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The Effect of Competition on Managers' Compensation: Evidence From a Quasi-natural Experiment*

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Abstract

This paper studies the effect of competition on executive compensation. We estimate the effect of increased product market competition on the performance-pay sensitivity of CEOs, and contrast it with the effect for department managers and other workers in the corporation. We use a recent reform that simplified firm entry regulation in Portugal as a quasi-natural experiment. The empirical strategy exploits the staggered implementation of the reform across municipalities. Using linked employer-employee data for the universe of workers and firms, we show that increased product market competition, following the reform, decreased the sensitivity of pay to performance of CEOs and other managers, with no significant effects found for other workers. These findings are consistent with existing theoretical results in a principal-agent framework that a fall in entry costs leads to weaker managerial incentives.

Key Words: Entry Deregulation, Product Market Competition, Executive Compensation, Performance-related Pay.

JEL Classification Numbers: J31, J33, M52.

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1 Introduction

The pay of CEOs and other top executives has received wide attention recently from both policymakers and academic researchers. The main reason is the sharp increase in recent decades in top executives' pay relative to that of other workers in the firm. For example, Bertrand (2009) argues that by 2005 the median US CEO's pay was 110 times higher than the average worker's, compared with 30 times in the 1970s. For the UK, Bell and Van Reenen (2013) show that the ratio for the FTSE-100 CEOs went from 11 in 1980 to 116 in 2010. The key question for many is whether top executives are worth so much and this frequently comes down to the link between their pay and the performance of the firms they manage. The empirical research reviewed in Bertrand (2009) suggests that executive pay is correlated with measures of firm performance, but that there is more to CEO pay than just this - Bertrand and Mullainathan (2001), for example, show that CEOs are also rewarded for luck.

In this paper we take an empirical approach to a relatively neglected aspect of CEO's performance-related pay - the way in which it is affected by product market competition. The link between competition and managerial incentives has certainly attracted theoretical attention - see, for example, Schmidt (1997) and Raith (2003) - but this has not been fully exploited empirically. In particular, Raith has predicted that the link depends critically on the way in which competition is increased: while increases due to increased substitutability between varieties or increased market size will strengthen the links between pay and performance, increases induced by reducing barriers to entry will weaken them. The existing empirical literature - e.g. Burgess and Metcalfe (2000) and Cuñat and Guadalupe (2005 and 2009) - discusses only the former, whereas we, uniquely we believe, discuss the latter case. Taken together, their and our work constitutes a test of – and as it turns out a validation of - Raith's predictions.

The analysis of entry barriers is of considerable practical and policy importance. Many countries have sought over the last decade to increase product market competition through entry deregulation, and as cash-strapped governments seek ways of stimulating growth without incurring public expenditure this trend is likely to continue. Moreover, in one sector in which performance-related pay is sometimes thought to have got out of hand – the banking sector – there is also great concern about barriers to entry keeping competition low. Our results, which show that reducing entry barriers in Portugal reduced the strength of the performance-pay link, hint that perhaps the two issues are related.

We investigate the effect of entry deregulation on both the fixed and the variable components of managers' pay, focussing particularly on the latter, which is a function of firm performance. We assess whether the sensitivity of pay to firm performance changes with product market competition, for CEOs and department managers relative to other workers in the firm. We use linked employer-employee data for the universe of private sector firms and workers in Portugal,

and exploit the "On the Spot Firm" program, introduced in 2005 with the purpose of reducing the cost of entry and the complexity of the process of registering a new firm. To register a business prior to 2005, an entrepreneur would need to visit several public offices; it took on average 78 days to complete the 11 procedures required and cost about 13.5% of GDP per capita. The "On the Spot Firm" program created one-stop shops where entrepreneurs could register a company in a single visit, in about one hour and at a cost of about 3% of GDP per capita. Between 2005 and 2010, Portugal rose from 113th to 26th in the World Bank's "Doing Business" ranking.

The "On the Spot Firm" offices were initially opened in a few municipalities and in the following years the program expanded to municipalities across the country.[1] We exploit this cross-time and cross-municipality variation in the implementation of the reform to estimate the effect on the structure of compensation of managers. Using the roll-out of the program as an exogenous source of increased firm entry and product market competition, we provide quasi-natural experimental evidence on the effect of entry deregulation on the performance-pay sensitivity for managers and other workers in the firm, and on the fixed component of compensation. The linked employer-employee data (LEED) Quadros de Pessoal (QP) has unusually rich and detailed information, such as the workers' gender, age, education, occupation, type of contract of employment, hiring date in the firm, hours of work and earnings, split into each of its components; and the firms' industry, location, total employment, number of establishments, sales volume, legal structure and ownership structure. The data thus allows us to obtain estimates that control for observed worker and firm characteristics, and for unobserved individual- or match (firm-worker)-specific heterogeneity, as well as changes in industry composition and regional characteristics.

We merge the linked employer-employee data with balance sheet data containing information on the firms' performance, to estimate the slope of the performance-pay relationship and how it changed after the deregulation of entry. The fact that our data cover the universe of private sector firms and all of their workers is a significant advantage relative to most existing studies which have focussed on top executives only in the largest firms. The main challenge in studies of competition is how to measure it empirically. Commonly used measures of competition, such as concentration ratios or the Herfindahl-Hirschman index face a number of clear limitations, including potential endogeneity, correlation with omitted variables and non-monotonicity of their effects on outcome variables (Sutton, 1991). Our use of the "On the Spot Firm" program as a quasi-natural experiment that increased firm entry allows us to identify the causal link between competition and performance-based pay of executives more cleanly, avoiding the caveats required of the more common measures of competition.

[1] By the end of 2009 there were 164 one-stop shops dispersed throughout Portugal (see Figure 1 in Fernandes et al. (2014).

We show that the "On the Spot Firm" reform increased firm entry and that in line with Raith's theoretical prediction, the resultant increase in competition decreased the slope of performance-based pay for CEOs, but not for department managers or other workers. Our empirical specifications control for individual worker fixed effects, thus eliminating potential biases arising from unobserved individual characteristics, and for industry, municipality, and year effects, to parse out any industry or region characteristics or aggregate trends that might affect our outcomes. We further saturate the models and include trends by municipality to account for any differential pre-existing trends in pay. Finally, we control for firm-worker (match) fixed effects. In those specifications, the effect of the reform on the sensitivity of pay to performance is identified from individuals who stay in the same firm after the deregulation, and not from those who move to other firms, with potentially different structures of compensation, after the reform. In all specifications, we find that the coefficient on the interaction between the measure of firm performance and the "On the Spot Firm" treatment variable is negative and statistically significant for CEOs.

We also find that the reform increased the fixed component of compensation for both CEOs and department managers, but not for workers. This suggests that the reform affected the structure of compensation, with firms substituting towards fixed and away from variable, performance-based, pay. The fact that our data cover the universe of private sector firms allows us to estimate the effects by quartiles of firm profits. The results show that the overall estimates obtained for the performance-pay relationship are driven by the largest firms, in the fourth quartile, whilst the performance-pay sensitivity for smaller firms is statistically insignificant. This suggests that smaller firms have lower agency costs, and need to rely less on incentive-based pay to their managers.

The rest of the paper is organized as follows. The next section reviews the theoretical background and related literature. In section 3 we describe the data used and present descriptive statistics, and describe the "On the Spot Firm" experiment and the identification strategy. Section 4 studies the effect of the reform on firm creation. Section 5 presents the quasi-natural experiment and discusses the results of the deregulation on the fixed and performance-based components of compensation for workers across the corporate hierarchy. The last section concludes.

2 Theoretical background and related literature

In this section we discuss the theoretical literature that studies the relationship between competition and managerial incentives, and review the empirical studies of that relationship. The theoretical link between competition and compensation is analyzed by Schmidt (1997) and Raith (2003) in a principal-agent setting. They investigate the effect of competition on the distribu-

tion of profits across firms, and how this affects compensation schemes. Vives (2008) provides a more general model to analyze the effect of competition on product and process innovation. The effect of an increase in competition on cost-reducing investments depends on both the residual demand and the elasticity of residual demand faced by the firm. An increase in the number of competitors decreases residual demand but increases the elasticity of demand, such that, the net effect on R&D effort is ambiguous.

In Schmidt (1997) the competitive environment in which the firm operates affects the contract between the manager (agent) and the shareholder (principal). An increase in product market competition reduces the profits of a firm, and increases the probability of liquidation. This has two opposing effects on the incentives to exert effort. On the one hand, it induces the manager to work harder for a cost reduction in order to avoid liquidation and keep her job, and the owner to provide steeper incentives to the manager. On the other hand, if competition reduces the firm's size, it reduces the value of a given cost-reduction to the owner, and owners are induced to provide flatter marginal incentive schemes. Overall, the effect of competition on incentives is ambiguous.

Raith (2003) extends Schmidt's model by allowing for endogenous entry and exit of firms. As a result of increased competition, prices and profits decrease, leading some unprofitable firms to exit until the remaining firms' profits are restored. Thus, surviving firms become larger and so have a larger incentive to reduce costs: that is, the first of Schmidt's effects dominates, eliminating the ambiguity. Raith's model predicts unambiguously that an increase in competition leads firms to provide stronger incentives to their managers to reduce costs if the increase in competition is through changes in market size or the elasticity of substitution and if it increases output per firm. However, if competition increases through a reduction in the cost of entry, such as the "On the Spot Firm" program we analyze here, new firms enter the market and the firm-level output decreases. The lower firm-size reduces the value of a cost reduction and so firms provide weaker managerial incentives, flatter incentive schemes.

In this paper we test Raith's main theoretical prediction for the case of lower entry costs. By analyzing the "On the Spot Firm" reform we can identify precisely how an increase in competition resultant from lower entry costs affects the performance-based pay of executives and workers. Our finding of a reduced performance-pay sensitivity following increased competition is consistent with the theoretical prediction. To our knowledge this is the first paper to investigate empirically that prediction for the case of a comprehensive reduction in entry costs domestically.

Other theoretical papers, including Hermalin (1992), Scharfstein (1988) and Hart (1983), study how competition affects managerial slack through increases in information about market conditions. The idea is that if there is a common component to costs across firms, more competition gives managers, who need to achieve profit targets, less scope to engage in managerial slack than if costs are independent across firms. This can have effects on the steepness of in-

centive contracts. However, generally, this literature delivers ambiguous results about the effect of competition on incentive pay.

An empirical literature has investigated the effect of competition on performance related pay. Cuñat and Guadalupe (2005, 2009) study the effects of changes in foreign competition on the structure of compensation, and in particular the performance-based sensitivity of executives and workers. Cuñat and Guadalupe (2005) exploit the 1996 appreciation of the British pound as a quasi-natural experiment. They find that the higher level of foreign competition is associated with increased performance-pay sensitivity in the UK, in particular for executives. Cuñat and Guadalupe (2009) study how import penetration (instrumented by exchange rates and tariffs) affects compensation and incentives of US executives, and find that increased foreign competition leads to stepper performance-pay.

Cuñat and Guadalupe (2009b) and Hubbard and Palia (1995) study deregulation in the banking and financial sectors in the United States. They find that deregulation resulted in a stronger pay-performance relationship for a panel of executives. Burgess and Metcalfe (2000), study how competition affects the use of incentive schemes using data from survey questions, answered by managers in a sample of around 2000 British firms, on whether they use performance-related pay, and a measure of perceived competition. They find that competition has a positive effect on the probability that the firm will use performance-related pay. Aggarwal and Samwick (1999) study how strategic interaction between firms affects executive compensation. They use Herfindahl indices and measures of own-firm and also rival performance. In some specifications their estimates of both own and rival pay-performance sensitivities are positive. Our paper is also related to the more general papers about performance-pay (see, for example, Jensen and Murphy, 1990; Blanchflower and Oswald, 1988; and more recently Bell and Van Reenen, 2012).

3 Data and identification strategy

3.1 Data and descriptive statistics

The main data source used for our analysis is the Portuguese longitudinal linked employer-employee data Quadros de Pessoal (QP). These data have been collected annually, since 1985, by the Portuguese Ministry of Labour and Social Solidarity and include information on workers and their employers. All private sector firms with at least one employee are requested by law to answer the survey and each firm and each worker have a unique registration number which allows them to be traced over time. The information in general refers to the situation observed in the month when the survey is collected (October), and it covers the firm, each of its plants and each of its workers. The survey is administrative and the legal requirement that the firm

has it available for consultation results in an unusually high coverage and reliability.[2] Firm level information in the QP include, for example, the year of creation, industry, location, total number of workers employed in the firm, number of establishments, sales volume, legal setting of the firm and ownership structure (equity breakdown among domestic private, public or foreign). Information on workers includes, for example, gender, age, education level (schooling), level of skill, occupation, type of contract of employment, hiring date in the firm, promotions, monthly hours of work (normal and overtime) and earnings, which are split into each of its components (base wage, seniority payments, regular and irregular bonuses and overtime pay).

Although the QP data include information on salary and bonuses, they do not include long term incentive plans (LTIP) or stock options as most firms are not publicly traded. Hence, our empirical analyses will consider the real monthly pay of the worker. This variable is constructed by summing: (i) the base pay - gross wage for the normal hours of work; (ii) tenure related payments; and (iii) regular and irregular bonuses. Our results are therefore to be interpreted as the effect of competition on performance-pay sensitivity for short-term compensation (salary and bonuses). Although we do not consider LTIP, short-term compensation has been shown to be the most responsive part of pay to performance, and thus the more relevant component of pay for this type of study. For example, Bell and Van Reenen (2012), using different data sources for the UK, show that the effect of performance on long-term incentive plans is substantially smaller than that for salary and bonus. They argue that while bonuses can be explicitly related to contemporaneous performance, LTIP are usually set by firms as a multiple of base pay, while performance is only implicitly taken into account. Therefore, insofar we only have information on regular pay and bonuses, our estimates reflect the sensitivity of the most responsive part of pay to performance, and the effect of "On the Spot Firm", for short term compensation.

Our measure of firm performance is the firms' annual accounting profits before tax. Since our data covers the universe of firms, most of them are not publicly traded; as such, we are unable to use stock-market returns to measure firm performance, as in previous studies.[3] Information on profits is available from the SCIE (Enterprise Integrated Accounts System), a census of firms since 2004, covering detailed balance-sheet information for firms; and from its predecessor for the years prior to 2004, the IAE (Annual Survey of Enterprises), which covered a representative sample of around 40 000 firms. Both datasets are collected annually by the Office for National Statistics (INE) and have a firm identifier compatible with that of QP-LEED. Our analysis focuses on the period between 2002 and 2009, and is restricted to private sector manufacturing and service firms, excluding agriculture, fishing and mining, covering 46 industries. Table A.1 in the Appendix reports the description (and the percentage distribution of observations) of

[2] The legal requirement that the data is publicly available at the firm is related to the monitoring by the Ministry that the firm conforms to the law.

[3] Previous work has shown the relevance of using profits to measure performance in the analysis of compensation schemes (see Cunat and Guadalupe, 2005; Bushman and Smith, 2001; Blanchflower and Oswald, 1988).

the SIC 2-digit industries considered. The resulting LEED sample contains information on 440,544 distinct firms (contributing 1,881,740 firm-year observations) and 3,700,412 workers (contributing 15,534,057 worker-year observations) over the period. We identify the creation of new firms using the reported year the firm was constituted. A firm is considered to be a start-up if the year of creation is equal to the year of analysis.[4] The distribution of firms (existing firms and startups) and workers by year is shown in Table 1. We observe that 20% of the new firms were created in municipalities with "On the Spot Firm" offices in 2005, rising to 76% within 4 years.

[Table 1 about here]

The QP data includes information on the occupational category of the workers. We exploit this information to investigate the effects of the deregulation on the performance pay of CEOs, department managers and workers. Occupations are recorded in the QP data in accordance with the International Standard Classification of Occupations (ISCO) 1988. We use the information on occupations at the 3-digit level, and our analysis distinguishes between CEOs (ISCO88 category 121), Department managers (ISCO88 categories 122 and 123) and the remaining workers (including all other occupational categories).[5] Our regressions control for observable characteristics of the workers: gender, age and tenure (and their squares), the type of contract of employment (whether open-end or closed-end contract) and the education level of the worker.[6] We also control for characteristics of the firm, such as the log of the firm's size (measured by the number of employees), the profits of rival firms, the ownership status (private, public or foreign owned, depending on whether more than 50% of the firms' social capital is owned by private, public or foreign investors), whether the firm is an exporter, and whether the firm is multi-plant.[7]

We merge the QP-LEED with the IAE-SCIE data to obtain the information on the firms'

[4] Because the survey is collected in October, we recover some information on firm births if the reported year of creation is $t-1$ but the firm is observed for the first time in t. In these cases, we set the year of creation of the firm to t.

[5] The definition of the ISCO88 categories for directors is as follows: ISCO88 121 - "Directors and Chief Executives"; ISCO88 122 - "Production and Operations Department Managers"; ISCO88 123 - "Other Department Managers", which includes managers of the following departments: Finance and administration, Personnel and industrial relations, Sales and marketing, Advertising and public relations, Supply and distribution, Computing services, Research and development, Other.

[6] The level of education is recorded according to the International Standard Classification of Education (ISCED), approved by UNESCO in 1997. The correspondence between ISCED levels and years of schooling in Portugal is: ISCED 1 - first and second stages of basic education (up to 6 years of schooling); ISCED 2 - lower secondary education (9 years of schooling); ISCED 3 - upper secondary education (12 years of schooling); ISCED 5/6 - higher education (more than 15 years of schooling, corresponding to university degrees). In Portugal, there is no degree corresponding to ISCED level 4; and it is not possible to distinguish between ISCED levels 5 and 6 from the data.

[7] Information on exporters is from the International Trade dataset collected by the Portuguese National Institute of Statistics (INE). This dataset includes the universe of monthly export and import transactions by Portuguese firms.

profits.[8] For estimation purposes, for the regressions on the structure of compensation, we exclude very small firms, with fewer than 10 workers, for which we believe the theory is inapplicable, and also outlier observations with the highest and lowest 1% of profits to try to avoid the worst of measurement errors in that variable.[9] Finally, in order to ensure that our results are not distorted by the specifics of newly created firms (and also to evade a possible endogeneity problem below), we restrict the sample to firms that existed in 2004. Detailed descriptive statistics for the merged estimation sample are presented in Table 2, while Table A.2 reports summary statistics for all variables.

As expected, the CEOs are the group of workers with higher real monthly pay (ln(monthly pay) of 8.2), followed by department managers with mean monthly pay of 7.7 log points; the other workers have significantly lower average monthly pay of 6.6 log points. Only 17% of CEOs in our sample are women; and 72% of them hold a university degree. CEOs are more likely than other workers to be employed by foreign owned firms (19%) and by firms that are export-oriented (74%). On the other hand, the rest of the workers are generally younger (average of 37 years of age), have lower levels of educational attainment (only 8% of them hold a university degree, and 51% of them have only attained ISCED level 1) and the rate of female labour market participation in this group is much larger (44%). The firms where these workers are employed are mostly private national firms (82%). Regarding the "On the Spot Firm", 34% (37%) of the observations in the CEOs (Other workers) group are in municipalities with one-stop shops during the period of observation.

[Table 2 about here]

3.2 Quasi-natural experiment: the "On the Spot Firm" program

This section describes the "On the Spot Firm" business registration reform. At the start of 2005 Portugal languished in 113th place of the World Bank's Ease of doing business index. The bureaucracy associated with setting up a firm was extensive, with several Ministries involved which between them required an entrepreneur to fulfil 11 procedures and complete 20 forms. In all, it took around 78 days and fees equivalent to around 13.5 % of GDP per capita to achieve.[10] In May 2005, the newly elected government created the Unit for Coordination of Administrative Modernization (UCMA) to coordinate across ministries, which in turn led the Ministry of Justice to create the "On the Spot Firm" (Empresa na Hora) program to reduce red tape associated with setting up a new firm.[11] This initiative was unannounced and unanticipated. It established one-stop shops where entrepreneurs can register a company in less than an hour (the average

[8] Due to the sampling nature of the IAE-SCIE in the years prior to 2004, the resulting merged sample has a lower number of observations. Summary statistics for the merged sample are reported in Tables 2 and A.2.

[9] The results remain robust whether or not those observations are included.

[10] This compares with an average of 6.8% in the OECD (World Bank, 2006).

[11] http://www.empresanahora.pt/ENH/sections/EN_homepage

time in 2007 was 47 minutes), at a single office desk and at a cost of around 3% of GDP per capita. In the one-stop shops, the legal and commercial registration is completed and the company identification card, the corporate tax payer number and the social security number are all handed over in the same day.

One-stop shops were launched in July 2005 in four municipalities.[12] The program expanded over time, and by the end of 2009 there were 164 one-stop shops dispersed in municipalities throughout the country, covering most of mainland Portugal and the autonomous region of Madeira.[13] Figure 1 of Fernandes et al (2014) shows the opening dates and geographical dispersion of the one-stop shops between 2005 and 2009. An entrepreneur can register a new company under the "On the Spot Firm" program in any of the one-stop shops located across Portugal. However, as documented by Branstetter et al. (2013), the fraction of firms registered outside their local municipality is trivially small.[14]

Our identification strategy exploits the cross-municipality-specific and cross-time variation in the implementation of the "On the Spot Firm" program to estimate the effect of the reform on the performance-pay sensitivities for workers across the corporate hierarchy, in particular for top executives. As explained above, the policy change was unanticipated, and arguably exogenous.[15] We exploit the variation in the timing of adoption of the reform across municipalities for identification, to obtain differences-in-differences estimates of changes in the slope of performance-pay following the reform. Our treatment variable in the following sections, $Spot_{mt}$, takes the value of 1 in the years when and after a one-stop shop was introduced in municipality m, and 0 otherwise. Therefore, firms and individuals in municipalities with "On the Spot Firm" offices are the treatment group.

This identification strategy relies on the assumption that the introduction of the program was not systematic; specifically, that it was not correlated with pre-existing trends in the outcome variables in municipalities. Thus below we control for pre-existing trends by municipality and for a host of other factors that might affect outcome variables. As an initial test of our identification strategy, we test whether the order in which municipalities adopted the "On the Spot Firm" is correlated with prior trends in the variables used in our analysis. We test whether municipalities that adopted the reform in the first two years (2005 and 2006) differ from municipalities that adopted the reform later (from 2007 onwards) in terms of growth trends in the years prior to the policy change.[16] In Table 3 we report pre-reform average trends for the group of municipalities

[12] Coimbra, Aveiro, Barreiro and Moita.

[13] Administratively, Portugal is divided into 308 municipalities which are the seats of local administrative and executive power.

[14] The program allows registration of all companies except state-owned companies or firms in industries with industry-specific requirements, or which require special permits. These are mainly in the finance, insurance and transportation sectors. We exclude observations in these industries from our analysis.

[15] Although there were also local elections in October 2005 for the municipality chief executive, the introduction of "On the Spot Firm" shops seems unrelated with political affiliation. As discussed in Branstetter et al. (2013), 40% of the municipalities with one-stop shops had heads from the main opposition Social Democrat party.

[16] This test of the identification strategy follows Bruhn (2011).

that adopt late (Column (1)) and early (column (2)), the differences and the p-values for the null hypotheses that the means (proportions) are equal. There are no significant differences and so we can conclude that the order in which municipalities introduced the program is not correlated with pre-reform trends.

[Table 3 about here]

4 Effect of the "On the Spot Firm" program on firm entry

This section investigates the effect of the "On the Spot Firm" on firm entry, to assess the validity of the reform as a source of higher entry, for the main analysis in the paper, on the effects on the pay-performance sensitivity. We then investigate in the following sections the prediction, arising from Raith's model, that competition through lower entry costs, and higher firm entry, leads to flatter incentives and thus lower pay-performance elasticities. We studied the effect of the "On the Spot Firm" program on firm entry in previous work (Fernandes et al., 2014) and the remainder of this section is based on that work. To estimate the effect of the reform on the number of new firms created by municipality-industry-year, we run the following specification, using a negative binomial model:

$$NewFirms_{mst} = \delta Spot_{mt} + d_{(.)} + \epsilon_{mst} \tag{1}$$

Where the "On the Spot Firm" dummy variable ($Spot_{mt}$) takes the value of 1 in the years when and after a one-stop shop was introduced in municipality m, and 0 otherwise.[17] We control for different sets of fixed effects $d_{(.)}$, including industry indicators to parse out any industry characteristics that may affect entry (d_s); year indicators to capture any aggregate shocks (d_t); and municipality fixed effects to control for municipality time invariant factors that may affect firm entry (d_m). We cluster standard errors by municipality. Table 4 reports results, with different sets of those fixed effects included across the columns of the Table. The results suggest that the entry deregulation increased the number of new firms. The coefficient on $Spot_{mt}$ is always positive and statistically significant (at 1% level). In particular, the difference in the logs of the expected counts of new firms is estimated to be between 0.08 and 1.21 units higher after the reform. That is, it increased the number of start-ups by up to 4.2 per sector, municipality and year (see ME in column 3). Therefore, the reform has an economically meaningful effect on the number of new firms. Results remain robust if we use a linear specification instead of the negative binomial, for the same count variable.[18]

[Table 4 about here]

[17] Figure 1 shows the opening dates of the one-stop shops in Portuguese municipalities across the country.

[18] These results on firm entry following a reform that simplifies business registration are consistent with those reported by Branstetter et al. (2013) and Bruhn (2011).

5 Effect of the "On the Spot Firm" on managers' pay: Quasi-natural experimental evidence

The previous section shows that the "On the Spot Firm" deregulation program is positively related to firm entry and hence to measured competition. In this section we use the deregulation reform as a quasi-natural experiment, that exogenously increased competition, to study how it affected the pay of CEOs and department managers relative to all remaining workers in a corporation. In what follows we present and discuss the results obtained for the effects of the creation of one-stop-shops on the monthly returns of the three groups of workers.

5.1 Effect of the "On the Spot Firm" on managers' total pay

We start by investigating the effect of the "On the Spot Firm" program on total pay of CEOs and department managers relative to other workers in firms located in treated municipalities relatively to those in non-treated municipalities. To that end we estimate the following specification.

$$\ln w_{ijmkt} = \alpha + \beta_1 Spot_{mt} + \beta_2 Manager_{kit} + \beta_3 (Spot_{mt} \times Manager_{kit}) + \gamma X'_{it} + \lambda Z'_{jt} + d_{(\cdot)} + \epsilon_{ijmkt} \quad (2)$$

where the dependent variable is the log of monthly real pay of worker i (in firm j, municipality m) in year t. $Spot_{mt}$ is our treatment dummy for municipalities with one-stop shops; as explained above, it takes the value of 1 in the years when and after the "On the Spot Firm" was introduced in municipality m, and zero otherwise.[19] $Manager_{kit}$ is a vector of manager dummies, including a dummy variable for whether the worker is the CEO, and a dummy variable for whether the worker is a department manager; "other workers" in the firm is the omitted category. X'_{it} is a matrix of individual characteristics, including age and tenure and their squares, occupation and type of contract; and Z'_{jt} is a matrix of firm characteristics, including the log of size, the ownership structure (domestic private, public or foreign), a dummy for whether the firm is an exporter, and a dummy for whether the firm is multi-plant, and the firms' rivals' profits. Controlling for firm size is important in the narrative above, because the larger the firm the larger the pay-off to a given reduction in costs. It has also long figured in theoretical and empirical work on executive compensation, see, for example, Rosen (1982, 1990) and Kostiuk (1990) respectively.

Industry (d_s), municipality (d_m) and time (d_t) dummies are also included to absorb aggregate business shocks and account for unobserved industry characteristics and municipality-specific factors that may affect compensation. The nature of the linked employer-employee data we

[19] Some municipalities have more than one one-stop shop. Our treatment dummy is set to 1 after the first shop was opened.

use also allows us to include individual, or worker-firm (match) fixed effects in our specifications, d_i, and d_{ij}, respectively. These effects help to control for potential biases arising from individual heterogeneity on the patterns of job mobility, different compensation policies across firms and sorting of workers across firms. Although the policy reform was unexpected and despite us showing previously that early adopting municipalities are not statistically different from late adopters in terms of pre-reform trends in compensation, to make sure that there are no differential pre-existing trends in wages, we saturate the model even further and include municipality-specific linear trends, $d_m \times t$. These absorb any potential trends in compensation at the municipality level. ϵ_{ijmkt} is an error term assumed to be white noise. In all of our specifications standard errors are clustered at the municipality level to account for potential correlation between observations within the same municipality, the level of introduction of the policy.

Our coefficients of interest are those in the vector β_3, the coefficients on the interaction between the reform variable and the managers' dummy variables. Each element of vector β_3 captures the differential effect of the deregulation on the total pay of CEOs and of department managers, respectively, relative to other workers, in treated municipalities relative to workers in municipalities not affected by the "On the Spot Firm". If β_3 is positive, the reform is associated with an increase in total pay of CEOs, or department managers, relative to other workers in the firm.

Table 5 reports the results from estimating Eq.(2) with different sets of fixed effects controlled for across the columns of the Table. The coefficient on the interaction between the reform variable and the CEO dummy is positive and statistically significant across all specifications, and estimated at around 0.06. This suggests that the reform increased the pay of CEOs in treated municipalities relative to other workers by about 6 percent, relative to those in unaffected municipalities. Similarly, the introduction of the reform is associated with increased relative pay of department managers in affected municipalities by around 5 percent. The coefficient on the $Spot_{mt}$ variable, β_1, is statistically insignificant, suggesting the reform had no effect on total pay of workers, the omitted category. These results are basically a specialization to a more tightly defined set of workers of our previous results, which showed that the "On the Spot Firm" program increased the returns to higher levels of skill and higher education – Fernandes et al (2014). In addition to these program effects, Table 5 also reinforces the importance of firm size and the fact that CEOs and managers earn more than other workers even after allowing for personal and firm characteristics.

[Table 5 about here]

In sum, results from Table 5 show that the reform, and the extra competition it induced, increased the total pay of CEOs and department managers, but not that of workers. Higher

total pay may indicate an increased incentive to avoid bankruptcy; however, as we discussed above, this is not the same as observing that competition increases the link between pay and performance on the margin. It is the latter that is our main topic of interest, and so in the next section we ask whether, in line with Raith's theoretical prediction, the increased competition from lower entry costs led to weaker managerial marginal incentives, and flatter incentive schemes.

5.2 Effect of the "On the Spot Firm" on managers' fixed and performance-based pay

In the previous section we estimate the effect of the "On the Spot Firm" program on total managers' pay. However, managers' compensation is generally comprised of a fixed component and of a variable component which is a function of performance. In this section we analyze the effect of the "On the Spot Firm" entry deregulation on both the fixed and performance-related components of managers' pay. We are particularly interested in testing Raith's theoretical prediction that a reduction in entry costs will lead firms to provide weaker marginal managerial incentives, and thus flatten the incentive schemes. To do this we estimate the following equation:

$$\begin{aligned} \ln w_{ijmkt} &= \alpha + \beta_1 Spot_{mt} + \beta_2 Profit_{jt} + \beta_3 Manager_{kit} + \beta_4 (Spot_{mt} \times Profit_{jt}) + \\ &+ \beta_5 (Spot_{mt} \times Manager_{kit}) + \beta_6 (Manager_{kit} \times Profit_{jt}) + \\ &+ \beta_7 (Spot_{mt} \times Manager_{kit} \times Profit_{jt}) + \beta X'_{it} + \lambda Z'_{jt} + d_{(.)} + d_m t + \epsilon_{ijmkt} \end{aligned} \tag{3}$$

The dependent variable is the log of monthly real pay of worker i (in firm j, municipality m) in year t. $Spot_{mt}$ is our treatment dummy for municipalities with one-stop shops; as explained above, it takes the value of 1 in the years when and after the "On the Spot Firm" program was introduced in a municipality, and zero otherwise. $Profit_{jt}$ is our measure of firm performance explained in section 3. Most of the firms in our sample are not publicly traded, and there is no stock market information for them, therefore we use real accounting profits in millions of Euros at the firm-year level as the measure of performance.[20] As before, $Manager_{kit}$ includes a set of dummies for wether the worker is a CEO or a department manager, with "other workers" being the omitted category. To study the effects of the reform on both fixed and performance-based pay of workers across the corporate hierarchy, and to provide an additional benchmark against which to gauge the effects on CEOs' and managers' pay, we interact the reform variable ($Spot_{mt}$) with the indicators for managers. The estimated coefficients on these interactions measure the differential effects of the reform on compensation for managers relative to workers. In addition we interact profits with the manager indicators to allow different workers to have different degrees of sensitivity to performance and with the program dummy in order to allow

[20] This also follows Cuñat and Guadalupe (2005) and Blanchflower and Oswald (1988).

for general changes in the performance-pay relationship induced by the program. X'_{it} is a matrix of individual characteristics, including age and tenure and their squares, occupation and type of contract of the worker; and Z'_{jt} is a matrix of firm characteristics, including the log of size, the ownership structure (domestic private, public or foreign), a dummy for whether the firm is an exporter, and a dummy for whether the firm is multi-plant, and the firms' rivals' profits.

The elements of β_5 in Eq. (3), are the difference-in-difference estimates of the effect of the "On the Spot Firm" deregulation on the fixed component of CEOs and department managers' compensation, relative to other workers, in treated municipalities; the effects on the workers' fixed pay is given by β_1, the stand-alone reform variable. The coefficient on the performance variable, β_2 measures the performance-pay sensitivity for workers in the sample, while the elements of β_6 capture the differential sensitivity of pay to performance for CEOs and department managers. Our main interest lies in the triple interaction term between the reform dummy, the performance measure and the manager indicators: each element in the vector β_7 measures the change in the slope of the performance-related pay for CEOs and Department managers in affected municipalities relative to workers following the "On the Spot Firm" deregulation. If β_7 is negative, consistent with the theoretical prediction from Raith (2003), firms in municipalities that experienced increased competition following the reform, reduced the slope of their post-reform performance-related pay schemes. The effect on the workers is measured by β_4.

As explained in the previous section, we control for industry (d_s), municipality (d_m) and time (d_t) dummies and include individual, or worker-firm (match) fixed effects in our specifications, d_i and d_{ij}, respectively, thus accounting for individual heterogeneity on the patterns of job mobility, different compensation policies and sorting of workers across firms. We also include municipality-specific linear trends, $d_m \times t$ to absorb secular trends at the municipality level in wages. ϵ_{ijmkt} is a white noise error term. We cluster standard errors by municipality in our specifications.

The results from estimating Eq. (3) are reported in Table 6, with different combinations of the fixed effects included in the columns of the Table. In column (1) we control for worker fixed effects and include year, municipality, industry dummies and linear trends by municipality, while in column (2) we replace worker, industry and municipality fixed effects with firm-worker match fixed effects. Aggarwal and Samwick (1999) suggest that rival firm performance may also affect performance-based incentives offered by the firm. To take such effects into account, in columns (3) and (4) we control additionally for a measure of the performance of rival firms, and its interaction with the reform dummy. The measure of rivals' performance is calculated as the average asset return of all other firms in the same 2-digit sector, multiplied by the firms' assets.[21]

The results show that the basic performance-pay sensitivity for CEOs relative to that of

[21] This follows Cuñat and Guadalupe (2005).

workers, is positive and statistically significant, and is estimated at around 0.004, that is an increase in firm profits by a million results in increased relative CEOs pay by 0.4%. This estimate is relatively low, suggesting that incentive mechanisms are relatively weak. However, this low estimate is consistent with previous findings of very small pay-performance sensitivities (see Conyon et al., 1995; Bell and Van Reenen 2012). The estimates of the sensitivity of pay to performance for department managers and workers is statistically insignificant, suggesting that only the pay of CEOs is linked to performance. We also find that firm size is a significant determinant of pay, with larger firms paying higher wages.

[Table 6 about here]

The next set of estimates in Table 6 shows the coefficients of interest, the difference-in-difference estimates of the effect of the "On the Spot Firm" reform on the sensitivity of pay to performance. The differential slope for CEOs in municipalities affected by the reform is negative and statistically significant at 1% across specifications. In column (4), where we identify the effects from workers that remain in the same firm, and not from those that move between firms, with potentially different structures of compensation, after the reform, and control for rivals' profits, we estimate that the reform reduced the performance-pay sensitivity of CEOs by 0.003. That is, the CEOs pay-performance relationship becomes flatter after the entry deregulation. We obtain a smaller negative effect for department managers, while no statistically significant effect is found for workers. Controlling for rivals' performance does not significantly affect the other coefficients. The result of a negative effect of increased competition following the reduction in entry costs on the CEOs performance-pay slope is consistent with the theoretical result that increased firm entry leads firms to flatten managers' incentive schemes.

The fact that we find no relationship between firm performance and the pay of department managers, and a lower effect of the deregulation on that slope than that for CEOs, is consistent with the definition in the ISCO88 classification: while the Directors and Chief Executives group (occupation 121) "head enterprises or organizations, determine and formulate policies, plan, direct and coordinate the activities of enterprises or organizations", the tasks of the group of Department Managers include to "plan, direct and coordinate particular activities, under the broad guidance of the directors and chief executives, and in consultation with managers of other departments or sections". Therefore, since the Department Managers are not involved in defining the firm's general policy and strategy, as the CEOs are, it is expected that their pay is less, if at all, sensitive to performance and less affected by increased competition as the CEOs pay is.

The coefficients on the interaction terms between the reform variable ($Spot_{mt}$) and the CEO and department manager indicators, respectively, capture the differential effect of the reform on the fixed component of the incentive contracts. We obtain positive and statistically significant

coefficients for both CEOs and department managers, suggesting that the reform increased the relative fixed component of CEOs pay by around 6% and that of department managers by 5%, with no statistically significant effects found for workers' pay. These results taken together show that the reform is associated with an increase in the fixed component and a decrease in the slope of the incentive contract of CEOs in treated municipalities, suggesting that the reform changed the structure of compensation, with firms substituting into fixed pay and away from the variable, performance-based, component. For department managers, only the fixed component is significantly affected, with increases in relative fixed pay.

In sum, our results show that the "On the Spot Firm" reform is associated with a flattening of the incentive schemes offered to CEOs by firms in treated municipalities. We estimate a negative and highly statistically significant coefficient on the interaction term between the reform dummy and the measure of firm performance for CEOs, suggesting a decrease in the sensitivity of pay to performance as a result of the entry deregulation. These findings provide empirical support for the theoretical prediction in Raith (2003) that increased competition through a fall in entry costs (as with the reform we analyze) leads firms to provide weaker incentives to their top managers. The finding that the reform is associated with increases in the fixed component of pay for CEOs and department managers could be the result of higher demand for these executives resultant from the increased firm entry, leading firms to pay more for these executives. It is also consistent, as discussed above, with higher incentives to avoid bankruptcy – i.e. the non-marginal element of managerial incentives.

As we noted above, our results coupled with the opposite effects found by Cuñat and Guadalupe (2005, 2009) in response to increases in competition induced by increases in market size or the elasticity of substitution, represent a complete test of and vindication of the theoretical predictions of Raith (2003). The effect of increased competition on managerial incentives really does depend on what drives the increase.

5.3 Effect of the "On the Spot Firm" on managers' performance-based pay, by quartiles of profits

In this section we allow the fixed and variable components of pay, and the effect of the "On the Spot Firm" program on compensation, to vary across the distribution of firm profits. An advantage of our data relative to most previous studies, which have focussed on managers' compensation structure in large, traded, firms, is that it includes information for the universe of private sector firms. This allows us to estimate the effects of the entry deregulation separately for large and small firms. This is important because smaller firms could have different compensation structures from large firms, and lower performance-pay sensitivities if smaller firms have lower agency costs, as discussed in Cuñat and Guadalupe (2005). On the other hand, existing empirical evidence suggests that performance-based pay is higher in small firms (see e.g. Jensen

and Murphy, 1990). Therefore it is of importance to assess whether the effects estimated in the previous section are widespread across the profit distribution, or are driven by large firms, which have been the focus of most of the existing literature on executive compensation.

In what follows, we estimate the effects of the deregulation for different quartiles of firm profits. To avoid endogenous changes in profits after the deregulation to affect our results, we define quartiles of the profit distribution in 2004, before the entry deregulation, and divide firms into four profit quartiles. We then estimate a specification similar to Eq. (3) but interacting each term with quartile dummies, defined as $I_{jq}^{P} = 1$ if firm j is quartile q of profits in 2004, and zero otherwise, where $q = 1, ..., 4$ with $q = 1$ being the lowest quartile of profits. The coefficients on the interaction between the terms in Eq (3) and the quartile dummies measure the effects for workers in firms from the first to the fourth quartiles of profits.

[Table 7 about here]

Results for the specifications that allow the fixed and variable components of pay, and the effects of the experiment on both components, to differ by profit quartiles are reported in Table 7. The first set of coefficients, on the terms $CEO \times Profit \times I_{jq}^{P}$ measure the basic performance-pay sensitivity of CEOs by quartiles of firm profits. The estimates show that for CEOs in the highest quartile ($q = 4$) the basic performance-pay sensitivity is positive and statistically significant, and of larger magnitude and statistical significance than the overall slope in Table 6, while no statistically significant coefficients are obtained for CEOs in smaller firms. This suggests that the slope of the performance-pay relationship estimated in the previous section is driven by the largest firms, which is consistent with the hypothesis that smaller firms have lower agency costs and hence less need for performance-related managerial incentives. The coefficients on the interactions $Dpt.Mng. \times Profit \times I_{jq}^{P}$ are statistically insignificant across all profit quartiles, suggesting that department managers' pay is insensitive to performance, consistent with the results from Table 6.

The next set of estimates reported in Table 7 ($CEO(Dpt.Mng.) \times Spot \times Profit \times I_{jq}^{P}$) measure the effect of the experiment on the slope of the performance-pay contract for managers in affected municipalities across profit quartiles. Consistent with the results in the previous section and with the theory, we find that the "On the Spot Firm" decreased the performance-pay sensitivity of CEOs. Again the effects are driven by the largest firms, in the fourth quartile - the coefficients on the interactions $CEO \times Spot \times Profit \times I_{j4}^{P}$ are negative and statistically significant at the 1% level, with no statistically significant results for CEOs or for department managers in smaller firms. The effects of the program on the fixed component of CEOs' and department managers' pay, relative to that of workers, for different quartiles are given by the terms $CEO(Dpt.Mng.) \times Spot \times I_{jq}^{P}$. The estimated coefficients of these terms show that the reform increased the fixed component of department managers' pay across all profit quartiles,

with managers in the largest firms benefiting more (see column (4) of Table 7). The reform also increased the fixed component of pay of CEOs in firms in the third and fourth profit quartiles, in treated municipalities, while those in smaller firms are unaffected by the program. Other workers in the smallest firms seem to have lost on average from the reform, the coefficient on $Spot \times I_{j1}^{P}$ is negative and statistically insignificant.[22] In sum, the results reported in this section show that the overall estimates for the fixed and performance-related components of managers' pay, as well as the effect of the entry reform on those components, are driven by the largest firms with no effects found for manages in smaller firms. These results suggest that smaller firms rely less on this type of managerial incentive mechanism.

6 Conclusion

A number of theoretical papers have studied the effect of increased product market competition on managerial incentives (Vives, 2008; Raith, 2003; Schmidt 1997; Scharfstein, 1988; Hart, 1983). Overall the literature delivers ambiguous results about the effect of competition on performance-related pay as incentive scheme. However, by allowing the endogenous entry and exit of firms to eliminate the profit effect for surviving firms, Raith (2003) predicts unambiguously that competition measured by larger market size or increased elasticity of substitution leads to an increase in incentive provision, while increased competition due to a reduction in entry costs leads firms to provide weaker incentives to their CEOs. The reason for the latter result is that new firm entry reduces firm-level output, and thus the value of a cost-reduction, leading to flatter managerial incentives and lower pay-performance elasticities.

In this paper we investigate that prediction empirically using the "On the Spot Firm" business registration reform introduced in Portugal in 2005 as a quasi-natural experiment. By exploiting the exogenous change in entry costs that increased firm entry across industries and municipalities, we are able to identify the causal link between competition and performance-based pay of managers, avoiding the caveats surrounding common measures of competition.

In line with the theoretical prediction, our estimates suggest that the increase in competition resultant from the "On the Spot Firm" reform decreased the steepness of performance-based pay. This effect is observed for CEOs but not for department managers or for other workers in the hierarchy. As a result of the reform, firms in municipalities with "On the Spot Firm" offices decreased the elasticity of pay to performance for their top executives but not for other workers, relative to other firms. We find that the overall performance-pay sensitivity and the effect of the reform on the slope of the incentive contracts for CEOs are driven by the largest firms, with no statistically significant effects obtained for smaller firms. This suggests that small firms have

[22] Also included in the specifications in Table 7, but not reported for space considerations, are the interaction terms $Profit \times I_{jq}^{P}$ and $Spot \times Profit \times I_{jq}^{P}$ (all coefficients on those terms are statistically insignificant); and interaction terms $CEO(Dpt.Mng.) \times Profit \times I_{jq}^{P}$ (all coefficients are positive and statistically significant).

lower agency costs and hence can rely less on incentive pay to their managers. We also find that the reform is associated with increases in the fixed component of pay, for both CEOs and department managers. After the entry deregulation, firms changed the structure of managers' compensation substituting fixed for variable pay.

In our empirical specifications we control for individual fixed effects, thus eliminating potential biases arising from unobserved individual characteristics, and we control for industry, municipality, and year effects, to parse out any industry or region characteristics or aggregate trends that might affect our outcomes. In all specifications, we find that the coefficient on the interaction between the measure of firm performance and the "On the Spot Firm" treatment variable is negative and statistically significant for CEOs. Finally, we also control for firm-worker (match) fixed effects identifying the effect from individuals who stay in the same firm after the deregulation, and not by those that move firms, which may have different compensation structures. Our results provide novel evidence of a causal link between increased product market competition through lower entry costs and the performance-pay of executives. We find empirical support for the theoretical prediction in Raith (2003) that lower entry costs lead to weaker managerial incentives.

In addition to testing Raith's predictions, however, our results have potentially important lessons for policy-makers. In an era of low growth and austerity, governments will be attracted to policies such as deregulation which apparently offer extra growth at no extra public expense. Our results have suggested that reducing barriers to entry to a sector not only potentially stimulates growth but also reduce the sensitivity of top executive pay to firm performance. At least in some sectors, this may enhance their political attractions. On the other hand, we have found that the fixed portion of executive pay was increased by the reduction of entry barriers and so it is not clear that such policies will reduce overall pay. Where the existence of performance-related components has been deleterious for other reasons, however, such as arguably in the banking sector, our results might be interpreted as hinting at a partial solution.

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8 Tables

Table 1: Sample size, employer-employee full sample

Year	All firms	Start ups	% Start ups "On the Spot"	CEOs	Department managers	Other workers
	(1)	(2)	(3)	(4)	(5)	(6)
2002	211,113	13,389	–	3,862	59,046	1,733,353
2003	215,354	15,603	–	5,067	52,695	1,698,841
2004	218,817	14,593	–	5,520	52,752	1,732,098
2005	233,514	16,509	20.00	6,373	56,379	1,862,363
2006	235,094	17,147	42.32	2,930	59,912	1,870,955
2007	255,757	20,182	51.24	3,678	65,789	1,981,376
2008	258,943	20,413	66.42	3,891	66,150	2,015,322
2009	253,148	17,382	76.26	3,978	62,017	1,936,227
Total	1,881,740	135,218	35.29	35,299	474,740	14,830,535

Source: Own calculations based on Portugal, MTSS (2002-2009).

Table 2: Detailed summary statistics of ln(monthly real pay) by groups of workers, estimation matched sample

ln(monthly real pay)	No. of Obs.	Mean	Median	Std. Dev.	P10	P90
CEOs	17,849	8.203	8.275	0.857	7.038	9.218
Department managers	162,705	7.724	7.754	0.767	6.701	8.661
Other workers	7,403,219	6.642	6.573	0.604	6.085	7.407
All employees	7,583,773	6.669	6.586	0.633	6.090	7.469

Note. These statistics were computed using the estimation sample. Source: Own calculations based on Portugal, MTSS (2002-2009).

Table 3: Pre-reform averages of outcome variables

	Late adopters	Early adopters	Difference	P-value
	(1)	(2)	(3)	(4)
New firms	0.109	0.115	-0.006	0.923
	(0.044)	(0.031)	(0.061)	
Profits	-0.391	-1.350	0.958	0.150
	(0.316)	(0.667)	(0.664)	
Wages				
Overall	-0.033	-0.039	0.006	0.793
	(0.019)	(0.008)	(0.025)	
CEOs	-0.169	-0.103	-0.066	0.431
	(0.065)	(0.053)	(0.085)	
Department managers	-0.131	-0.122	-0.09	0.867
	(0.042)	(0.024)	(0.053)	
All other workers	-0.033	-0.040	0.007	0.777
	(0.019)	(0.008)	(0.024)	

Note: outcome variables are measured as initial growth trends (between 2002 and 2004) of average wages, average profits, number of new firms at the municipality level. Standard errors in parentheses. The p-value relates to the test of the null hypothesis of equality between the means (proportions).

Table 4: Effect of the "On the Spot Firm" program on firm creation

Effect of "On the Spot Firm" on the number of firm start-ups (negative binomial)					
	(1)	(2)	(3)	(4)	(5)
On the spot firm	0.825***	0.984***	1.208***	0.227***	0.079***
	(0.109)	(0.112)	(0.164)	(0.017)	(0.020)
ME	2.473***	3.135***	4.242***	0.585***	0.196***
Constant	0.656***	-0.283***	-0.238***	0.417***	0.287***
	(0.067)	(0.062)	(0.074)	(0.043)	(0.047)
Industry FE		Yes	Yes	Yes	Yes
Year FE			Yes		Yes
Municipality FE				Yes	Yes

Note: The dependent variable is the number of new firms created. One observation per municipality, industry and year corresponding to 56,782 records. ME stands for the marginal effect of the "On the Spot Firm". Robust standard errors, clustered by municipality, in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 5: Effect of the "On the Spot Firm" program on manager's total pay

	(1)	(2)	(3)
CEO×Spot	0.061***	0.061***	0.057***
	(0.008)	(0.008)	(0.007)
Dpt.Mng.×Spot	0.047***	0.047***	0.048***
	(0.005)	(0.004)	(0.005)
Spot	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)
CEO	0.093***	0.094***	0.057***
	(0.009)	(0.009)	(0.010)
Dpt.Mng.	0.074***	0.074***	0.049***
	(0.004)	(0.004)	(0.006)
ln(firm size)	0.015**	0.015**	0.054***
	(0.006)	(0.006)	(0.005)
Year FE	Yes	Yes	Yes
Municipality FE		Yes	
Munic×time trend		Yes	Yes
Industry FE	Yes	Yes	
Worker FE	Yes	Yes	
Match (worker-firm) FE			Yes
Nb. Obs.	7,583,773	7,583,773	7,583,773
R^2	0.041	0.043	0.036

Note: The dependent variable is the log monthly pay of workers. Further covariates include gender, age and tenure (and their squares), type of contract (whether or not fixed term), education levels, ln size of firm, whether firm is exporter and whether it is multiestablishement, and ownership of the firm. Robust standard errors, clustered by municipality, in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 6: Effect of the "On the Spot Firm" program on managers' performance-pay

	(1)	(2)	(3)	(4)
CEO×Profit	0.004**	0.004**	0.004**	0.004**
	(0.001)	(0.002)	(0.002)	(0.002)
Dpt.Mng.×Profit	0.000	0.000	0.000	0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Profit	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
CEO×Spot×Profit	-0.003**	-0.003**	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Dpt.Mng.×Spot×Profit	-0.000	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Spot×Profit	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
CEO×Spot	0.066***	0.062***	0.066***	0.061***
	(0.007)	(0.006)	(0.007)	(0.006)
Dpt.Mng.×Spot	0.049***	0.050***	0.048***	0.050***
	(0.005)	(0.005)	(0.005)	(0.005)
Spot	-0.003	-0.003	-0.002	-0.003
	(0.003)	(0.003)	(0.002)	(0.002)
CEO	0.088***	0.052***	0.086***	0.049***
	(0.008)	(0.009)	(0.009)	(0.010)
Dpt.Mng.	0.073***	0.048***	0.072***	0.047***
	(0.004)	(0.005)	(0.004)	(0.006)
$Profit^2$	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
ln(firm size)	0.016***	0.054***	0.016**	0.054***
	(0.006)	(0.005)	(0.006)	(0.004)
rivalprofit			-0.000	-0.000
			(0.000)	(0.000)
CEO×Spot×rivalprofit			-0.000	-0.000
			(0.000)	(0.000)
Dpt.Mng.×Spot×rivalprofit			-0.000	0.000
			(0.000)	(0.000)
Spot×rivalprofit			0.000	0.000
			(0.000)	(0.000)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes		Yes	
Munic×time trend	Yes	Yes	Yes	Yes
Industry FE	Yes		Yes	
Worker FE	Yes		Yes	
Match (worker-firm) FE		Yes		Yes
Nb. Obs.	7,578,081	7,578,081	7,451,848	7,451,848
R^2	0.043	0.036	0.042	0.035

Note: The dependent variable is the log monthly pay of workers. Further covariates include gender, age and tenure (and their squares), type of contract (whether or not fixed term), education levels, ln size of firm, whether firm is exporter and whether it is multiestablishement, and ownership of the firm. Robust standard errors, clustered by municipality, in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 7: Effect of the "On the Spot Firm" program on managers' performance-pay by profit quartiles[23]

	(1)	(2)	(3)	(4)
CEO×Profit×I^P_{j1}	-0.008	-0.005	-0.008	-0.005
	(0.011)	(0.010)	(0.011)	(0.010)
CEO×Profit×I^P_{j2}	0.056	0.024	0.057	0.024
	(0.075)	(0.060)	(0.075)	(0.060)
CEO×Profit×I^P_{j3}	-0.069	-0.082	-0.072	-0.104
	(0.110)	(0.108)	(0.120)	(0.113)
CEO×Profit×I^P_{j4}	0.004***	0.004***	0.005***	0.005***
	(0.001)	(0.002)	(0.001)	(0.002)
Dpt.Mng.×Profit×I^P_{j1}	0.000	-0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Dpt.Mng.×Profit×I^P_{j2}	-0.084***	-0.056**	-0.078***	-0.053*
	(0.025)	(0.027)	(0.026)	(0.028)
Dpt.Mng.×Profit×I^P_{j3}	-0.059*	-0.030	-0.068**	-0.037
	(0.033)	(0.032)	(0.034)	(0.032)
Dpt.Mng.×Profit×I^P_{j4}	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
CEO×Spot×Profit×I^P_{j1}	-0.001	-0.000	-0.001	0.000
	(0.013)	(0.013)	(0.013)	(0.013)
CEO×Spot×Profit×I^P_{j2}	-0.169	-0.106	-0.167	-0.104
	(0.160)	(0.157)	(0.161)	(0.158)
CEO×Spot×Profit×I^P_{j3}	0.133	0.128	0.138	0.152
	(0.117)	(0.110)	(0.124)	(0.115)
CEO×Spot×Profit×I^P_{j4}	-0.003***	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Dpt.Mng.×Spot×Profit×I^P_{j1}	-0.003	-0.001	-0.004	-0.001
	(0.003)	(0.002)	(0.003)	(0.002)
Dpt.Mng.×Spot×Profit×I^P_{j2}	-0.135	-0.129	-0.143	-0.135
	(0.108)	(0.119)	(0.111)	(0.122)
Dpt.Mng.×Spot×Profit×I^P_{j3}	0.091**	0.072	0.098**	0.079*
	(0.042)	(0.046)	(0.042)	(0.046)
Dpt.Mng.×Spot×Profit×I^P_{j4}	-0.001**	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
CEO×Spot×I^P_{j1}	0.031*	0.035**	0.038**	0.041**
	(0.018)	(0.016)	(0.017)	(0.017)
CEO×Spot×I^P_{j2}	0.006	-0.014	0.013	-0.007
	(0.052)	(0.048)	(0.055)	(0.049)
CEO×Spot×I^P_{j3}	0.074**	0.072*	0.062**	0.057*
	(0.037)	(0.039)	(0.031)	(0.031)
CEO×Spot×I^P_{j4}	0.077***	0.071***	0.075***	0.069***
	(0.007)	(0.007)	(0.007)	(0.007)
Dpt.Mng.×Spot×I^P_{j1}	0.018**	0.037***	0.019**	0.037***
	(0.009)	(0.008)	(0.009)	(0.008)
Dpt.Mng.×Spot×I^P_{j2}	0.018	0.016	0.015	0.013
	(0.012)	(0.014)	(0.013)	(0.015)
Dpt.Mng.×Spot×I^P_{j3}	0.048***	0.045***	0.047***	0.045***
	(0.010)	(0.010)	(0.010)	(0.010)
Dpt.Mng.×Spot×I^P_{j4}	0.058***	0.056***	0.057***	0.055***
	(0.005)	(0.005)	(0.006)	(0.006)
Spot×I^P_{j1}	-0.010***	-0.014***	-0.010***	-0.014***
	(0.003)	(0.004)	(0.003)	(0.003)
Spot×I^P_{j2}	-0.005	-0.002	-0.004	-0.000
	(0.005)	(0.004)	(0.005)	(0.004)
Spot×I^P_{j3}	-0.006*	0.001	-0.006	0.002

(Continued on next page)

Table 7: (– continued from previous page)

	(1)	(2)	(3)	(4)
	(0.004)	(0.003)	(0.003)	(0.003)
Spot×I_{j4}^P	-0.000	-0.001	0.000	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Profit2	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
ln(firm size)	0.015**	0.053***	0.015**	0.053***
	(0.006)	(0.005)	(0.006)	(0.004)
rivalprofit			-0.000	0.000
			(0.000)	(0.000)
CEO×Spot×rivalprofit			0.000	0.000
			(0.000)	(0.000)
Dpt.Mng.×Spot×rivalprofit			0.000	0.000
			(0.000)	(0.000)
Spot×rivalprofit			-0.000	-0.000
			(0.000)	(0.000)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes		Yes	
Munic*time trend	Yes	Yes	Yes	Yes
Industry FE	Yes		Yes	
Worker FE	Yes		Yes	
Match (worker-firm) FE		Yes		Yes
N	7,583,773	7,583,773	7,457,580	7,457,580
R2	0.043	0.036	0.042	0.035

Note: The dependent variable is the log monthly pay of workers. Further covariates include gender, age and tenure (and their squares), type of contract (whether or not fixed term), education levels, ln size of firm, whether firm is exporter and whether it is multi-plant, and ownership of the firm. I_{j1}^P is an indicator variable that equals one if firm j is in the qth quartile of profits in 2004. Also included but not reported for space considerations are the interaction terms Profit*I_{j1}^P and Spot*Profit*I_{j1}^P (all coefficients on those terms are statistically insignificant); and interaction terms CEO (Dpt.Mng.)*I_{j1}^P (all coefficients are positive and statistically significant). Robust standard errors, clustered by municipality, in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

9 Figures

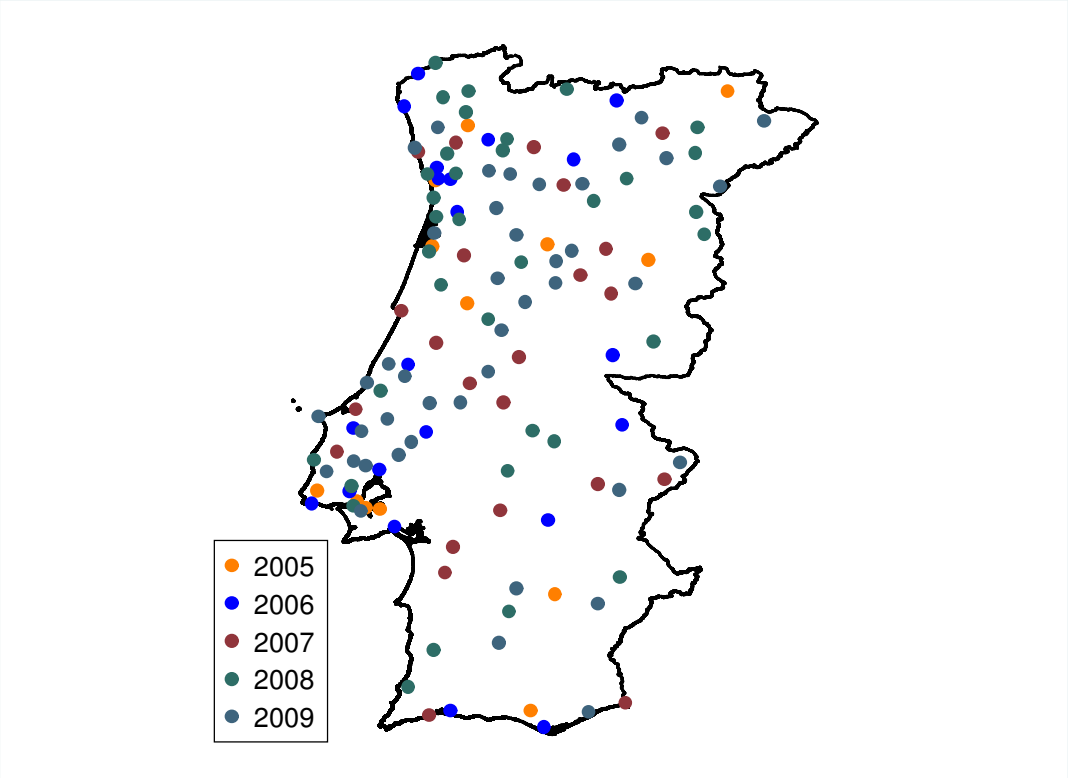

Fig. 1: "On the Spot Firm" introduction by year and municipality

A Appendix

Table A.1: SIC2 - Industries

	Industry	% Obs.
15	Manuf. of food, beverages & tobacco	5.99
17	Manuf. of textiles	5.26
18	Manuf. of wearing apparel; dressing and dyeing of fur	5.84
19	Tanning and dressing of leather; Manuf. of luggage, handbags, saddlery, harnes & footwear	2.95
20	Manuf. of wood & prods of wood & cork, except furniture; Manuf. of straw & plaiting materials	2.08
21	Manuf. of pulp, paper and paper products	0.74
22	Publishing, printing and reproduction of recorded media	1.40
24	Manuf. of chemicals & chemical prods; Manuf. of coke, refined petroleum prods & nuclear fuel	1.67
25	Manuf. of rubber and plastic products	1.67
26	Manuf. of other non-metallic mineral products	3.60
27	Manuf. of basic metals	0.68
28	Manuf. of fabricated metal products, except machinery and equipment	4.02
29	Manuf. of machinery and equipment n.e.c	2.45
31	Manuf. of electrical machinery and apparatus n.e.c.	1.19
32	Manuf. of radio, television and communication equipment and apparatus	0.85
33	Manuf. of medical, precision and optical instruments, watches and clocks	0.33
34	Manuf. of motor vehicles, trailers and semi-trailers	2.41
35	Manuf. of other transport equipment	0.67
36	Manuf. of furniture; others manufacturing activities, n.e.c.	2.23
37	Recycling	0.19
40	Electricity, gas & water	0.20
41	Water collection, treatment and distribution	0.27
45	Construction	13.96
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	0.56
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	10.44
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and HH goods	11.79
55	Hotels and restaurants	4.73
60	Land transport; transport via pipelines	0.04
62	Air transport	0.00
63	Supporting & auxiliary transport activities; travel agencies and other tourist assistance	0.46
64	Post and telecommunications	1.20
65	Financial intermediation, except insurance and pension funding	0.00
70	Real estate activities	0.07
71	Renting of machinery and equipment without operator and of personal and HH goods	0.14
72	Computer and related activities	1.30
73	Research and development	0.00
74	Other business activities	5.54
80	Education	0.01
85	Health and social work	2.10
90	Sewage and refuse disposal, sanitation and similar activities	0.35
91	Activities of membership organizations n.e.c.	0.00
92	Recreational, cultural and sporting activities	0.21
93	Other service activities	0.38

Note. Sample size: 7,583,773 worker-year observations (estimation sample). Source: Own calculations based on Portugal, MTSS (2002-2009)

Table A.2: Summary statistics: means of covariates by groups of workers

Covariate	CEOs	Department managers	Other workers
ln(monthly real pay)	8.203	7.723	6.642
Profits (real, in millions)	1.671	2.341	3.479
Spot	0.335	0.387	0.373
Women	0.170	0.268	0.438
Age	47.229	43.117	37.708
Tenure	11.635	10.550	8.476
Closed-end contract	0.127	0.112	0.260
Education (baseline: ISCED1)			
ISCED2	0.074	0.119	0.218
ISCED3	0.120	0.222	0.190
ISCED56	0.718	0.498	0.080
ln(size of firm)	4.293	4.427	4.790
Exporter	0.735	0.668	0.642
Multi-plant	0.358	0.408	0.396
Ownership status (baseline: private national)			
Public	0.021	0.015	0.025
Foreign	0.192	0.165	0.149
No. of observations	17,849	162,705	7,403,219

Note. Means were computed using the estimation sample. Source: Own calculations based on Portugal, MTSS (2002-2009).