 random draws from the sample of clusters in the quasi-experiment estimation. The dependent variable is equal to one if the individual transits from fixed term to permanent employment in a given year, and zero otherwise. The measures of competition are a dummy for working in the energy sector in 1997 or after, a dummy for working in the rail&road sector in 1998 or after and a dummy for working in the post&telecom sector in 1999 or after. The coefficients are marked with * if the level of significance is between 5% and 10%, ** if the level of significance is between 1% and 5% and *** if the level of significance is less than 1%.

The baseline regression includes controls on individual and job characteristics (age, married, household head, dummies for region of residence, high school graduate, university graduate, number of coworkers, dummies for duration of the fixed term contract in years and quarter dummies). The second column adds year dummies to the baseline regression. The third column includes, in addition to the variables in column 2, dummies for industry of employment. Column 4 displays the results when individuals are weighted according to the ratio between the number of workers in their industry one year before the date of the interview and the number of workers in their industry at the time of the interview. Finally, column 5 adds individual fixed effects. The sample is drawn from the Spanish Labor Force Survey and includes men aged 16 to 64 with a fixed term contract, who do not switch sector of employment and who have no seasonal jobs. The industries included are energy, rail&road, post&telecom, airline and retail. The airline and retail industries serve as controls. Errors are clustered by sector-year.