The effect of product market competition on job security

The Effect of Product Market Competition on Job Security

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Abstract

This paper studies the impact of product market competition on job security. I use differences between types of labor contracts to measure job security. The effect of competition on the use of different types of labor contracts is identified by changes in legislation that lead to exogenous shifts in competition. Using both worker data from the Spanish Labor Force Survey and firm data from the Spanish Business Strategies Survey, I show that job security decreases with competition. A one standard deviation increase in competition decreases the probability that a worker switches to a more secure labor contract by at least 22 percent.

JEL codes: J41, J24, M51, C41, C33, C35, J6, L1

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1 Introduction

Workers deem job security to be one of the most important job amenities. The International Social Survey Program, a database containing survey information on 14,000 individuals in 19 OECD countries, ranks job security as highest among all job amenities, above pay and hours of work. Job security is likely to depend not only on characteristics of the worker and the firm but also on characteristics of the labor and product markets. If competition in the product market makes firing more likely, firms facing greater competition may be more reluctant to offer secure jobs (for instance, jobs entitling the employee to severance pay). This paper studies how product market competition affects the level of job security offered by firms.

Job security is often quantified with measures of job termination, like sector switches and transitions to unemployment. However, these measures do not take into account the insecurity experienced by workers who never change or lose their jobs. In this paper, I take advantage of differences between types of labor contracts in Spain to measure the degree of job security experienced by employees while on the job. This approach is complemented by the analysis of transitions to unemployment and sector switches.

In Spain, as in most European countries, labor contracts are either fixed-term (temporary) or open-ended (permanent). Fixed-term contracts are characterized by predetermined durations and negligible termination costs. In Spain, firms cannot employ the same worker on fixed-term contracts for more than three years. After that period expires, the firm must either lay off the employee or offer her an open-ended contract. In contrast, open-ended contracts carry high termination costs.

The lower level of job security offered by fixed-term contracts not only decreases workers' satisfaction (see Booth, Francesconi and Frank, 2002) but also affects the decisions of workers and firms. Workers with fixed-term contracts tend to delay marriage and parenthood (see De la Rica and Iza, 2005) and firms tend to offer less training to workers with fixed-term contracts (also documented by Booth, Francesconi and Frank, 2002).

I present a simple theoretical model to study the impact of competition on labor

contracts. Higher competition leads to a higher probability of firing because higher competition reduces profit margins, making it more likely that low productivity shocks render firm-employee matches unprofitable. Hence, the model predicts that competition reduces the likelihood of transitions from fixed-term to open-ended contracts. Testing this prediction is the objective of the empirical analysis in this paper.

For the analysis, I use individual data to estimate the impact of competition on the probability of switching from a fixed-term to an open-ended contract. The identification of this impact is challenging because of (i) the potential impact of labor contracts on competition and (ii) the existence of unobserved firm characteristics (e.g. technology) and unobserved worker traits (e.g. ability) which simultaneously affect competition and labor contracts. In order to overcome those challenges, I exploit that deregulation in specific service sectors positively affects competition in manufacturing sectors.[1] In particular, I use the exogenous variation in the level of competition in each manufacturing sector induced by changes in the intensity of regulation in some sectors that provide services to *that* manufacturing sector as measured by the Regulatory Impact index (RI) of the OECD. I also use a complementary identification strategy based on the implementation of EU directives that significantly increased competition in specific service sectors. These directives reduced barriers to entry in the energy, rail and road, and post and telecommunication sectors in 1997, 1998 and 1999, respectively.

Empirical results show that a one standard deviation increase in the level of competition as measured by the price-cost margin lowers the probability that a worker with a fixed-term contract switches to an open-ended contract in a given year by at least 22 percent. Similarly, the elimination of legal barriers to entry (allowing free entry to a legal

[1] Deardorff (2001), Francois and Wooton (2010) and Smith and Thanassoulis (2012) propose theoretical models that show how liberalization of service sectors fosters competition in manufacturing sectors. Moreover, many empirical papers document the existence of a positive influence of deregulation in specific service sectors on competition in manufacturing sectors. Ghosh and Morita (2006) show that lower communication costs lead to more competition in the automobile industry. Kerr and Nanda (2009) find evidence that US banking deregulations led to increased competition in other sectors. Smith and Thanassoulis (2008) highlight that lower competition in the retail sector reduces the level of competition in other sectors.

monopoly) induces a 5 percent decrease in the probability of switching to an open-ended contract. These results are consistent with those obtained using traditional measures of job security. A one standard deviation increase in the level of competition as measured by the price-cost margin increases the probability that a worker switches sectors by at least 42 percent and raises the probability of becoming unemployed by at least 15 percent. Moreover, I show that the number of firms in a sector increases with competition. Given that firms entering a new sector are less likely to use open-ended contracts, firm entry is a potential channel through which competition affects labor contracts.

Results are robust to the use of different empirical specifications and datasets. My baseline specification is a linear duration model of transitions from a fixed-term to an open-ended contract. I estimate it by OLS and IV where the RI of the OECD serves as an instrument for the level of competition. This specification is robust to the use of a multinomial probit model to simultaneously estimate exits from a fixed-term contract to an open-ended contract, to other sectors and to unemployment. I also check the robustness of my baseline results using firm-level data. In this case, job security is measured by the proportion of open-ended contracts in a firm. The firm-level data allows me to control for firm fixed-effects.

A vast and growing literature studies the impact of product market competition on labor market outcomes.[2] Several country-level analyses find a positive effect of product market competition on employment and wages; see for instance Nicoletti and Scarpetta (2005), Griffith et al. (2007) and Fiori et al. (2007). Other studies show that product market competition improves labor market efficiency. In particular, product market

[2]Concepts and measures of product market competition differ across studies. Nicoletti and Scarpetta (2005), Griffith et al. (2007) and Fiori et al. (2008) use indicators of product market regulation by the OECD. Griffith (2001) analyzes the implementation of the European Union Single Market Program as a quasi-experiment. Bertrand and Kramarz (2002) use changes in entry regulations as a source of increases in competition. Cuñat and Guadalupe (2006) study the effect of foreign competition as measured by import penetration. Levine, Levkov and Rubinstein (2008) take advantage of bank deregulation to identify a case of exogenous intensification of competition. Heyman, Svaleryd and Vlachos (2008) exploit firm takeovers as determinants of increases in competition. Bertrand (2004) uses exchange-rate movements as generators of exogenous variation in import competition. Guadalupe (2007) proxies competition by the concentration ratio and applies two quasi-experiments based on an exogenous and sudden appreciation of the British Pound and the implementation of the European Union Single Market Program.

competition increases productivity (Griffith, 2001), job creation (Bertrand and Kramarz, 2002), executive incentives (Cuñat and Guadalupe, 2009), and on-the-job training (Bassanini and Brunello, 2010), while it reduces gender and race discrimination (Heyman et al., 2008 and Levine et al., 2008). In contrast, product market competition negatively affects some aspects of workers' welfare and equality. In particular, competition is found to decrease the extent to which employers shield workers' wages from external labor-market conditions (Bertrand, 2004) and to increase wage inequality (Guadalupe, 2007). More closely related to this paper, Goldberg, Tracy and Aaronson (1999) study whether exchange rate fluctuations have an impact on employment stability as measured by the probability of changing jobs and the probability of switching industry. Their findings suggest that there are no significant effects of US Dollar movements on employment stability. Overall, competition has been found to affect many relevant aspects of the labor market. However, the question of whether competition affects job security remains largely unanswered.

The Spanish case provides an interesting framework for the study of the impact of competition on job security for two reasons. First, Spanish legislation establishes a clear distinction between fixed-term and open-ended contracts, which proves useful for measuring job security. Second, employment relationships in Spain typically start with a fixed-term contract that may be converted into an open-ended contract later.[3] Hence, the sample for my analysis of transitions from fixed-term contracts is sufficiently large and includes workers with different characteristics.

The rest of the paper proceeds as follows. Section 2 presents a simple theoretical model. Section 3 describes the data. Section 4 presents the empirical methodology. Section 5 provides a discussion of the empirical results. Section 6 presents several robustness checks and Section 7 concludes.

[3]Bover, Arellano and Bentolila (2002) and Bover and Gómez (2004) provide evidence that most new hirings are under fixed-term contracts.

2 A Simple Model

In this section I present a theoretical framework to study the effect of product market competition on labor contracts. Competition is inversely related to firms' capacity to set prices that exceed their marginal cost. This classic definition of competition is typically attributed to Lerner (1934). There are two types of labor contracts: open-ended contracts and fixed-term contracts. They differ in two ways: (i) employers must pay severance when they fire workers with open-ended contracts and (ii) workers with fixed-term contracts are more likely to leave the firm.

I consider a two-period economy with firms and workers. Firms are risk neutral and operate in a market with level of competition $\theta \in [0, \infty]$. A firm can choose to produce one unit and if it does, it obtains profits $\Pi_{it} = p(\theta) - c_{it}$ where p is the price of the product and c_{it} is its cost. The cost can be expressed as $c_{it} = \overline{c}_i - \eta_{it}$ where $\overline{c}_i$ is the firm-specific cost and η_{it} is an i.i.d. shock to total factor productivity which is firm and time specific. The variable η_{it} is distributed according to $f(\eta)$ with support $[0, \overline{c}_i]$. Each firm hires one worker and decides which type of contract to offer to the worker and whether to produce or not. Workers are ex-ante all identical.[4] I assume that an unemployed worker always accepts a job offer. Similarly, a worker with a fixed-term contract always switches to an open-ended contract when offered one.[5]

The timing of events can be described as follows. In the first period, a match is formed and the worker is hired under a fixed-term contract. Then, the shock to productivity η_{i1} is revealed and the firm decides whether to produce or not. In the second period, the firm must decide whether to keep the worker under a fixed-term contract or to offer her an open-ended contract. If a worker is offered a new fixed-term contract, she leaves

[4] For simplicity, I do not model workers' job search behavior. However the main mechanism of the model can be generated by a search model with wage posting. In such a setting, once a match is created, the firm offers a wage that leaves the worker indifferent between accepting the offer and remaining unemployed.

[5] Since I do not model workers' behavior, I do not provide a micro-foundation for the worker's preference for open-ended contracts. Note however that in a setting where workers are risk averse and firms are risk neutral (e.g. Azariadis, 1975), workers prefer open-ended contracts but firms only offer them to some.

the firm with probability l.[6] Without a worker, the firm does not produce and earns zero profits. If the worker stays, which happens with probability $1 - l$ for workers with fixed-term contracts and 1 for workers with open-ended contracts, the exogenous shock to productivity η_{i2} is revealed. After that, the firm decides whether or not to produce. If production does not take place, the firm must pay severance S to workers with open-ended contracts.

To solve the model I focus on the second period, when the firm decides which type of labor contract to offer. For readability, I omit the time subindex in the expressions that follow. Second period profits under an open-ended contract $\Pi^o(\theta, \eta_i)$ are given by:

$$\Pi^o(\theta, \eta_i) = \begin{cases} -S & \text{if } p(\theta) - (\overline{c}_i - \eta_i) \leqslant -S \\ p(\theta) - (\overline{c}_i - \eta_i) & \text{otherwise,} \end{cases} \tag{1}$$

while profits under a fixed-term contract $\Pi^f(\theta, \eta_i)$ are:

$$\Pi^f(\theta, \eta_i) = \begin{cases} 0 & \text{if } p(\theta) - (\overline{c}_i - \eta_i) \leqslant 0 \text{ or if the worker leaves} \\ p(\theta) - (\overline{c}_i - \eta_i) & \text{otherwise.} \end{cases} \tag{2}$$

The value of the productivity shock η_i is ex-ante unknown. Thus, the firm chooses the type of contract that provides the maximum expected profits given the level of competition θ. The firm's optimal choice depends on the difference between expected profits under open-ended and fixed-term contracts:[7]

$$E_\eta[\Pi^o - \Pi^f] = \int_0^{\overline{c}_i - p(\theta)} \Pi^o(\theta, \eta) f(\eta) d\eta + l \times \int_{\overline{c}_i - p(\theta)}^{\overline{c}_i} p(\theta) - (\overline{c}_i - \eta) f(\eta) d\eta \tag{3}$$

The first term in Equation (3) represents the losses incurred by the firm when the

[6] I assume workers with fixed-term contracts are more likely to leave the match than workers with open-ended contracts. This difference in the probability of quitting can be understood as a reduced form of a more complex model with on-the-job search where workers prefer open-ended to fixed-term contracts.

[7] The calculations that lead to Equation (3) can be found in Appendix A.

productivity shock is low and the worker has an open-ended contract. These losses include the severance pay if the firm decides not to produce but also negative profits if the firm decides to produce to avoid paying severance. The second term represents the gains derived from using open-ended contracts when the productivity shock is high because workers with open-ended contracts never leave. If the difference above is positive (negative) the firm offers the employee an open-ended (a fixed-term) contract. Both terms are monotonically decreasing in the level of competition θ and thus, the difference between profits under open-ended and fixed-term contracts is monotonically decreasing in competition.[8]

For each level of competition, the type of labor contract offered by the firm is a function of its firm-specific cost, $\bar{c}_i$. Only firms with sufficiently low firm-specific costs offer open-ended contracts. Hence, the proportion of workers that transition from a fixed-term to an open-ended contract is given by $E_{\bar{c}}\left[\mathbf{1}\{E_{\eta}[\Pi^o - \Pi^f] > 0\}\right]$.

This proportion decreases with competition: more competition cause some firms that would have offered open-ended contracts to offer fixed-term contracts instead. Therefore, more competition leads to a lower probability of observing a transition from a fixed-term to an open-ended contract.[9]

The model can be extended to accommodate workers with different productivities. In that case, the probability of switching to an open-ended contract is higher for high productivity workers. The main conclusion of the benchmark model with identical workers carries over to this extended model because the probability of switching to an open-ended contract decreases with competition for all types of workers; see the Appendix for details.

[8] Given that the cost c_{it} is fully determined by firm-specific cost and an i.i.d. shock, the price is the only variable that directly depends on competition. Therefore, a term is decreasing in competition if and only if it is increasing in price.

[9] In the empirical analysis, I study the impact of a change in competition as measured by the price-cost margin (computed as price minus marginal cost divided by price). The price-cost margin can be defined in the context of the theoretical setup as $\frac{p(\theta)-c_i}{p(\theta)}$ which is strictly decreasing in the level of competition θ.

3 Institutional Features and Data Description

3.1 Institutional Features

In the legal code, fixed-term contracts are characterized by predetermined durations, a much lower severance pay than open-ended contracts and a limited duration for consecutive fixed-term contracts. Fixed-term contracts can have durations that range from six months (one year, since April 1992) to three years. Firms cannot employ the same worker on fixed-term contracts for more than three years. Laws regulating severance payments for workers with fixed-term contracts have suffered some changes during the period of study. A new type of fixed-term contract was introduced in 1984. The so called "employment-fostering" contract could be used to hire any worker for any kind of activity. It was the only type of fixed-term contract that contemplated a severance payment (12 days of wages per year of seniority). A reform in 1994 (Law 10/1994) restricted the use of "employment-fostering" contracts to workers older than 45, handicapped workers, and unemployment recipients hired by small firms. As a result, the number of fixed-term contracts that entitled workers to severance payments was significantly reduced. Finally, the Law 12/2001 established a severance payment of 8 days per year of seniority for all types of fixed-term contracts with the exception of replacement, discriminated minorities, and apprenticeship contracts. In contrast, since 1980, workers with open-ended contracts have been entitled to severance payments of 20 days per year of seniority (with a maximum of 12 monthly wages). In case the dismissal is ruled unfair by a court they are entitled to payments of 45 days per year (with a maximum of 42 monthly wages). Since 1997, severance payments for unfair dismissal have been reduced to 33 days per year of seniority (with a maximum of 24 monthly wages) for "employment-fostering" contracts. A detailed description of the history of Spanish labor market institutions can be found in Dolado and Jimeno (2004).

The institutional framework described above was the one in force during my sample period (1993-2003). The legislation regarding labor contracts has changed slightly

since 2003. Severance payments for workers with fixed-term contracts have increased progressively and will reach twelve days in 2015 (Law 35/2010, September 17). From 2012 onwards, the severance payment for all workers with open-ended contracts has been reduced to 33 days with a maximum of 24 monthly wages.

Prior to 1984, the use of fixed-term contracts was restricted to a few temporary activities. Since 1984, fixed-term contracts have been extended to all activities. This translated into a pronounced increase in the proportion of employees with fixed-term contracts from 1984 to 1992, year in which the proportion of employees with fixed-term contracts stabilized at around one third. The use of fixed-term contracts has stayed at those levels since then, despite the efforts of the Spanish government to promote their conversion to open-ended contracts (mostly through subsidies). Only after 2008 has the incidence of fixed-term contracts decreased to levels under 30% as a consequence of the overall reduction in employment, which typically affects workers with fixed-term contracts disproportionately. In fact, the diffusion of fixed-term contracts in the last decades led to a parallel increase in the frequency of transitions to unemployment (Bover, Arellano and Bentolila, 2002).

3.2 Measuring competition

I measure competition by the price-cost margin. This measure is often preferred over other long-established measures of competition, like the concentration ratio or the inverse of the number of firms (see Scherer and Ross, 1990 and Elzinga and Mills, 2011). Boone (2000) studies the performance of the price-cost margin in the context of several theoretical models of competition and finds it performs best among standard measures of competition. Econometric studies involving measurement of competition predominantly use the price-cost margin (see Nickell, 1996 and Aghion, Bloom, Blundell and Griffith, 2005). While in this paper I focus on this measure, results do not depend on it; substituting the price-cost margin by the concentration ratio or the inverse of the number of firms leads to quantitatively similar results.

3.3 Datasets

I combine information about workers' characteristics and their labor contracts with information on product market competition and regulation in their sectors of employment. This information is obtained from four different datasets:

1) Spanish Labor Force Survey

The Spanish Labor Force Survey (Encuesta de la Población Activa) provides data about households living in Spanish territory. It has a rotating panel structure where each household is interviewed up to six consecutive quarters.[10] The survey provides information on individual labor market status, type of labor contract, duration of labor market status, duration of labor contract, and many other individual and job characteristics. The sample size is 60,000 households, approximately 180,000 individuals. This data is used for the analysis of individual transitions from fixed-term to open-ended contracts.

2) Industrial Enterprise Survey

The Industrial Enterprise Survey (Encuesta Industrial de Empresas) includes accounting information on firms located in Spanish territory that operate in manufacturing sectors. It includes information on employment, revenues, costs, investments and other production features. I use the information provided in this survey to construct the price-cost margin by sector and year, which is the main measure of competition in the empirical analysis.[11]

3) OECD Product Market Regulation Database

The OECD has developed a wide range of indicators that measure product market regulation by sector. These indicators include information on barriers to entry, public

[10] 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 of employment at the 2-digit level, while the cross-section version does. Therefore, I use the panel data resulting from the match of the cross-sections by means of the algorithm described in Jiménez-Martín and Peracchi (2002). This algorithm matches the cross-sections of the Spanish Labor Force Survey from 1993 to 2003. This matching procedure precisely replicates the panel version of the Spanish Labor Force Survey and provides researchers with information on variables that were originally included in the cross-section but not in the panel.

[11] For details about the construction of the price-cost margin see the Online Appendix which is available at http://sites.carloalberto.org/aparicio/doc/CompetitionandJobSecurity_OA.pdf

ownership, vertical integration, market structure, and price controls, as well as information on the impact of anti-competitive regulation in some service sectors on manufacturing sectors.

The Regulatory Impact (RI) indicator measures the extent to which anti-competition legislation in some service sectors (energy, transport, communications, retail distribution, business services and finance) affects manufacturing sectors.[12] The effect on each manufacturing sector depends on the extent to which it uses inputs from each service sector. The RI can be interpreted as a measure of how regulation affects the bundle of the above-mentioned services used by each manufacturing sector. The RI is constructed in two steps: first, information on barriers to entry, public ownership, vertical integration, market structure, and price controls is collected for each service sector. Second, this information is aggregated at each manufacturing sector and the intensities of use of each service sector are used as weights. A more detailed description of this indicator can be found in Conway and Nicoletti (2006); see Tables 1-2 for descriptive statistics on the RI.

The set of OECD indicators is available for 36 different sectors in 21 OECD countries between 1975 and 2003. I use the RI indicator as an instrument for the level of competition in manufacturing sectors and the information on barriers to entry as a measure of the impact of EU Directives on competition.

4) Business Strategies Survey

The Business Strategies Survey (Encuesta sobre Estrategias Empresariales) is an annual survey of a representative sample of Spanish manufacturing firms. It provides data on average worker characteristics, firm characteristics, the economic sector, as well as firm accounting data and some competition measures. The survey includes information about 4,355 firms that have been in the sample for an average of 12 years. I use this data to study how the proportion of open-ended contracts in a firm changes with competition.

[12] For data on the RI, see: http://www.oecd.org/document/1/0,3343,en_2649_34323_2367297_1_1_1_1,00.html.

3.4 Sample Definition and Descriptive Statistics

Throughout the empirical analysis, I consider individuals between 16 and 64 years old. In order to match the annual frequency of the data on product market competition, I include each individual's first interview and the interview one year later.

I use two different identification strategies; each of them requiring a different sample. I refer to the sample used in the baseline estimations (OLS and IV) as Sample 1. This sample includes individuals with fixed-term contracts working in sectors for which both, information on the price-cost margin and the RI are available. This selection criteria leaves me with 25 manufacturing sectors. Table A.1 in the Online Appendix presents the list of included sectors. I denote by Sample 2 the sample used in the quasi-experiment based on the application of EU directives in Spain. It includes individuals with fixed-term contracts working in sectors for which I observe barriers to entry. This selection criteria leaves me with 5 sectors: energy, transport, communications, retail distribution, business services and finance.[13] To each of these two samples, I add data on competition and regulation at the sector level and I assign to each individual the level of competition and regulation in the sector where he or she is employed.

Table 1 shows the descriptive statistics for Sample 1. Switches from fixed-term to open-ended contracts represent 17 percent of total observations. The average price-cost margin is 0.065, with a standard deviation of 0.028.[14] The average RI is 0.15, with a standard deviation of 0.04. Table 2 represents descriptive statistics for Sample 2. Transitions from fixed-term to open-ended contracts represent 10 percent of total observations and treated observations represent 14 percent of total observations.

In complementary regressions, I analyze job security as measured by sector switching and transitions to unemployment. For this analysis, I consider all individuals with a non-

[13] In both samples, I exclude individuals with seasonal employment contracts because while some of these contracts are similar to fixed-term contracts, others are more like discontinuous open-ended contracts. Only a very small proportion of the Spanish workforce holds seasonal jobs (in my sample less than 0.04%).

[14] Those magnitudes are arguably similar to those in Aghion et al (2005) for UK manufacturing sectors, i.e., an average of 0.05 and a standard deviation of 0.023.

seasonal job, regardless of the type of labor contract. Again, I match each worker with the level of competition and regulation in his or her sector of employment.

The sample of firm-level data includes all firms which can be assigned to a single 2-digit sector (92 percent of the sample). I assign to each firm the level of competition and regulation in the respective sector.

4 Empirical Analysis

I estimate the effect of competition on individual transitions from fixed-term to open-ended contracts using a linear discrete-time duration model. As shown by Guo (1993) and Jenkins (1995), discrete-time duration models can be estimated using standard binary choice models after a certain reorganization of the data. In particular, as explained in Jenkins (2005, page 73), discrete-time duration models can be conveniently estimated in four steps: (1) reorganize the data into person-period format; (2) create time-varying covariates (including a variable describing duration dependence in the probability of a transition); (3) choose the functional form for the discrete hazard, i.e., the probability of a transition conditional on being in the initial state for a certain time; and (4) estimate the model using any standard binary dependent regression routine. In step (3) I model the discrete hazard using the following linear specification:[15]

$$P(y_{ijt} = 1) = \beta_0 + \beta_1 C_{jt} + \beta_2 X_{ijt} + \beta_3 V_j + \beta_4 Z_t + \varepsilon_{ijt} \tag{4}$$

where y_{ijt} is equal to 1 if individual i switches from a fixed-term to an open-ended contract in a firm operating in sector j in year t and 0 if the individual continues to work under a fixed term contract[16], and C_{jt} is a measure of competition. The vector X_{ijt} includes

[15] In my specific case, the linear model is preferable over maximum likelihood estimators because the small number of observations per individual would render maximum likelihood estimators inconsistent in the fixed-effect estimations (the incidental parameters problem). Nevertheless, results are highly invariant to the use of other functional forms. I report the marginal effects resulting from the estimation of transitions from fixed-term to open-ended contracts using a probit duration model in Table A.2 of the Online Appendix.

[16] As in the standard linear duration model, I treat transitions to states other than open-ended contracts

individual characteristics (gender, age, marital status, household head, education, and nationality)[17], and fixed-term contract duration dummies.[18] V_j represents a set of sector dummies, and Z_t includes year and quarter dummies. Finally, ε_{ijt} is the error term.[19]

Competition may have indirect effects on the type of labor contract through its impact on the composition of the pool of workers in the industry and the sector composition of the economy.

Firms that operate in more competitive markets reward ability more (Guadalupe, 2007 and Cuñat and Guadalupe, 2009). Hence, more able workers may self-select into more competitive sectors. In order to remove this confounding effect, I include several individual controls that account for changes in observed worker characteristics. Moreover, I also present estimates from specifications that include worker fixed-effects.

Increasing competition may also lead to the expansion of the affected sectors. I account for changes in the sector composition of the economy by weighting observations by the ratio between the number of workers in the sector one year before the date of the interview and the number of workers in the sector in the year of the interview. As a result, the size of each sector remains constant.

Increased product market competition may affect labor contracts by: (i) inducing/preventing worker transitions between contracts within the sector and (ii) inducing/preventing workers switching across sectors, which is often associated with a new fixed-term contract. In order to disentangle these two mechanisms, I first consider observations of workers who switch sectors as censored at the time of the switch. Then, in Section 6, I study the role of

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as censored at the time of exit.

[17] I select individual controls that are unrelated to exogenous changes in competition because they are either exogenous (age, gender, marital status,...) or predetermined (immigrant status, education,...). I include education because in Spain by the time an individual starts working, his or her level of schooling is mostly determined; very few individuals re-enroll in education. I nevertheless estimate all equations excluding individual controls; coefficients remain unchanged. As shown in Table 3, the OLS coefficient of the specification without individual controls is 0.2 (0.207 in the complete specification) and the IV coefficient is -1.441 (-1.352 in the complete specification).

[18] One-, two- and three-year contract duration dummies are included and thus, contract duration of less than one year is left as the reference category. The Online Appendix contains the details on the construction of the duration dummies.

[19] All measures of competition vary at a higher level of aggregation than does the dependent variable. To address this, I cluster standard errors at the sector-time level.

sector switching as an additional mechanism through which competition may affect labor contracts.

4.1 Identification Strategy

One of the main challenges that arise when estimating the impact of product market competition on transitions to open-ended contracts is the potential endogeneity of the competition measure. Endogeneity may be present for two reasons. First, the use of open-ended contracts in a sector may influence the level of competition in the sector (reverse causality). This may happen if the type of labor contract affects the productivity of the worker (e.g. through the motivation of the worker, on the job training, etc.) which may have an impact on competition. Second, unobserved factors such as technology or workers' productivity may influence both the use of open-ended contracts and competition in the sector. In this case, endogeneity results from omitted variables.

To address endogeneity concerns, I propose an instrumental variable (IV) approach and complement it by a quasi-experiment. Both strategies are based on arguably exogenous changes in legislation that affected product market competition.

As an instrument for the level of competition, I use the RI provided by the OECD. The RI varies both at the sector and time dimensions simultaneously. It presents variation across sectors because the use of services differs across manufacturing sectors and it changes over time because anti-competitive laws change over time.

The RI can be used as an instrument for product market competition because deregulation in some service sectors induces higher competition in the manufacturing sectors. This happens because deregulation in some service sectors reduces barriers to entry and inefficient costs in goods markets. For instance, an increase in competition in the transport and communication sectors may render access to geographically distant markets affordable resulting in higher competition in those markets. Another example is the increase in credit affordability after banking deregulation which may foster firm creation and expansion translating into higher competition.

The exogeneity of the RI originates from two facts: First, it is highly unlikely that the number of fixed-term to open-ended contracts in the Spanish manufacturing sectors was somehow correlated with the motivation to liberalize service sectors. Second, the intensity of the use of services by manufacturing sectors is kept fixed at the initial level. Hence, it is impossible that endogenous changes in the use of transport, communication, distribution, and other services by manufacturing sectors would drive the results.

One may be concerned that the RI affects the price-cost margin independently of the level of competition. This could happen if deregulation in the service sectors reduces prices of services and hence manufacturing costs which, for given prices of manufacturing goods, increases the price-cost margin. To address this concern, I analyze pairwise correlations between price, cost, and the price-cost margin. I find that, as expected, price and price-cost margin are positively correlated. However, cost and price-cost margin are also positively correlated. Hence, the concern that deregulation has an effect on the price-cost margin through costs and that such effect is unrelated to competition is not supported by the data.[20]

One may also be concerned that the RI does not fulfill the exclusion restriction if deregulation in some service sectors implies displacement of workers from these service sectors into manufacturing sectors that are more intensive in the use of these services. However, previous literature (see for example Bertrand and Kramarz, 2002) shows that deregulated service sectors experience employment growth, rather than reductions in employment. Still, one may be concerned that some exit occurs. To address this possibility, I regress the number of workers in each manufacturing sector on the RI and control for year and sector dummies. The coefficient of the RI is positive and not significantly different from zero, ruling out that an inflow of workers to the sectors that are most affected by the deregulation is a problem for the estimation.[21]

[20] The fact that the positive correlation between the RI and the price-cost margin prevails over a potential negative correlation operating through costs but unrelated to competition is corroborated by the first stage regression shown in Table 4.

[21] The resulting coefficient is 32 and is not statistically significant (the p-value is 0.75).

4.1.1 Quasi-Experiment: The Application of EU Directives in Spain

The energy, rail and road, and post and telecommunications sectors experienced increases in competition as a result of legislative changes starting in 1997, 1998 and 1999, respectively. Those legislative changes were the result of the application of EU directives in Spain; see Appendix B for further details on the consequences of the application of EU directives on each sector. The OECD indicator on barriers to entry reflects the magnitude of the change in competition resulting from the application of EU directives in these sectors.[22] According to the OECD indicator, the barriers to entry decreased by 96.2 percent in the energy sector from 1996 to 1997, by 53.3 percent in the rail and road sector from 1997 to 1998, and by 85.9 percent in the post and telecommunications sector from 1998 to 1999. On the other hand, airline and retail distribution sectors experienced no change in barriers to entry during the period of study. Therefore, they serve as control sectors.

In the quasi-experiment, changes in barriers to entry in the energy, rail and road and post and telecommunications sectors are used as exogenous sources of changes in product market competition. The resulting specification is equivalent to that described in Equation (4) where C_{jt} is a vector with three components: C_{jt}^1, a dummy equal to 1 if an individual is employed in the energy sector after 1996, C_{jt}^2, an indicator equal to 1 if the individual is employed in the rail and road sector after 1997, and C_{jt}^3, a binary variable equal to 1 if the individual is employed in the post and telecommunications sector after 1998. Positive (negative) coefficients associated with these three variables are interpreted as more competition inducing a higher (lower) probability of moving to an open-ended contract. I add sector-specific linear trends to the list of controls in Equation (4) to account for potentially different underlying trends across sectors. Additionally, in the quasi-experiment specification it is possible to control for individual fixed effects.[23]

[22] For data on barriers to entry, see:
http://www.oecd.org/document/1/0,3343,en_2649_34323_2367297_1_1_1_1,00.html

[23] It is impossible to control for individual fixed-effects in the instrumental variables estimation because the data on the RI do not present enough within-individual variation. Hence, the instrument does not pass the Stock and Yogo (2005)'s test when individual fixed effects are controlled for.

As explained above, the sectors affected by the reforms are providers of services for the rest of the economy. As a consequence, the sectors in the control group may have experienced second order increases in competition as a result of the contagion effect that operates through the use of services provided by the treated sectors. Therefore, when comparing treated and control groups, one may actually compare: (i) an increase in competition in the treated sectors as a consequence of the direct impact of the reforms and the contagion effect from the other treated sectors and (ii) an increase in competition in the control sectors because of contagion effects through service provision by the treated sectors. If the contagion effects are significant, the coefficients estimated in the quasi-experiment will be consistent estimates of a lower bound of the true effect.

The exogenous nature of this quasi-experiment originates in the Spanish government's resistance to apply the EU directives. The Spanish government opposed the timing imposed by the European Union and argued 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. For example, 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". Moreover, not only the timing but also the effectiveness of these reforms was unforeseen; incumbents in some sectors were unaware of the real extent of the application of the reforms. "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).

5 Empirical Results

Table 3 shows the results of the estimation of individual transitions from fixed-term to open-ended contracts as described in Equation (4). The OLS results point towards a

positive but statistically insignificant relationship between competition and transitions from fixed-term to open-ended contracts. The IV results, on the other hand, show a negative and statistically significant impact of competition on transitions from fixed-term to open-ended contracts. The differences between OLS and IV results reveal the importance of accounting for endogeneity in this set-up. A Hausman test confirms that the OLS coefficient is biased upward. The magnitude of the bias is such that it offsets (almost) the entire estimated causal effect. Many sources of endogeneity can explain such a strong positive bias: worker effort and on-the-job training are examples of potentially relevant omitted variables. Worker effort has been found to be positively correlated with the level of competition (Nickell, 1999) and with transitions to open-ended contracts (Dolado and Stucchi, 2008). On the job training has also been found to be positively associated with competition (Bassanini and Brunelli, 2011) and with transitions to open-ended contracts (Albert, Garcia-Serrano and Hernanz, 2004). In the IV estimation, the introduction of individual controls and the application of weights have only small impacts on the magnitude of the coefficient.[24]

The coefficient from the complete specification with time, sector dummies and weights (column 6) indicates that a one standard deviation increase in the level of product market competition reduces by at least 22 percent the probability that a worker with a fixed-term contract obtains an open-ended contract.

The estimates for the coefficients of individual controls are fairly standard, and they are consistent with previous studies using logit estimates (see Alba, 1998), as well as competing risks duration models (see Güell and Petrongolo, 2007). Similar to the latter study, my results reveal two pronounced spikes at one- and three-year contract durations.

The IV specification uses the price-cost margin as a measure of competition and the RI as an instrument. The first stage (Table 4) reflects a positive correlation between liber-

[24]If anything, the estimation using weights reflects a slightly weaker negative impact, indicating that industries in which the identifying variation occurs tend to expand. This is coherent with results obtained by the previous literature, which show that more competition induces higher employment; see Nicoletti and Scarpetta (2005), Griffith et al. (2007) and Fiori et al. (2007).

alization in the service sectors and competition in the industries that use those services.[25]

The results shown in Table 3 are robust to the use of the inverse of the number of firms as an alternative measure of competition (see Table A.3 in the Online Appendix).[26]

Next, I analyze how the impact of competition on job security changes after fixed-term contract expiration and for workers who switch sector. I also explore the role of changes in the number of firms as a mechanism for the estimated effect.

Fixed-term contract expiration

Transitions to open-ended contracts often happen at the end of an existing fixed-term contract. I analyze whether the impact of competition differs for individuals with an ongoing fixed-term contract and those with a recently expired fixed-term contract. In order to identify individuals whose fixed-term contract expires in the next period, I focus on the first interview of the individual and use information about the time she has worked under her current contract and the total duration of the contract. The proportion of individuals with an expired fixed-term contract in my sample is 41%. I run the baseline regression in Equation (4) adding a dummy for a recently expired contract and its interaction with the level of competition.[27] The results of this estimation are shown in Table A.5 of the Online Appendix. The coefficient of the variable "expired" is positive. This corroborates that when an individual is observed shortly after the expiration date of her fixed-term contract, she is more likely to switch to an open-ended contract. The coefficient of the interaction of "expired" with competition is positive but it is smaller in absolute value than the coefficient of competition. This indicates that for individuals with expired fixed-term contracts, the probability of switching to an open-ended contract is less affected by product market competition. In other words, an increase in competition is more effective

[25] For all regressions, the F-statistic of the excluded instruments is greater than the corresponding critical value of Stock and Yogo (2005); consequently the instrument is not weak.

[26] Standard errors are extremely similar to the ones I obtain with cluster by sector and with two-dimensional cluster in which one dimension is the sector-time cell and the other is the individual (see Table A.4 in the Online Appendix). Two-dimensional cluster allows me to account for the correlation of the errors within sector-time cells as well as for serial correlation (as explained in Bertrand et al., 2004).

[27] In this part of the analysis, I exclude the first interview of the individual which is only used to identify contract expiration.

in deterring early conversions to open-ended contracts than in deterring transitions to open-ended contracts after expiration of a fixed-term contract.

Changes in the number of firms as a mechanism

An increase in competition is typically associated with an increase in the number of firms, and new firms are more likely to use fixed-term contracts. Hence, changes in the number of firms in a sector may (partly) explain the negative impact of competition on the probability of switching to an open-ended contract. I check whether an exogenous increase in competition causes a significant increase in the number of firms in my sample. To this end, I estimate Equation (4) using the log of the number of firms in the sector as the dependent variable. Results show that competition has a positive and significant impact on the number of firms.[28] Hence, changes in the number of firms are a potential channel through which competition affects labor contracts.

5.1 Quasi-Experiment Results

Table 5 shows the results obtained from the quasi-experiment. In the complete specification, all coefficients are negative and significant (except for the post and telecom sector after 1999) which confirms that competition reduces the probability of switching from fixed-term to open-ended contracts. The first panel shows that the estimated effects are consistent across the energy, rail and road and post and telecommunications sectors, as well as with results from the IV specification. Similar to results from the IV estimation, including individual controls and using weights does not alter coefficients significantly.

As expected, the inclusion of individual fixed-effects as controls leads to larger negative effects. This can be explained because individuals with "good" ("bad") individual characteristics are more (less) likely to experience transitions to open-ended contracts and

[28] The data on number of firms is obtained from the Industrial Enterprise Survey. The dependent variable is the logarithm of the number of firms. The measure of competition is the price-cost margin multiplied by -1. The coefficient of competition in the most complete specification using the Regulatory Impact indicator as the instrument is 6.345. The corresponding standard error obtained after clustering by sector-year is 2.361. As a result, the coefficient is significant at the 1% level.

are more (less) likely to work in sectors with high levels of competition. This suggests that the coefficients obtained in the specifications without individual fixed effects, including the IV specification, provide lower bound estimates of the true effect.

In order to interpret the results in terms of magnitude, I also estimate an equation in which I use as a measure of competition 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 OECD. The second panel of Table 5 shows that this leads to a coefficient of -0.054, indicating that the elimination of legal barriers to entry (allowing free entry to a legal monopoly) leads to a decrease of 5 percent in the probability of becoming open-ended.

According to Imbens (2004), a difference-in-differences approach, as the one used for the quasi-experimental analysis, requires support for the validity of two assumptions: (i) overlap in the covariates distributions, and (ii) exogeneity (also called unconfoundedness). Concerning (i), Table 2 shows a significant overlap in the distribution of the covariates for workers employed in the treated sectors and the distribution of the covariates for workers employed in the untreated sectors. With respect to (ii), Figure 1 presents evidence that the pre-treatment trends were similar for treated and untreated sectors.[29] Moreover, the overlapping of the confidence intervals shows that the proportions of open-ended contracts in the treated and control sectors were statistically indistinguishable in the pre-treatment period and that they only become statistically different after the treatment. As an additional test of assumption (ii), I estimate the treatment effect on a pre-treatment variable as a test for the existence of a "placebo" effect. In particular, I address the impact of the treatment on transitions from fixed-term to open-ended contract a year before the treatment took place; see tables 1 and 2 in Appendix D. While the energy sector and the

[29] There is a trough in the proportion of open-ended contracts in 2001 for both treatment and control groups. The trough can be explained because in 2001, for the first time since 1980, the unemployment rate was below 11%. Hence, the trough may be the consequence of temporary contracts being very common among new hirings. In the empirical analysis, year and quarter dummies are included to control for the influence of fluctuations in the economic cycle on labor contracts. In addition, weights account for changes in the number of workers in each sector from one period to the next.

post and telecom sector are associated to insignificant coefficients, the rail and road sector presents a positive and significant coefficient. This positive coefficient could indicate the presence of a pre-existing positive trend and in that case, our negative estimated effect would be biased towards zero. Given that the "placebo" test does not support the validity of the common trends assumption for the rail and road sector, I repeat the estimation omitting this sector and find that the coefficients of the other two treatments remain invariant.

Given that there are 39 degrees of freedom in the quasi-experimental regressions, one may be concerned about whether there are enough clusters (defined as sector-year cells) to provide reliable estimates. To address these concerns, I perform bootstrap on clusters of sector-year cells. Coefficients arising from each iteration are displayed in Figure A.1 of the Online Appendix. These coefficients are consistently negative and they are of similar magnitude.

6 Robustness checks

In this Section, I present a series of robustness checks. I first measure job security by sector switching and transitions to unemployment. Next, I study transitions from fixed-term contracts to alternative states, namely, open-ended contracts, other sectors, and unemployment. Finally, I analyze the proportion of open-ended contracts in a firm using firm-level data.

The Continuous Sample of Working Histories as an alternative database

For my benchmark analysis I choose to use the Labor Force Survey instead of other potentially suitable datasets like the Continuous Sample of Working Histories (CSWH; Muestra Continua de Vidas Laborales by its Spanish name). In this latter dataset a relevant proportion of observations for the type of labor contract is missing for the earlier

years of my sample period. Moreover, competition itself may affect the composition of this dataset. The reason for this is that the CSWH only includes individuals who were working or receiving unemployment benefits after 2004 and competition may alter the probability of labor force participation. On the other hand, the Spanish Labor Force Survey is a representative sample of all working individuals. However, the CSWH presents some advantages with respect to the Spanish Labor Force Survey: it captures more short fixed-term contracts and it includes more disaggregated information regarding sector of activity. To check robustness, I re-estimate Equation (4) using the CSWH. To reduce the sample selection problem discussed before, instead of using one wave only, I use the 2005-2008 waves to construct a sample of all individuals who established some relationship with social security at some point between 2005 and 2008. In this constructed sample the proportion of missing observations for type of contract are reduced to 32%, compared to 45% when a single wave is used. Appendix E shows these estimation results which are very similar to those obtained using the Labor Force Survey.

6.1 Traditional Measures of Job Security: Sector Switching

Analogous to Goldberg et al. (1999), I use sector switching as an additional measure of job security. The baseline specification can be written as in Equation (4). The outcome of interest, y_{ijt}, equals 1 if individual i in sector j at time t switches sectors, and 0 if the individual stays. The vector X_{ijt} contains the set of individual characteristics listed in Section 4 with the exception of fixed-term contract duration dummies which are substituted by job-duration dummies defined in years because the new sample includes also workers with open-ended contracts.[30]

Competition is potentially endogenous to sector switching. Endogeneity might originate from: (i) the presence of omitted variables (e.g. individual sector switching costs

[30] When estimating the probabilities of sector switches and transitions to unemployment, I do not use weights because sector switches and transitions to unemployment are one of the channels through which the sector composition of the economy can change.

and ability) and (ii) the existence of reverse causality because sector switching may affect competition through changes in the productivity of workers switching sector. Hence, I estimate this regression using IV.

Table 6 contains the results on the impact of competition on sector switching. Comparison of OLS and IV results shows that the OLS estimation induces a bias towards zero. The IV results show that a rise in competition in a sector induces an increase in the probability of a worker moving out of that sector. In particular, a one standard deviation rise in competition increases the probability that a worker moves to a different sector by over 42 percent.

These results stand in contrast to Goldberg et al (1999) who find no pattern between exchange rate movements and sector switching. Different results could arise because of structural differences between the Spanish and the US market. Goldberg et al (1999)'s results could also be explained: (i) if only some firms were exposed to foreign competition, (ii) if dollar appreciations decreased competitiveness for exporters but increased competitiveness for importers, resulting in an ambiguous overall effect, or (iii) if macroeconomic variables adjusted and compensated for the variation in exchange rates.

6.2 Traditional Measures of Job Security: Unemployment

The probability that a worker becomes unemployed is an alternative measure of job security. This measure is significantly related to the type of labor contract because fixed-term contracts are associated with a higher probability of unemployment. However, keeping a worker under a fixed-term contract or firing a worker could potentially be strategic substitutes for the firm. Therefore, the impact of product market competition on unemployment may differ from the impact on the use of fixed-term contracts.[31] The specification of interest is very similar to Equation (4). The outcome of interest, y_{ijt}, is now equal to 1 if

[31] The simple model in Section 2 predicts that a rise in competition translates into more transitions to unemployment. This is in line with the theoretical model proposed by Amable and Gatti (2004) in which an increase in product market competition increases the separation rate.

individual i working in sector j at time t becomes unemployed in a given year and 0 if he or she continues working. The set of individual characteristics, X_{ijt}, includes the controls in Equation (4) with the exception of fixed-term contract duration dummies, which are substituted by job-duration dummies defined in years.

Again, endogeneity concerns call for the use of IV. The results obtained from the analysis of the impact of competition on transitions to unemployment are shown in Panel A of Table 7. The IV regression indicates that a one standard deviation rise in competition increases the probability of becoming unemployed by at least 15 percent. However, these effects are not precisely estimated. The reason is that men's and women's transitions to unemployment respond very differently to changes in competition. To illustrate this, in Panel B of Table 7 I allow the estimate to be different for men and women. Transitions to unemployment rise with competition for both genders, but the impact is significantly higher for women. However, these differences disappear when I compare the coefficients to male and female transition rates. In particular, a rise in competition by a one standard deviation causes an increase in the probability of becoming unemployed by over 21 percent for men and 20 percent for women.

I complement the IV results by a quasi-experimental strategy that analyzes the impact of competition on the probability that a worker becomes unemployed. Results are consistent with those from the IV estimation; all coefficients are positive but only half of them are significant at conventional levels.[32]

6.3 Transitions from Fixed-Term Contracts to Multiple Destinations

As explained before, the linear duration model deals with the presence of multiple destination states by treating transitions to states other than the one of interest (open-ended contracts) as censored at the time of exit. Studying transitions to open-ended contracts,

[32] Results are available from the author upon request.

I thus treat transitions to other sectors and unemployment as censored. Other models, like the logit or probit models, present functional forms that can be easily extended to jointly estimate the probability of transitions to different states. In order to show that my results are invariant to the explicit consideration of multiple destinations, I estimate a multinomial probit model. In this model, the probability that worker i switches from employment with a fixed-term contract to alternative k can be written as:

$$P_{ijk} = P(y_{ij} = k) = \Phi(\gamma_0 + \gamma_1 C_{jt} + \gamma_2 X_{ijt} + \gamma_3 V_j + \gamma_4 Z_t) \tag{5}$$

where Φ stands for the standard normal cumulative distribution function and the controls are the same as in Equation (4).

This analysis improves upon the linear probability model because it takes into account potential correlations between the probabilities of moving to an open-ended contract, switching sectors and becoming unemployed. Results shown in Table 8 are consistent with those from the linear probability model. The marginal effect of competition on transitions from fixed-term to open-ended contracts is slightly higher than before. However, the difference is not significant. Both, sector switching and transitions to unemployment increase with competition, but only the effect on the probability of switching sector is precisely estimated.

6.4 The Proportion of Open-Ended Contracts in a Firm

The individual-level analysis of transitions from fixed-term to open-ended contracts is complemented with an analysis performed at the firm-level. The effect of competition on the proportion of open-ended contracts in a firm is estimated as follows:

$$P_{fjt} = \beta_0 + \beta_1 C_{jt} + \beta_2 V_j + \beta_3 Z_t + \varepsilon_{fjt} \tag{6}$$

where P_{fjt} is the proportion of open-ended over all contracts in firm f operating in sector j in year t, and C_{jt} is a measure of competition. Regarding controls, V_j represents sector

indicators, and Z_t stands for year dummies. Finally, ε_{fjt} is the error term.

Competition may affect which firms leave, stay or enter a sector. Hence, unobserved characteristics of firms that operate in a given sector when competition is high may be different when competition is low. For instance, when competition increases, only the most productive firms remain, and these firms may be more prone to apply a particular contract policy. If unobserved firm characteristics influence the type of labor contracts, the estimated impact of competition on contracts may be biased. This is why I account for firm heterogeneity. To this end, I demean the data by subtracting averages computed at the firm level, a transformation that is equivalent to including firm fixed-effects:[33]

$$\widetilde{P}_{fjt} = \beta_0 + \beta_1 \widetilde{C}_{jt} + \beta_2 \widetilde{V}_j + \beta_3 \widetilde{Z}_t + \varepsilon_{fjt} \tag{7}$$

where the tilde indicates that the variable equals the original variable minus the average for each firm.

The dependent variable varies at the firm, sector, and time levels, while the explanatory variables vary only by sector and time. This could lead to misleading standard errors because the identifying variation is lower than the variation at the firm level. To avoid this, I aggregate Equation (7) by calculating the average of the included variables in each sector-year cell. The resulting equation is:

$$\overline{P}_{jt} = \beta_0 + \beta_1 \overline{C}_{jt} + \beta_2 \overline{V}_j + \beta_3 \overline{Z}_t + \upsilon_{jt} \tag{8}$$

where the upper bar indicates that the variable is aggregated at the sector-year level. Observations are weighted according to the number of firms in each sector-year cell.

Table 9 shows the results of the estimation of the proportion of open-ended contracts in a firm as in Equation (8). The OLS and IV estimates point to a negative impact of competition on the proportion of open-ended contracts in a firm. The comparison of

[33] In the linear model, the inclusion of firm fixed effects is equivalent to estimating the model after demeaning the data by substracting averages computed at the firm level (see page 34 in Baltagi, 2008).

OLS and IV results show that the OLS estimates are biased towards zero. In the IV estimation, the magnitude of the effect decreases when firm fixed effects are included. This can be due to firms sorting across sectors according to their characteristics and the level of competition in the sector. While this kind of sorting may affect the results from the estimation without fixed effects, it does not affect the results from the fixed-effect estimation. Potentially relevant characteristics in this context could be if a firm is a multinational or a former public firm. Multinationals are often found in sectors with high competition (Barrios, Görg and Shobl, 2005) and they have a higher tendency to use open-ended contracts (Traferri, 2008). Former public firms are more commonly found in environments with low competition and they are also more likely to use open-ended contracts (Dolado, Garcia-Serrano and Jimeno, 2002).

The coefficient for the complete estimation that includes time, sector dummies, and firm fixed effects (column 4) indicates that a one standard deviation increase in the level of product market competition decreases the proportion of open-ended contracts in the firm by at least 9 percent. These results are robust to the use of the concentration ratio as an alternative measure of competition; see Table A.6 in the Online Appendix.

In order to paint a broader picture of the effects of competition on labor contracts, I analyze the impact of competition on employment at the firm level. I estimate Equation (8) with the log of the number of workers as an alternative dependent variable. Results show that competition induces an increase in the number of workers per firm.[34]

7 Conclusion

A vast and growing literature studies the impact of product market competition on labor market outcomes. This paper contributes to this literature by estimating the impact of competition on job security as measured by the probability of switching from a fixed-term to an open-ended labor contract.

[34] See columns (5)-(8) in Table 9.

I propose a simple theoretical model that sheds light on the relationship between competition and type of labor contract. Open-ended contracts differ from fixed-term contracts in that: (i) open-ended contracts imply a severance pay in case of dismissal, and (ii) workers with fixed-term contracts are more likely to leave the firm. Competition reduces profit margins, and hence makes it more likely that low productivity shocks render firm-employee matches unprofitable. As a result, the model predicts that product market competition reduces transitions to open-ended contracts.

In the empirical analysis I combine data from the Spanish Labor Force Survey, the Industrial Enterprise Survey and the Business Strategies Survey. To overcome endogeneity concerns, I use changes in product market regulation as a source of exogenous variation in the level of competition. Exogeneity originates from: (i) the increase in competition in manufacturing sectors as a consequence of deregulation in service sectors, and (ii) the enforcement of the EU directives enhancing competition in Spain.

Overall, results show that product market competition has a significant negative impact on job security. In particular, a one standard deviation increase in product market competition: (i) decreases the probability that a worker moves from a fixed-term to an open-ended contract by at least 22 percent, (ii) increases the probability that the average worker in a sector moves to a different sector by at least 42 percent, and (iii) increases the probability that a worker becomes unemployed by at least 15 percent.

I conclude that more competition decreases job security on the job through two channels: First, workers who stay in the sector where competition increases are less likely to switch to open-ended contracts. Second, job security for workers who lost their job as a consequence of the increase in competition decreases because new jobs are often associated with fixed-term contracts.[35]

The large gap between firing costs of open-ended and fixed-term contracts has led to the dualization of labor markets. While some workers enjoy stable jobs and a high level of protection, others move from one fixed-term contract to another, often with unemploy-

[35] In my sample, 83% of individuals switching sector are hired under a fixed-term contract.

ment spells between contracts. These differences in employment protection account for a significant part of job losses during the Great Recession (Bentolila et al., 2012). To counteract the dualization of labor markets, leading economists have advocated the use of single contracts with severance pay that increases with tenure (Blanchard and Tirole, 2003 and Cahuc and Kramarz, 2004 for France; Boeri and Garibaldi, 2008 for Italy; and Andrés et al., 2009 for Spain). Single contracts would be beneficial for the majority of workers (Garcia Perez and Osuna, 2012), and their use is encouraged by the European Commission. However, in highly dualized labor markets like the Italian, French, and Spanish ones there is resistance to implement single contracts. My paper shows that product market competition increases the dualization of labor markets. Hence, governments that operate in the context of dualized labor markets and value job security positively should complement their competition-enhancing policies with measures to avoid the potential reduction in job security caused by the rise in product market competition.

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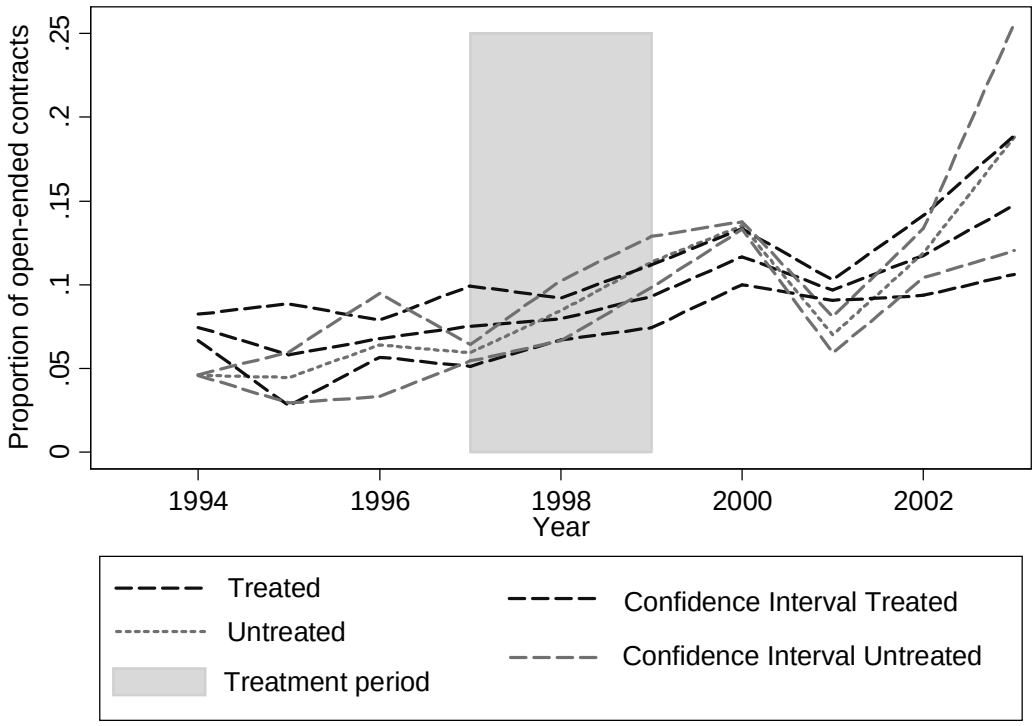
Figure and Tables

Figure 1: Proportion of open-ended over total labor contracts over time



This graph displays the proportion of open-ended contracts over the total number of labor contracts in the treated and the untreated sectors. The treated sectors are energy, rail & road and post & telecom and the untreated sectors are airlines and retail distribution.

Table 1: Descriptive statistics. Sample 1

	Mean	Sd	Min	Max
Switch to open-ended contract	0.171	0.376	0	1
Price-cost margin	0.065	0.028	-0.045	0.269
Regulatory Impact	0.151	0.042	0.099	0.546
Age	29.312	9.766	16	64
Married	0.351	0.477	0	1
Household head	0.249	0.432	0	1
High school graduate	0.700	0.458	0	1
University graduate	0.078	0.268	0	1
Spanish citizen	0.992	0.09	0	1
One year fixed-term contract duration	0.591	0.492	0	1
Two years fixed-term contract duration	0.308	0.462	0	1
Three years fixed-term contract duration	0.072	0.258	0	1
Region			1	52
Quarter			1	4
Year			1993	2003
Sector			1	25

The sample, drawn from the Spanish Labor Force Survey, consists of 31,084 individuals 16 to 64 with fixed-term contracts between 1993 and 2003.

Table 2: Descriptive statistics. Sample 2

	Full sample		Treated sectors		Control sectors	
	Mean	**Sd**	**Mean**	**Sd**	**Mean**	**Sd**
Switch to open-ended contract	0.101	0.301	0.101	0.302	0.101	0.301
Energy after 1997	0.011	0.105	0.042	0.201	0	0
Rail&road after 1998	0.085	0.279	0.319	0.466	0	0
Post&telecom after 1999	0.043	0.203	0.162	0.368	0	0
Age	28.473	8.92	32.834	9.668	26.894	8.072
Married	0.317	0.465	0.497	0.5	0.252	0.434
Household head	0.195	0.397	0.411	0.492	0.117	0.322
High school graduate	0.76	0.427	0.662	0.473	0.795	0.404
University graduate	0.077	0.267	0.09	0.287	0.073	0.259
Spanish citizen	0.994	0.077	0.993	0.086	0.995	0.074
One year fixed-term contract duration	0.461	0.498	0.424	0.494	0.474	0.499
Two years fixed-term contract duration	0.368	0.482	0.364	0.481	0.37	0.483
Three years fixed-term contract duration	0.103	0.304	0.124	0.329	0.095	0.294

The sample is drawn from the Spanish Labor Force Survey and includes individuals 16 to 64 with fixed-term contracts between 1993 and 2003. The industries included are energy, rail & road, post & telecom, airline and retail. Energy, rail & road and post & telecom are considered the treated sectors, while airline and retail industries serve as controls. There are 15,663 observations, 4,430 in the treated sectors and 5,237 in the untreated sectors.

Table 3: The impact of competition on job security

	OLS			IV		
Dep var: Switch to open-ended	(1)	(2)	(3)	(4)	(5)	(6)
Competition	-.205	0.2	0.207	-1.529	-1.441	-1.352
(-Price-cost margin)	(0.128)	(0.207)	(0.217)	(0.563)***	(0.555)***	(0.521)***
Number of observations	31,084	31,084	31,084	31,084	31,084	31,084
R-squared	0.025	0.058	0.058	0.043	0.056	0.056
Individual characteristics	No	Yes	Yes	No	Yes	Yes
Weights	No	No	Yes	No	No	Yes

The dependent variable is equal to 1 if a worker moves from a fixed-term to an open-ended contract, and 0 otherwise. The measure of competition is the price-cost margin multiplied by -1. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Table 4: The impact of deregulation on competition (first stage)

Dep var: Price-cost margin	(1)	(2)	(3)
Regulatory Impact	0.227	0.227	0.232
	(0.051)***	(0.051)***	(0.051)***
Number of observations	31,084	31,084	31,084
R-squared	0.868	0.868	0.868
F of excluded instrument	19.95	20.03	20.99
Individual characteristics	No	Yes	Yes
Weights	No	No	Yes

The dependent variable is minus the price-cost margin. The instrument for which the coefficient is displayed is minus the Regulatory Impact indicator. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year. The F-statistics of the excluded instrument are greater than the critical values provided by Stock and Yogo (2005), which indicates that the instrument is not weak.

Table 5: The impact of deregulation on job security (quasi-experiment)

Three separated treatments

Dep var: Switch to open-ended	(1)	(2)	(3)	(4)
Energy after 1997	-.005	-.009	-.016	-.137
	(0.032)	(0.031)	(0.021)	(0.046)***
Rail&road after 1998	-.042	-.043	-.034	-.041
	(0.009)***	(0.009)***	(0.009)***	(0.016)***
Post&telecom after 1999	0.021	0.02	0.025	-.012
	(0.028)	(0.028)	(0.028)	(0.037)
Number of observations	19,877	19,877	19,474	15,663
R-squared	0.135	0.137	0.14	0.243
Individual characteristics	No	Yes	Yes	Yes
Weights	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes

Accounting for treatment intensity

Dep var: Switch to open-ended	(1)	(2)	(3)	(4)
Barriers reduction	-.021	-.023	-.013	-.054
	(0.017)	(0.017)	(0.016)	(0.03)*
Number of observations	19,877	19,877	19,474	15,663
R-squared	0.135	0.137	0.14	0.243
Individual characteristics	No	Yes	Yes	Yes
Weights	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes

The dependent variable is equal to 1 if the individual moves from a fixed-term to an open-ended contract, and 0 otherwise. In the first table, 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. In the second table, the measure of competition is the OECD indicator on barriers to entry. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Table 6: The impact of competition on the probability of switching sector

Dep var: Sector switching	OLS		IV	
	(1)	(2)	(3)	(4)
Competition	-.011	-.010	0.15	0.146
(- Price-cost margin)	(0.028)	(0.028)	(0.061)**	(0.06)**
Number of observations	109,325	109,325	109,325	109,325
R-squared	0.022	0.022	0.021	0.022
Individual characteristics	No	Yes	No	Yes

The dependent variable is equal to 1 if the individual switches sector in a given year, and 0 otherwise. The measure of competition is the price-cost margin multiplied by -1. This is instrumented using the Regulatory Impact. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Table 7: The impact of competition on the probability of becoming unemployed

Panel A: Both genders

Dep var: Transitions to unemployment	OLS		IV	
	(1)	(2)	(3)	(4)
Competition	0.069	0.065	0.067	0.068
(- Price-cost margin)	(0.027)**	(0.027)**	(0.068)	(0.069)
Number of observations	110,675	110,675	110,675	110,675
R-squared	0.089	0.09	0.089	0.09
Individual characteristics	No	Yes	No	Yes

The dependent variable is equal to 1 if the individual becomes unemployed in a given year, and 0 otherwise. The measure of competition is the price-cost margin multiplied by -1. The price cost margin is instrumented using the Regulatory Impact. *Significant at 10%,**5%,***1%. All the regressions include year fixed effects, quarter indicators, sector binary variables, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Panel B: Disaggregated by gender

	OLS			IV		
Dep var: Transitions to unemployment	(1)	(2)	(3)	(4)	(5)	(6)
Competition	0.068	0.065	0.089	0.065	0.068	0.21
(- Price-cost margin)	(0.027)**	(0.027)**	(0.046)*	(0.069)	(0.069)	(0.095)**
Male		-.007	-.009		-.007	-.016
		(0.001)***	(0.003)***		(0.001)***	(0.005)***
- Price-cost margin*Male			-.029			-.141
			(0.038)			(0.064)**
Number of observations	110,675	110,675	110,675	110,675	110,675	110,675
R-squared	0.09	0.09	0.09	0.09	0.09	0.09

The dependent variable is equal to 1 if the individual becomes unemployed in a given year, and 0 otherwise. The measure of competition is the price-cost margin multiplied by -1. The price cost margin and its interaction with the male dummy are instrumented using the Regulatory Impact and its interaction with the male dummy. *Significant at 10%,**5%,***1%. All the regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Table 8: The impact of competition on transitions from fixed-term contracts to multiple destinations (multinomial probit)

	no-IV			IV		
Dependent variable:	open-ended	other sector	unemployed	open-ended	other sector	unemployed
Competition (coefficient)	0.995	-0.011	3.181	-8.911	11.35	6.472
	(1.137)	(1.564)	(1.474)**	(4.19)**	(5.471)**	(5.395)
Competition (marginal effects)	0.168	-0.0004	0.066	-1.515	0.48	0.136
Number of observations	38,786	38,786	38,786	38,786	38,786	38,786

The dependent variable is equal to 1 if the individual moves from a fixed-term to an open-ended contract, 2 if the individual switches sector, 3 if the individual becomes unemployed, and 0 otherwise. The measure of competition is the price-cost margin multiplied by -1. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Table 9: The impact of competition at the firm level

Dep var:	Proportion of open-ended				Log number of workers			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Competition	-.333	-.312	-5.053	-2.543	-.658	-.098	16.796	7.962
(- Price-cost margin)	(0.126)***	(0.111)***	(3.064)*	(1.345)*	(0.728)	(0.233)	(12.289)	(4.298)*
No. of observations	228	228	228	228	228	228	228	228
R-squared	0.896	0.678	0.158	0.017	0.896	0.678	0.158	0.017
Firm fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

The dependent variable is the proportion of workers with open-ended contracts over total contracted workers in columns (1)-(4) and the logarithm of the number of workers in columns (5)-(8). The measure of competition is the average price-cost margin in the industry multiplied by -1. This is instrumented using the Regulatory Impact. *Significant at 10%,**5%,***1%. All the regressions include year fixed effects, and sector dummies. Errors are clustered by sector-year.

Appendix A: Solving the Model

I start from Equations (1) and (2) and rewrite the profits obtained by firms that use open-ended contracts as:

$$\Pi^o(\theta,\eta_i) = \int_0^{\overline{c}_i-p(\theta)-S} -Sf(\eta)d\eta + \int_{\overline{c}_i-p(\theta)-S}^{\overline{c}_i-p(\theta)} p(\theta)-(\overline{c}_i-\eta)f(\eta)d\eta + \int_{\overline{c}_i-p(\theta)}^{\overline{c}_i} p(\theta)-(\overline{c}_i-\eta)f(\eta)d\eta$$

The first term refers to the case in which the productivity shock is so low that the firm prefers to fire the employee and to pay severance rather than to produce, the second term applies when the productivity shock is such that the firm decides to produce and to incur in losses rather than paying severance, and the third term refers to a situation in which the productivity shock is high enough to lead to positive profits.

With Equation (1) the above expression can be simplified to:

$$\Pi^o(\theta,\eta_i) = \int_0^{\overline{c}_i-p(\theta)} \Pi^o(\theta,\eta)f(\eta)d\eta + \int_{\overline{c}_i-p(\theta)}^{\overline{c}_i} p(\theta)-(\overline{c}_i-\eta)f(\eta)d\eta$$

Profits obtained by firms that use fixed-term contracts are given by:

$$\Pi^f(\theta,\eta_i) = (1-l)\int_{\overline{c}_i-p(\theta)}^{\overline{c}_i} p(\theta)-(\overline{c}_i-\eta)f(\eta)d\eta$$

These expected profits are given by the product of the probability that the employee with a fixed-term contract stays and the level of profits when the productivity shock is such that production leads to positive profits.

By subtracting the two equations above, I obtain Equation (3):

$$E_\eta[\Pi^o-\Pi^f] = \int_0^{\overline{c}_i-p(\theta)} \Pi^o(\theta,\eta)f(\eta)d\eta + l\int_{\overline{c}_i-p(\theta)}^{\overline{c}_i} p(\theta)-(\overline{c}_i-\eta)f(\eta)d\eta$$

Appendix B: The model with heterogenous worker productivities

In the model presented in Section 2 workers are assumed to be equally productive. Here I present an extended version of the model that incorporates workers with different productivities.

I consider a two-period economy with firms and workers. Firms are risk neutral and operate in a market with level of competition $\theta \in [0, \infty]$. A firm i can choose to produce one unit and if it does so, it obtains profits $\Pi_{it} = p(\theta) - c_{it}$, where p is the price of the product and c_{it} is its cost. Each firm hires one worker j with an associated productivity level α_{jt}.[36] Production cost can be expressed as $c_{ijt} = \overline{c}_i - \alpha_{jt} - \eta_{it}$ where $\overline{c}_i$ is the firm-specific cost and η_{it} is an i.i.d. shock to total factor productivity. The value of α_{jt} lies between 0 and $\overline{c}_i$. Consistently, the new η_{it} lies between 0 to $\overline{c}_i - \alpha_{jt}$, which is firm and time specific. The variable η_{it} is distributed according to $f(\eta)$ with support $[0, \overline{c}_i]$. Each firm decides which type of contract to offer to the worker and whether to produce or not. I assume that an unemployed worker always accepts a job offer. Similarly, a worker with a fixed-term contract always switches to an open-ended contract when offered.

The timing of events can be described as follows. In the first period, a match is formed and the worker is hired under a fixed-term contract. Then, the shock to productivity η_{i1} is revealed and the firm decides whether to produce or not. In the second period, the firm observes α_{jt} and must decide whether to keep the worker under a fixed-term contract or to offer an open-ended contract. If a worker is offered a new fixed-term contract, she leaves the firm with probability l. Without a worker, the firm does not produce and earns zero profits. If the worker stays, which happens with probability $1 - l$ if offered a fixed-term contract and 1 if offered an open-ended contract, the exogenous shock to productivity η_{i2} is revealed. After that, the firm decides whether or not to produce. If production does not take place, the firm must pay severance S to workers with open-ended contracts.

[36] The assumption that productivity is period-specific allows me to keep the model tractable. It does not have implications for the impact of competition on labor contracts because decisions on labor contracts are made only in the second period.

To solve the model I focus on the second period, when the firm decides which type of labor contract to offer. For readability, I omit the time subindex in the expressions that follow. Second period profits under an open-ended contract $\Pi^o(\theta, \eta_i)$ are given by:

$$\Pi^o(\theta, \eta_i) = \begin{cases} -S & \text{if } p(\theta) - (\overline{c}_i - \eta_i) \leqslant -S \\ p(\theta) - (\overline{c}_i - \alpha_j - \eta_i) & \text{otherwise,} \end{cases} \tag{9}$$

while profits under a fixed-term contract $\Pi^f(\theta, \eta_i)$ are:

$$\Pi^f(\theta, \eta_i) = \begin{cases} 0 & \text{if } p(\theta) - (\overline{c}_i - \eta_i) \leqslant 0 \text{ or if the worker leaves} \\ p(\theta) - (\overline{c}_i - \alpha_j - \eta_i) & \text{otherwise.} \end{cases} \tag{10}$$

The value of the productivity shock η_i is ex-ante unknown. Thus, the firm chooses the type of contract that provides the maximum expected profits given the level of competition θ. The firm's optimal choice depends on the difference between expected profits under open-ended and fixed-term contracts:

$$E_\eta[\Pi^o - \Pi^f] = \int_0^{\overline{c}_i - p(\theta)} \Pi^o(\theta, \eta) f(\eta) d\eta + l \times \int_{\overline{c}_i - p(\theta)}^{\overline{c}_i} p(\theta) - (\overline{c}_i - \alpha_j - \eta) f(\eta) d\eta \tag{11}$$

The first term in Equation (3) represents the losses incurred by the firm when the productivity shock is low and the worker has an open-ended contract. These losses include the severance pay if the firm decides not to produce but also negative profits if the firm decides to produce to avoid paying severance. The second term represents the gains derived from using open-ended contracts when the productivity shock is high, because workers with open-ended contracts never leave. If the difference above is positive (negative) the firm offers the employee an open-ended (a fixed-term) contract. Both terms are monotonically decreasing in the level of competition θ and thus, the difference between profits under open-ended and fixed-term contracts is monotonically decreasing in

competition.[37]

For each level of competition, the type of labor contract offered by the firm is a function of the firm-specific cost and worker productivity, $\overline{c}_i - \alpha_j$. Only firms with sufficiently low firm-specific costs and/or high worker productivity offer open-ended contracts. Hence, the proportion of workers that transition from a fixed-term to an open-ended contract is given by $E_{\overline{c}-\alpha}\left[\mathbf{1}\{E_\eta[\Pi^o - \Pi^f] > 0\}\right]$.

This proportion decreases with competition: more competition cause some firms to offer fixed-term contracts. Therefore, more competition leads to a lower probability of observing a transition from a fixed-term to an open-ended contract.

[37] Given that the cost c_{it} is fully determined by firm-specific cost and an i.i.d. shock, the price is the only variable that directly depends on competition. Therefore, a term is decreasing in competition if and only if it is increasing in price.

Appendix C: The Application of EU Directives in Spain

At the end of the 1990s, the Spanish government, following the directives of the European Union, enacted several laws to liberalize economic activity in certain economic sectors. The aim was to apply structural reforms to promote competition and improve the quality of regulation. In practice, these regulatory changes implied important reductions in the legal barriers to entry in the affected sectors.

This appendix provides further details on the application of EU directives enhancing competition in the energy, rail and road, and post and telecommunications sectors in Spain.

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

The level of competition in the rail and road sector increased from 1997 to 1998. Although the rail sector continued to be wholly publicly owned, its administration was divided into two separate entities that competed in the same rail district in the passenger and freight transport markets. The two entities needed to become more profitable because EU directives forced the government to reduce subsidies.

The post and telecommunications sectors were subject to changes in competition legislation between 1998 and 1999. In 1997, a law was promoted aimed at the full liberalization of the telecommunications sector by December 1998. However, it was not until January 1999 that the new law was enforced. The 1997 EU Directive on the liberalization of postal services sector translated into a 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 regulations beginning in 1999.

Appendix D: "Placebo" test

Three separated treatments

Dep var: Switch to open-ended	(1)	(2)	(3)	(4)
Energy after 1996	-.034	-.035	-.023	0.007
	(0.028)	(0.027)	(0.026)	(0.046)
Rail&road after 1997	-.007	-.006	-.00006	0.066
	(0.016)	(0.017)	(0.015)	(0.015)***
Post&telecom after 1998	0.042	0.043	0.045	0.013
	(0.028)	(0.027)	(0.028)	(0.031)
Number of observations	19,877	19,877	19,474	15,663
R^2	0.135	0.137	0.14	0.243
Individual characteristics	No	Yes	Yes	Yes
Weights	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes

Accounting for treatment intensity

Dep var: Switch to open-ended	(1)	(2)	(3)	(4)
Barriers reduction in t-1	0.012	0.013	0.018	0.068
	(0.027)	(0.026)	(0.025)	(0.052)
Number of observations	19,877	19,877	19,474	15,663
R^2	0.135	0.137	0.14	0.243
Individual characteristics	No	Yes	Yes	Yes
Weights	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes

The dependent variable is equal to 1 if the individual moves from a fixed-term to an open-ended contract, and 0 otherwise. In the first table, 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. In the second table, the measure of competition is the OECD indicator on barriers to entry. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, marital status, household head, dummies for region of residence, high-school graduate, and university graduate. Errors are clustered by sector-year.

Appendix E: The impact of competition on job security. Data from CSWH

	OLS			IV		
Dep var: Switch to open-ended						
Competition	-.276	-.298	-.345	-1.358	-1.397	-1.401
(- Price-cost margin)	(0.171)	(0.168)*	(0.163)**	(0.82)*	(0.803)*	(0.808)*
Number of observations	701,431	701,243	701,243	701,431	701,243	701,243
R-squared	0.09	0.095	0.096	0.09	0.094	0.095
Individual characteristics	No	Yes	Yes	No	Yes	Yes
Weights	No	No	Yes	No	No	Yes

The dependent variable is equal to 1 if a worker moves from a fixed-term to an open-ended contract, and 0 otherwise. The measure of competition is the price-cost margin multiplied by -1. *Significant at 10%,**5%,***1%. All regressions include year fixed effects, quarter indicators, sector fixed effects, and fixed-term contract duration dummies. The individual characteristics are gender, age, and an immigrant dummy. Errors are clustered by sector-year.