Financing Constraints and Fixed-Term Employment: Evidence from the 2008-9 Financial Crisis*

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Abstract

This paper investigates the effect of the 2008-9 financial crisis on firms' employment composition decision when it is possible to choose between permanent and fixed-term workers. We use linked employer-employee data for the universe of private sector firms in Portugal, and exploit precrisis variation in financial vulnerability across industries for identification. We find that firms in more financially constrained industries hire a larger proportion of fixed-term workers with respect to permanent workers after the 2008-9 crisis, relative to less financially vulnerable firms. At the worker-level, workers hired by firms in industries that require significant external financing are more likely to be hired with a fixed-term contract after the crisis than comparable workers hired by other firms. Our results suggest that the crisis induced financially constrained firms to use the more flexible fixed-term contracts more intensively.

Key Words: Financial Constraints, Financial Crisis, Firm-level Employment, Fixed-term Contracts

JEL Classification Numbers: J2, J41, G20, M51

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1 Introduction

The global financial crisis of 2008-9 has sparked renewed interest - both in academic and in policy circles - in understanding the cyclicality of employment and, in particular, the link between financial constraints, credit availability and employment. Recent research has shown that financing constraints affect firm-level employment decisions (Benmelech et al., 2011), and that firms which borrowed from less healthy banks or that tightened debt capacity in the period preceding the crisis experienced a significantly larger fall in employment in the aftermath of the financial crisis (see Chodorow-Reich, 2014; Greenstone et al., 2014; Giroud and Mueller, 2015, for evidence on the US; and Bentolila et al., 2016, for evidence on Spain).[1]

This paper investigates how the financial crisis of 2008-9, and the resulting financing constraints imposed on firms, affected firms' decisions in terms of employment composition, when it is possible to choose between fixed-term and permanent contracts when hiring a worker. This question has received significantly less attention from researchers. Labor market responses to the crisis have been large in European labor markets, characterized by a dual structure where flexible fixed-term contracts coexist with permanent contracts with strict employment protection legislation (EPL). However, evidence on the effects of financial constraints, and in particular of the recent crisis, on firms' decisions regarding the composition of employment and the mix between fixed-term and permanent workers is very scant.

We use employer-employee data for the universe of private sector firms and workers in Portugal, and exploit the effect of the 2008-9 crisis on firms with differential precrisis dependence on external finance as a quasi-natural experiment. We employ a difference-in-differences identification strategy to study the effect of the crisis on the proportion of fixed-term hires with respect to permanent hires at the firm level. We also estimate, at the worker-level, how firms' financing constraints affect the probability of a worker being hired with a temporary contract after the crisis.[2] Portugal offers a good setting to study the use of fixed-term contracts as they represent a significant share of total employment, averaging 15 percent over the period, one of the largest shares in the EU. Importantly, strict EPL for permanent workers is accompanied by lax regulation of fixed-term employment.[3]

[1] Siemer (2014) and Duygan-Bump et al. (2015) exploit differential financing needs across industries, and find consistent evidence for firms in more financially dependent industries in the US.

[2] Portuguese firms continued to hire workers over the period, averaging 442,000 new hires per year. The average share of fixed-term hires was above 60 percent (Table 1).

[3] Portugal is at the top of the OECD Employment Protection index, having the largest protection

Understanding the effect of financial constraints on firms' choice between fixed-term and permanent contracts when hiring new workers is important given existing evidence that an increased use of fixed-term contracts has several adverse effects. These include increased employment volatility, lower wages of temporary workers as unions tend to protect the interests of permanent workers in the wage bargaining, and lower labor mobility due to higher uncertainty. Moreover, higher turnover rates of fixed-term workers may reduce investment in firm-specific human capital and firms' provision of training, with potential negative effects on labor productivity (see e.g., Dolado et al., 2002).

We find that firms in industries with higher precrisis dependence on external finance increased their share of fixed-term hires with respect to permanent hires after the crisis, relative to less financially constrained firms. We control for growth opportunities (as in Fisman and Love, 2007) and account for firms' unobserved characteristics, which absorb any systematic differences across firms with different degree of financial dependence, and for aggregate trends. Our results are robust to alternative measures of financial vulnerability - such as the Rajan and Zingales (1998) external finance dependence measure, the Hadlock and Pierce (2010) size-age index of financial constraints and precrisis reliance on short-term debt - and for different dependent variables to measure the share of fixed-term hires and employment within a firm.[4]

At the worker-level, we find that workers hired by firms in financially vulnerable industries are more likely to be hired with a fixed-term contract after the crisis, relative to comparable workers hired by financially unconstrained firms. These results control for workers' observable and unobservable characteristics. Our findings suggest that as a result of financing constraints and increased uncertainty, firms in more financially dependent industries increased their relative demand for the more flexible fixed-term employment contracts after the crisis.

Our results can be interpreted within a framework such as Caggese and Cuñat (2008). Assuming fixed-term and permanent workers are perfect substitutes but the latter are more productive, financing frictions have two opposing effects on the composition of employment. On the one hand, financially constrained firms require higher productivity to increase the value of internally generated funds, leading to an increased demand for the more productive permanent workers. On the other hand, increased uncertainty and expectation of future financing constraints lead to higher demand for the more flexible

gap between permanent and fixed-term contracts.

[4]Our results complement those in Caggese and Cuñat (2008), who find evidence from survey data for Italy over 1990-2000, that firms that self declared to be financially constrained had higher shares of fixed-term workers.

fixed-term workers. Our finding that financially constrained firms increased the share of fixed-term hires after the 2008-9 crisis suggests that they value more highly the flexibility of these workers to adjust future employment without incurring significant firing costs. This is particularly relevant in European labor markets where permanent workers are highly protected while fixed-term contracts have mild dismissal regulations.

The linked employer-employee data (LEED) that we use has unusually detailed information, including the workers' gender, age, education, occupation, hours of work, earnings, hiring date in the firm, and importantly for this study, the type of contract of employment: whether fixed-term or open-ended. Firm-level information includes total sales, total employment, industry, location, number of establishments, legal and ownership structures.

To identify credit supply effects, we use industry-level measures of external finance dependence, following the work of Rajan and Zingales (1998), the Hadlock and Pierce (2010) size-age index of financial constraints, firms' reliance on short-term debt; as well as asset tangibility, as in Braun (2003), and access to buyer-supplier credit, following Fisman and Love (2003). These measures are computed from firms' balance sheet and employer-employee data over the period that precedes the crisis, to avoid changes in firm behavior after the crisis to affect the industry measures of financial vulnerability.

By exploiting cross-industry differences in precrisis financial vulnerability measures, which are intrinsic characteristics of an industry and exogenously determined from the perspective of individual firms, we circumvent identification concerns in this type of study of disentangling supply-side from demand-side changes in the credit market in response to the crisis. To provide an additional test of our identification, we use the 2001 crisis that originated in the ICT sector, and find no statistically significant relation between financial vulnerability and the relative use of fixed-term employment contracts after the crisis. Our results about the effects of the 2008-9 crisis on fixed-term employment within firms are thus consistent with the role of shocks to credit supply and financial constraints.

Our findings have important policy implications. Empirical research has found that fixed-term workers earn lower wages and have repeated spells of unemployment. The finding that the use of these contracts increased after the crisis suggests on the one hand that their availability allowed firms to continue to hire in an uncertain environment given their flexibility. On the other hand, it may uncover additional costs of the shock with potential long-term effects in terms of decreased accumulation of human capital and productivity. This is particularly relevant in labor markets characterized by a dual

employment structure.

The paper proceeds as follows. The next section reviews the related literature. Section 3 describes the data used, the construction of the main variables and the empirical strategy. Section 4 presents and discusses the results on the effect of financing constraints on employment composition within firms after the crisis, and on workers' probability of a fixed-term employment contract. Section 5 discusses the interpretation and implications of our results. The last section concludes.

2 Related literature

This paper is related to recent studies on how financial shocks affect employment decisions of firms. Chodorow-Reich (2014), uses employment data from the U.S. Bureau of Labor Statistics (BLS) and the borrowing history of firms that accessed the syndicated loan market, to study the effect of bank lending frictions during the 2008-9 crisis on employment. He finds that firms which had borrowed from less healthy financial institutions before the crisis had lower probability of obtaining a loan after the crisis and reduced employment by more, relative to firms that borrowed from healthier lenders before the crisis. Greenstone et al. (2014) find that the withdrawal of lending to small firms accounted for statistically significant negative effects on U.S. county-level employment after the 2008-9 crisis. These results are consistent with the idea that smaller firms are more vulnerable to credit supply constraints due to problems of asymmetric information and reduced transparency (Gertler and Gilchrist, 1994).

Using a similar approach, but focusing on Spain, Bentolila et al. (2016) study employment changes from 2006 to 2010 for firms that obtained a significant share of funding from Spanish banks that were bailed out by the government as a result of the financial crisis, relative to firms that borrowed from healthier banks. They find that firms which borrowed from weak banks suffered a significantly larger fall in employment. Benmelech et al. (2011) exploit as quasi-experiments the variation in the amount of maturing debt, the bank deregulation in the U.S., and the contraction of loans by Japanese affiliate banks in the U.S. during the 1990's. They show that labor is sensitive to financial constraints and that the provision of bank credit affects unemployment, suggesting that finance plays an important role in firm-level employment decisions.

Siemer (2014) and Duygan-Bump et al. (2015) rely on an identification strategy similar to that employed in this paper by exploiting differences across sectors in external

finance dependence. Siemer (2014) uses data from the BLS and finds that small and young firms in sectors with high dependence on external finance had lower employment growth following the 2008 crisis than firms in sectors with low external finance dependence. He also develops a heterogeneous firm model with endogenous firm entry and financial constraints to study the effect of a financial shock on small and young firms. Duygan-Bump et al. (2015) also use BLS data and exploit industry-level external finance dependence - the proportion of capital expenditures financed with external funds - to study transitions from employment to unemployment at the worker-level during the 2008-9 crisis. They find that the probability of becoming unemployed during the financial crisis is higher for workers in industries with high external finance dependence, relative to those in industries with low dependence.

Our paper is distinct from previous studies given our focus on the effect of the crisis on the relative use of fixed-term versus permanent workers at the firm-level, rather than on total employment effects. We also investigate the effect of financing constraints on the probability of a worker being hired with a fixed-term contract following the crisis. The main contribution of this paper is thus to study how financing constraints affect firms' decision to hire fixed-term or permanent workers following shocks to credit supply. This is of particular importance given rigidities in European labor markets.

Previous research has studied how employment protection affects employment dynamics, and in particular the use of fixed-term and permanent employment contracts (e.g. Bentolila and Bertola, 1990; Bentolila and Saint Paul, 1992). Focussing predominantly on Europe, where reforms to labor laws regulating fixed-term contracts allowed such studies, empirical research has found that fixed-term employment absorbs a higher share of output volatility and increases overall employment volatility. The effects on unemployment are found to be largely ambiguous (see e.g., Blanchard and Landier, 2002; Dolado et al., 2002; Kugler and Pica, 2004; Alonso-Borrego et al., 2005). Holmlund and Storrie (2002) show that the share of fixed-term work in total employment in Sweden increased markedly following the 1990's recession. They document that fixed-term employment increased over most of the period, and the decline in employment during the downturn was the result of job losses of permanent workers. Bentolila et al. (2012) argue that the larger increase in unemployment in Spain compared to France after the financial crisis of 2008 can be explained by the larger dismissal costs of permanent workers and the laxer rules on the use of temporary contracts.[5]

[5]A literature on business cycle fluctuations and labor adjustment documents a negative correlation between hours and employment growth (Cooper et al., 2007; Trapeznikova, 2014). Borowczyk-Martins

Those studies do not address the link between financing constraints and firms' relative use of fixed-term contracts. As such, our paper is more closely related and complements the results in Caggese and Cuñat (2008), who study the interaction between financing constraints and the employment decision of firms to hire fixed-term or permanent workers. The authors develop a model in which financing constraints are an important determinant of the optimal mix between fixed-term and permanent employment. They test the model's predictions empirically using survey data for a sample of small and medium Italian manufacturing firms from 1995 to 2000. Their measure of financing constraints is based on qualitative survey answers where firms self-declare as financially constrained. We instead exploit variation across industries in external finance dependence and the 2008-9 financial crisis as a quasi-experiment. We identify a causal link between firms' financing conditions and the share of fixed-term hiring contracts, using data for the universe of private sector firms.

3 Data and methodology

3.1 Data

We investigate how the global financial crisis of 2008-9 and the subsequent financing constraints affect firms' decision to hire temporary or permanent workers. The main data source used in this paper is the Portuguese linked employer-employee data *Quadros de Pessoal* (QP), for the period from 2002 through 2012. These data have been collected annually since the 1980s by the Portuguese Ministry of Labor and Social Security. The data include information on all private sector firms that employ at least one worker, and on all of their plants and all of their employees. Firms are required by law to answer the survey and to have it publicly available at the workplace. This ensures a high degree of coverage and reliability of the data. Each firm and each worker has a unique registration number which allows them to be traced over time.

Firm-level information includes the firm's year of creation, industry, region, total number of workers, number of establishments, sales volume, legal structure and ownership type (equity breakdown among domestic private, public or foreign). Our analysis

and Lalé (2016) establish that the reduction in hours per worker following the 2008-9 crisis is largely driven by changes in the part-time employment share. We instead study firms' decision to hire fixed-term workers following the crisis as they offer flexibility to adjust future employment. In the Portuguese economy both fixed-term and permanent workers are predominantly on full-time jobs (over 95 percent of the total during the period).

considers firms in the manufacturing and services sectors. Information on workers includes gender, age, schooling, level of skill, occupation, monthly hours of work (normal and overtime), earnings, hiring date in the firm, date of the last promotion and type of employment contract. Importantly for this study, the variable "type of employment contract" allows us to identify whether the worker is employed with a permanent (open-ended) or with a fixed-term contract; this variable has been collected since 2000. We use the terms "temporary" and "fixed-term" interchangeably throughout the paper.

Fixed-term contracts are regulated in the Portuguese law since 1989 (Decree-law 64-A/1989). The law was amended over the years and included in the Labor Code (LC) approved in 2003 (Law 99/2003).[6] Despite the amendments to the labor law, there have been no significant changes regarding fixed-term or permanent contracts during the period covered by our analysis; in particular in the maximum duration, severance pay, or procedures to terminate a fixed-term contract. By law, fixed-term employment contracts are intended to fulfil firms' temporary work needs and in general cannot exceed three years of duration and can be renewed at the most three times.[7] Fixed-term workers are entitled to severance pay equal to 3 days for each month of employment (2 days if the employment relationship lasted less than six months). Severance pay was changed to 20 days for each year of employment for new contracts from 2012. The dismissal advance notice period remained at 15 days. The law that regulates fixed-term contracts is applied to all qualifications and occupations and across all firms and industries.[8]

The severance pay for open-ended contracts is one month for each year of seniority (20 days from 2012), with a minimum of 3 months; and the advance notice period is at least 2 months.[9] But the largest difference between the two types of employment contract is in the bureaucratic and monetary costs to terminate a contract, which are very significant for permanent contracts, involving court procedures, legal and administrative costs. Portugal has the highest value of the OECD employment protection index for permanent contracts throughout the period of our analysis (the U.S. have the lowest value).

[6]Parts of the LC were subject to changes over the following years, and a new LC was approved in 2009 (Law 7/2009), and revised in 2011 (Law 53/2011).

[7]If these limits are reached, the firm would have to either dismiss the workers or move them to an open-ended contract. The rationale for this is that if the employment relation reaches the maximum legal limit, the firm's requirement would be for a permanent rather than for a temporary worker.

[8]The general law in the Labor Code can be overruled by Instruments of Collective Regulation of Labor (IRCT) - agreements signed by unions and employers affecting workers employed in the particular industry or firm for which the agreement is established (depending on the instrument). However, IRCTs override the Labor Code only if they establish more favorable conditions to the workers (Principle of the most favorable treatment, Labor Code, art. 4, 2003; art. 476, 2009).

[9]This was changed from 2010 to 15 days if seniority is less than a year; 30 days if it is between 1 and 5 years; 60 days if between 5 and 10 years; and 75 days if it is 10 years or more.

Table 1 shows the total number of permanent and fixed-term workers hired in each year over the period. Portuguese firms hired on average 442,000 workers, and on average 62 percent of new hires were under a fixed-term contract. Appendix Table A.1 reports summary statistics for fixed-term employment shares at the firm-level for the firms in our estimation samples. Fixed-term contracts represent a significant share of total employment, averaging 15 percent over the period (column 2). Portugal has the third largest share of fixed-term employment of the European Union, below Spain and Poland (OECD, 2012). The proportion of fixed-term employment increased after the crisis, and in 2009 it was above 17 percent.

[Table 1 about here]

Our main goal is to investigate whether there is a differential effect of the crisis on the proportion of fixed-term hires with respect to permanent hires for financially constrained firms. Therefore, the main firm-level dependent variables in our specifications are the share of fixed-term hires in total hires and the ratio of fixed-term over permanent hires. We also use as alternative dependent variables the shares of fixed-term or permanent hires in total firm employment. In some of our specifications, we use the share of fixed-term workers in total employment and the ratio of fixed-term over permanent employment. Appendix Table A.1 reports summary statistics for these variables.

We identify permanent and fixed-term hires by combining information in the QP data on the workers' "type of employment contract" and "hiring date" in the firm. For each firm-year we then compute the number of new hires with a fixed-term employment contract and the number of hires with a permanent employment contract to obtain the shares of fixed-term new hires within a firm. As shown in Table A.1, the share of hires with fixed-term contract in total hires averaged 54 percent across firm-years (column 4). This share increased after the crisis, reaching 59 percent in 2009.

We use firms' balance sheet data collected by the Portuguese Office for National Statistics (INE) to compute the measures of financial dependence. From 2004 the data is from *Sistema de Contas Integradas das Empresas* (SCIE, Enterprise Integrated Accounts System) and covers the universe of firms in manufacturing and services. Prior to 2004, INE implemented the *Inquérito às Empresas Harmonizado* (IEH, Harmonized Enterprise Survey), a representative annual survey covering around 40,000 firms. Together, the SCIE and the IEH provide detailed firm balance sheet information, which we use to construct

the measures of financial vulnerability, described in more detail below. We then merge the matched employer-employee data with the measures of financial dependence. Appendix Table A.2 reports summary statistics for the alternative dependent variables and for all the covariates included in our firm-level specifications.

3.2 Measures of financial constraints

We require measures of financial dependence to identify differential effects of the crisis for financially constrained firms. Our empirical strategy exploits differences in vulnerability to credit availability across industries and uses the global financial crisis of 2008-9 as a shock to credit supply. Previous research has shown that some industries are more financially dependent than others. First, firms in some industries have substantially larger liquidity needs, for example, because of the initial project scale, the requirement for continuing investment, or the cash harvest period (Rajan and Zingales, 1998; RZ hereafter). As discussed in RZ, technological differences across industries in their dependence on external finance reflect intrinsic properties of the industries and persist across countries and time. Second, firms in sectors that are intrinsically associated with more tangible (harder) assets can pledge more collateral to access external funds (Braun, 2003; Claessens and Laeven, 2003). Third, firms in some industries receive more trade credit from suppliers, which can reduce dependence on credit from financial institutions (Fisman and Love, 2003). More recently, Hadlock and Pierce (2010, HP hereafter) proposed a size-age index of financial constraints, based on the finding that firms' size and age are highly related to financial constraints.

We use the common proxies for a sector's financial vulnerability: external finance dependence, asset tangibility, and the importance of trade credit, as well as the HP size-age index and precrisis reliance on short-term debt. We compute industry measures of financial vulnerability using balance sheet data, from the SCIE and the IEH, and employer-employee data for Portuguese firms. The measures are obtained for the period preceding the crisis, so that the effect of the financial crisis on firm behavior does not contaminate the industry measures of financial vulnerability. We follow the literature in computing the measures of liquidity and tangibility. We first calculate financial vulnerability at the firm-level as an average measure over the precrisis period (1997-2006) for all firms in the data.[10] We then use the median value across all firms within a 2-digit

[10]Restricting the precrisis period to 2004-2006, when the SCIE data covers the universe of firms, does not affect the results. As discussed in the literature, these measures tend to be stable over time, and display much larger variation across industries than across firms within a given industry.

ISIC rev 3.1 industry as the measure of financial dependence.

External finance dependence ($extfin$) is measured by the share of total capital expenditure that is not financed by internal cash flows from operations. Asset tangibility ($tang$) is the share of net plant, property and equipment in total book value assets. The measure of trade credit ($tcred$) is the ratio of total accounts payable over total cost of goods sold, following Love et al. (2007).[11] This reflects access to credit that firms receive from suppliers instead of making up-front payments for supplies. These industry measures are widely regarded as technologically determined characteristics of an industry, intrinsic to the industry and exogenous from the perspective of an individual firm. In particular, the RZ measure of external finance dependence has been extensively used in the literature.[12]

We obtain the size-age index (SA) of financial constraints for the firms in our sample as in Hadlock and Pierce (2010). Size is measured by the log of inflation adjusted book assets and age is the number of years of the firm.[13] The index shows that financial constraints fall as young and small firms mature and grow. Finally, we also use firms' precrisis reliance on short-term debt to measure financial vulnerability. Firms that rely more heavily on short-term debt during the precrisis period are more likely to be vulnerable to the crisis, relative to firms with more long-term debt, since following the crisis banks are less able to roll over short-term debt. We compute average precrisis short-term debt ratios (short-term debt/total debt) at the firm-level from firms' balance sheet data.[14]

Fisman and Love (2007) argue that the RZ measure may capture firm's growth opportunities, such that firms on a steeper growth trajectory would be more dependent on external finance than those at a more mature stage of their life cycle. In that case, the measure may implicitly reflect how financial institutions allow firms to respond to shocks to growth opportunities, rather than allowing them to grow in industries with higher fin-

[11] This measure is computed over 2006-2007 because the data distinguishes firms' credit from suppliers only since 2006.

[12] Examples of studies that employ the same methodology include Duygan-Bump et al. (2015) and Siemer (2014) to investigate unemployment dynamics during the 2008 global crisis; Chava and Purnanandam (2011) on the effect of shocks to the U.S. banking system on bank-dependent borrowers; Claessens and Laeven (2003) on the relation between financial development, property rights protection and growth; among many other.

[13] HP estimate ordered logit models, for the sample of firms in Compustat, where a firm's qualitatively determined financial constraint status is modeled as a function of size and age. The authors then use the estimates on size and age to create the SA index of financial constraints. The HP index is calculated as (-0.737×Size) + (0.043×Size^2) - (0.040×Age). Size is winsorized (capped) at \$4.1 billion, and age at 37 years to reflect a flat relation between financial constraints and these variables for very large/mature firms. By construction, financially more constrained firms have higher SA index.

[14] The HP SA index and the short-term debt ratios are computed over the 2002-2006 period, as data coverage is larger for these measures from 2002. All of the results remain robust to using the 1997-2006 period to compute these average measures.

ancial dependence. They test this conjecture by including an industry-level sales growth interaction in the Rajan and Zingales' original specification. They find that this growth measure is statistically significant, emphasizing the role of global growth opportunities. Therefore, to take into account firms' growth in the precrisis period, we follow Fisman and Love (2007) and include a sales growth interaction in our empirical specifications. The real sales growth measure is obtained following the same RZ methodology as for the other financial vulnerability measures. We compute average real sales growth over the precrisis period for each firm and then take the industry-level median of the firm-level sales growth rates.[15]

To identify differential effects of the crisis for financially constrained firms, we split the sample into firms with high and low financing constraints, defining dichotomous variables for whether the industry measures of financial dependence are above the median across industries. Splitting firms based on a-priori measures of financial constraints has been employed in several previous studies (e.g., Acharya et al., 2012; Duygan-Bump, 2015; Giroud and Mueller, 2015; among others). Appendix Tables A.2 and A.3 report summary statistics for the continuous measures and for the above-median dichotomous measures of financial constraints, in our firm-level and worker-level estimation samples, respectively.

To estimate the effect of the crisis for firms with different degrees of financial dependence, we identify the global financial crisis period by defining a binary variable, $Crisis$, which takes the value of 1 from 2008 onwards and zero otherwise. September 2008 is generally considered as the onset of the crisis. In July 2007, the interbank market interest rate increased following the announcement by the French bank BNP Paribas of the freezing of three investment funds based on the impossibility to value its subprime assets. Other banks followed in freezing their subprime portfolios. In March 2008, the withdrawal of short-term financing to Bear Stearns led to its sale to J.P. Morgan. Financial conditions then stabilized temporarily, but deteriorated severely in September 2008 with Lehman Brothers reports of losses and subsequent bankruptcy after not being able to obtain short-term financing or to find a buyer. Several other major financial institution failures and bailouts triggered a sharp escalation in the global credit crunch. The cost of interbank lending soared as a result (see Chor and Manova, 2012; and Chodorow-Reich, 2014, for details).[16]

[15] Real sales growth is computed over the 2002-2006 period, as for the HP SA index and short-term debt ratios.

[16] The onset of the crisis in Portugal was also 2008. The Portuguese economy experienced an expansion from 2004 to 2007, in which GDP grew at an average rate of 1.66%. Then the recession started in 2008 and GDP fell by 3% between 2008 and 2009; it recovered temporarily in 2010 and then continued to

3.3 Empirical strategy

To study the relationship between financing constraints and the employment decisions of firms with respect to the use fixed-term or permanent employment contracts after the crisis, we implement a difference-in-differences approach. The aim is to investigate whether firms in industries with high financial constraints increase their share of fixed-term hires disproportionately after the crisis, compared to firms in industries with low financial vulnerability, since the financial crisis reduced the availability of external credit. Hence, we estimate specifications of the form:

$$Y_{jst} = \beta_1(Crisis_t \times FinVuln_s) + \beta_2(Crisis_t \times Salesg_s) + \theta X'_{jt} + d_j + d_t + \epsilon_{jst}. \quad (1)$$

where the dependent variable, Y_{jst}, is the employment level or, most importantly, the share of fixed-term workers hired in total or permanent hires (or employment) of firm j in industry s, and year t. $Crisis_t$ is an indicator variable for the crisis period, taking the value 1 from 2008 onwards, and 0 otherwise. September 2008 is generally considered as the onset of the crisis, as discussed above.

$FinVuln_s$ is one of the measures of financial constraints for industry s: external finance dependence, the Hadlock and Pierce (2010) size-age index of financial constraints, short-term debt ratios, access to trade credit, and tangible asset shares. To estimate differential effects for the more financially constrained firms, we use dummy variables that take the value of 1 if industry s is above the median for the respective $FinVuln$ measure, and zero otherwise ($FinVuln^{ab\text{-}med}$). The strategy of dividing firms in two groups, with below-median and above-median financial dependence measures, respectively, has been employed in previous studies (see e.g. Giroud and Mueller, 2014; Duygan-Bump et al., 2015).

The coefficient of main interest, β_1, is interpreted as the differential effect of the crisis for firms in industries with above-median financial dependence precrisis, relative to firms in industries below the median. Our results remain robust to using the continuous measures of financial constraints. $Salesg_s$ is the measure of the industry's precrisis real sales growth. We include its interaction term to control for the fact that the measures of external finance dependence may capture firms' growth opportunities, such that firms on a steep growth trajectory may be more dependent on external finance (see Fisman and

decline from 2010 to 2012, by 3%. These recession periods coincide with those reported for the UK and most European countries by the Economic Cycle Research Institute, and correspond to the so called "double-dip" recession. GDP decreased on average 1.35% per year from 2008 to 2012 in Portugal (World Bank, World Development Indicators).

Love, 2007). Similar to the $FinVuln$ measures, we define a dummy variable that takes the value of 1 if the sector is above the median in terms of precrisis sales growth, and zero otherwise.

X'_{jt} is a vector of firm characteristics, such as lagged (ln of) sales (in real terms), legal structure, whether the firm is foreign-owned or multiplant. We also include sets of fixed effects to control for general trends, d_t, and for firm time-invariant unobserved characteristics, d_j, which may affect firms' mix between fixed-term and permanent workers. When we include year dummies and firm fixed effects, the stand-alone crisis dummy variable, $Crisis_t$, and the $FinVuln_s$ measure are absorbed by these sets of fixed effects, and are therefore not included. ϵ_{jst} is a random disturbance term. In all empirical specifications, standard errors are clustered by firm.

Given the fixed effects and covariates included, the coefficient of interest, on the interaction between the crisis dummy and the financial dependence measure, $Crisis_t \times FinVuln_s$, is interpreted as the differential effect of the crisis on the proportion of fixed-term hires for firms in industries with above-median financial dependence, relative to firms in other industries (after controlling for precrisis growth). We expect the coefficient on the external finance dependence interaction to be positive if firms in industries that rely more on external funds increased the share of fixed-term hires disproportionately after the crisis. Similarly, we expect the coefficient on the HP size-age index interaction and that on the short-term debt ratio interaction to be positive if higher financial constraints, measured by those variables, are associated with an increased relative use of fixed-term workers after the crisis.

Regarding the measure of client-supplier (trade) credit, on the one hand this type of credit may have been an alternative to credit from financial institutions, alleviating the effects of the crisis.[17] On the other hand, financially vulnerable firms may be less willing to extend trade credit to their clients after the financial crisis, propagating its effects through credit networks (Love et al., 2007). Therefore, the coefficient could be positive or negative. The coefficient on the asset tangibility interaction is expected to be negative if firms are able to use tangible assets as collateral to obtain external finance after the crisis. However, the 2008 financial crisis was accompanied by a sharp decline in the value of commercial real estate holdings of firms. This may have amplified the effects of the financial shock for firms dependent on pledgeable assets to access external financing. For

[17] Fisman and Love (2003) show that industries with higher dependence on trade credit have higher growth rates in countries with weaker financial institutions, suggesting that it may provide an alternative to bank credit.

example, Kleiner (2015) shows that the decline of the housing sector explains 10 percent of the 2007-9 unemployment in the UK.[18] Therefore, given the issues associated with the measures of tangibility and trade credit after the 2008-9 crisis, our preferred measures of financial constraints are the external finance dependence, once precrisis sales growth is accounted for, the HP SA index and the reliance on short-term debt.

We also use data at the worker-level to investigate whether workers hired by firms in industries with higher financial vulnerability were more likely to be hired with a temporary employment contract after the crisis, relative to comparable workers hired by firms with lower financial vulnerability. To that end, using the sample of workers that were hired during the period of our analysis, we estimate a linear model for the probability that a worker is hired with a fixed-term employment contract. That is, we estimate the following specification:

$$\begin{aligned} \Pr[fixed\text{-}term_{ijst}] &= \beta_1(Crisis_t \times FinVuln_s) + \beta_2(Crisis_t \times Salesg_s) + \gamma Z'_{it} \\ &\quad + \theta X'_{jt} + d(.) + \epsilon_{ijst} \end{aligned} \tag{2}$$

where the dependent variable is the probability of a fixed-term hiring contract. The estimation sample includes observations for each worker only for the years when the worker is newly hired by a firm. Therefore, $fixed\text{-}term_{ijst}$ is equal to one if worker i was hired by firm j (in industry s) in year t with a fixed-term contract, and is equal to zero if the worker was hired with a permanent contract. Z_{it} is a vector of worker characteristics, including the workers' gender, level of education attained, potential labor market experience (and its square), level of skill, and whether the worker is a foreign national.

X_{jt} is a vector of firm characteristics, as before. We also include sets of fixed effects, $d(.)$, to control for general trends, as well as for firm or worker time-invariant unobserved characteristics. Because some workers were hired more than once over the period, we are able to estimate specifications that control for worker fixed effects. The other variables are as defined above. The coefficient of interest, on the interaction term $Crisis \times FinVuln$, captures the differential effect of the crisis on the probability of a fixed-term hiring contract, for workers hired by firms in industries with above-median financial constraints, relative to those hired by other firms, controlling for all workers'

[18] Ersahin and Irani (2015) also show that there is a positive relation between real estate price growth and firm employment.

and firms' characteristics, including sales growth.

4 Results

4.1 Effect of the crisis on firms' total employment

We start by investigating the effect of the 2008-9 crisis on firm total employment. We regress the log of employment at the firm-year level on the crisis dummy variable, $Crisis_t$. We control for industry or firm fixed effects to absorb any systematic differences across industries or firms that may affect employment outcomes. The results are reported in Table 2. We find that firm-level employment declined after the crisis, both within firms and across firms within an industry. These results are consistent with recent studies that document overall employment decreases after the crisis (e.g. Chodorow-Reich, 2014; Greenstone et al., 2014).

[Table 2 about here]

Next, we assess whether there are differential employment effects for firms in industries with intrinsically higher external finance dependence, SA index, short-term debt ratios, lower dependence on trade credit, or lower shares of collateralizable assets. We estimate a specification similar to Eq. (1), with the log of employment as the dependent variable. The results are reported in Table 3. Even-numbered columns control for precrisis sales growth, as explained in the previous section. All columns include firm fixed effects, thus controlling for unobserved firm characteristics, and in particular for any systematic differences across firms in the treatment and control groups. The coefficient of interest is that on the interaction $Crisis_t \times FinVuln^{ab\text{-}med}$, which is interpreted as the differential effect of the crisis on employment for firms in industries with above-median financial dependence, relative to those in industries below-median. The stand-alone $FinVuln^{ab\text{-}med}$ term is absorbed by the firm fixed effects. In Panel A we include the stand-alone $Crisis$ variable for a more clear interpretation of the effect of the crisis, whilst in Panel B we control for year fixed-effects which account for global trends, affecting all firms, and thus absorb the stand-alone $Crisis$ variable. The results remain robust in both panels.

We find that firm employment was reduced after the crisis on average, while firms in industries with above-median dependence on external finance, SA index or precrisis reliance on short-term debt reduced employment by less compared to other firms. The coefficients on the interaction term between the crisis dummy and the financial dependence

measures reported in columns (1) through (6) of the table are positive and statistically significant. A hypothesis to explain this result is that since firms with higher financing needs require greater productivity to increase the value of internally generated funds, they used the more productive permanent workers more intensively before the crisis.[19] As a result, in a labor market with strict employment protection legislation against dismissal of permanent workers, the overall employment effects of the crisis would have been less pronounced. We provide evidence for this hypothesis below.

Columns (7) through (10) of Table 3 report results for the importance of buyer-supplier credit ($tcred$) and asset tangibility ($tang$) as (potentially inverse) measures of financial vulnerability. We find that firms in industries with above-median tangible asset shares or access to trade credit experienced a larger reduction in employment after the crisis relative to other firms. As discussed above, credit constrained upstream firms may have been less willing to extend credit to their clients after the crisis thus propagating its effects through client-supplier networks and magnifying the employment effects (see Love et al., 2007). Moreover, firms' ability to use tangible assets as collateral to obtain external finance may have been dampened by the sharp decline in the value of commercial real estate holdings of firms following the collateral shocks (see Kleiner, 2015). Given the issues associated with using asset tangibility and trade credit as inverse measures of financial vulnerability in the context of the 2008-9 crisis, our preferred measures of financial constraints are $extfin$, the HP SA index, and reliance on short-term debt. In the following sections we focus on those measures to investigate the role of financial vulnerability on the relative use of fixed-term labor after the crisis.

[Table 3 about here]

Appendix Table A.4 provides evidence for the hypothesis discussed above that financially constrained firms hired more permanent workers prior to the crisis and given strict EPL for these workers, decreased employment by less in the aftermath of the crisis. We regress the precrisis average share of permanent hires in total employment at the firm level on the measures of financial vulnerability. We control for firm characteristics and for the real sales growth measure, as before. Continuous measures of financial vulnerability are used in odd-numbered columns and the indicator variables for above-median

[19] In Section 5 below, we report evidence that larger shares of fixed-term workers are associated with lower sales per worker within firms, suggesting that fixed-term workers are less productive than permanent workers.

vulnerability in even-numbered columns. We obtain positive and statistically significant coefficients on the three measures of financial constraints.[20] That is, over the precrisis period firms with higher or above-median financial vulnerability had higher shares of permanent workers.

Since the crisis was largely unanticipated, financially constrained firms had an incentive to hire the more productive permanent workers to increase the value of internally generated funds. The high dismissal costs and strict employment protection laws for permanent workers may have resulted in firms hoarding these workers and experiencing a lower decrease in employment after the crisis. This could have induced financially constrained firms to increase the share of fixed-term hires after the crisis in order to retain flexibility to adjust future employment. We investigate how the crisis affected the proportion of fixed-term hiring for financially constrained firms in the remainder of the paper.

4.2 Effect of the crisis on fixed-term employment: firm-level

This section presents the main results of the paper. We are interested in identifying how financial constraints affected firms' decision to hire fixed-term versus permanent workers after the crisis, and thus the share of fixed-term hires and employment within firms. We investigate whether firms in more financially vulnerable industries hire a larger proportion of fixed-term workers with respect to permanent workers after the crisis, given the increased uncertainty and the flexibility of fixed-term contracts to adjust future employment. To that end, we estimate Eq. (1) using alternative dependent variables to measure the proportion of fixed-term hiring contracts within a firm. We use information in the matched employer-employee data on each worker's hiring date in the firm, and on their "type of employment contract" (fixed-term or permanent) to compute the shares of fixed-term new hires at the firm-year level.[21]

Table 4 reports results from estimating Eq. (1) for two alternative dependent variables: the share of fixed-term workers hired in total new hires by the firm (Panel A), and the ratio of fixed-term to permanent new hires (Panel B). In odd-numbered columns we include the interaction term of main interest, $Crisis_t \times FinVuln_s$, and in even-numbered columns we additionally include the interaction with precrisis real sales growth,

[20] Except when using the indicator variable for the short-term debt ratio (column 6).

[21] In addition to fixed-term and permanent contracts, the variable "type of employment contract" includes the categories: "other" and "ingnored". We exclude from our analysis observations in those categories, which account for only about 1% of observations.

$Crisis_t \times Salesg_s$. The latter accounts for firms' growth opportunities, which might otherwise be captured by the external finance dependence measure (see Fisman and Love, 2007). We also control for firm and year fixed-effects in all specifications, and for firms' observable characteristics, as discussed in previous sections. The standard errors are always clustered by firm.

In Panel A of Table 4 we obtain a positive and statistically significant coefficient on the $Crisis_t \times FinVuln_s$ interaction for the measure of external finance dependence (column 1). That is, after the crisis firms with above-median dependence on external finance increase the proportion of fixed-term hires in total hires relative to firms with below-median dependence. This result is obtained when controlling for firm fixed effects, which absorb any differential hiring preferences and policies of firms, as well as any other unobserved firm characteristics. The magnitude of the coefficient is economically significant, implying a differential increase of 1.6 percentage points in the share of fixed-term hires for firms with above-median dependence on external finance, relative to other firms. This corresponds to a 2.9 percent increase relative to the sample mean of 54.4 percent, reported in Table A.2. Controlling for precrisis real sales growth does not affect the sign, magnitude and statistical significance of the coefficient on the external finance dependence interaction (column 2).

These results are obtained both across firms within an industry and within firms after the onset of the financial crisis.[22] The finding that financially constrained firms increase the share of fixed-term hires in total hires following the crisis suggests that they value more highly the flexibility of the fixed-term contracts than unconstrained firms. To deal with increased uncertainty and expectation of future financing constraints, those firms hire a larger proportion of fixed-term workers, as they offer greater flexibility to adjust employment following a negative shock, given the lower firing costs associated with this type of contract.

[Table 4 about here]

The remaining columns of Table 4 report results for the two additional measures of financial constraints: the HP size-age index (columns 3-4) and the short-term debt

[22] Results with industry fixed effects instead of firm fixed effects, and including all other controls and fixed-effects, are reported in appendix Table A.5. As shown, the results remain robust; we continue to obtain positive and statistically significant coefficients on the interaction terms of main interest. That is, financially constrained firms increased the share of fixed-term hires after the crisis, relative to unconstrained firms.

ratio (columns 5-6). The SA index captures the fact that financial constraints fall as young and small firms mature and grow. By construction more financially constrained firms have higher SA index. The short-term debt ratio captures the fact that firms with high precrisis reliance on short-term debt are more likely to be vulnerable to the crisis. We continue to obtain positive and statistically significant coefficients on the interaction term of main interest for both these measures. This shows that firms in industries with above-median SA index or reliance on short-term debt precrisis experienced a larger effect of the crisis on the proportion of fixed-term hires, relative to other firms. Again, controlling for precrisis sales growth does not significantly affect the coefficient on the $Crisis_t \times FinVuln_s$ interaction.

Panel B of Table 4 uses as dependent variable the ratio of fixed-term over permanent hires at the firm-year level, conditional on firms hiring permanent workers. The results are consistent with those reported in Panel A. In particular, we continue to find a positive and statistically significant coefficient on the $Crisis_t \times FinVuln_s$ interaction for the three measures of financial vulnerability. That is, firms with above-median reliance on external finance, short-term debt or SA index increase the proportion of fixed-term hires with respect to permanent hires after the crisis, relative to firms below-median.

Next, we try to disentangle whether the positive effect on the share of fixed-term hiring reported above is driven by an increase in fixed-term hires, or by a reduction in permanent hiring after the crisis. To that end, Table 5 reports results from estimating Eq. (1) using four alternative dependent variables: the ratio of fixed-term hires over total employment, the ratio of permanent hires over total employment and the number of workers hired with a fixed-term and with a permanent contract, at the firm-year level. Results for the three measures of financial constraints are reported across the columns of the table. Even-numbered columns report results that control for the precrisis sales growth interaction. Panel A shows that there is a positive and statistically significant differential effect of the crisis on the share of fixed-term hires in total employment for firms with above-median financial dependence, relative to those below-median. This is found for all measures of financial vulnerability.

[Table 5 about here]

The dependent variable in Panel B is the share of permanent hires in total employment. The differential effect of the crisis for firms with above-median dependence on

external finance is not statistically significant (columns 1 and 2). This finding suggests that the positive effect estimated above for the share of fixed-term hires in total hires is driven by a relative increase in fixed-term hiring, while there is no statistically significant effect on the share of permanent hires. The results for the two alternative $FinVuln_s$ measures are mixed, with negative coefficients estimated for the SA index and positive for the short-term debt ratios. The results reported in Panel C, for the number of fixed-term hires, show that firms in industries with above-median financial constraints increased the number of fixed-term workers hired after the crisis, relative to firms below the median. The coefficients are statistically significant for all measures except the SA index. In Panel D, for the number of permanent hires, the coefficients are generally statistically insignificant (at the 5% level) when we include the sales growth interaction, except for the SA index. Overall, the results in Table 5 confirm that the positive effect on fixed-term hiring shares is driven by an increase in fixed-term hires.

Table 6 reports results for the effect on the stock of fixed-term workers rather than on the flow of new hiring. The dependent variable is the share of fixed-term employment in total employment in Panel A, and the ratio of fixed-term over permanent employment in Panel B. Consistent with the results reported above, we estimate an increase in the share of fixed-term workers in total (Panel A) or in permanent (Panel B) employment after the crisis for firms with above-median financial constraints. This is obtained for the three measures of financial vulnerability.

[Table 6 about here]

In sum, the results in this section are consistent with the interpretation that financing constraints play a role in firms' decision in terms of employment composition and the mix between fixed-term and permanent workers. In particular, financing constraints induced firms to hire a larger proportion of fixed-term workers relative to permanent workers after the financial crisis. We find robust evidence that firms in industries with above-median dependence on external finance increased the share of fixed-term hiring contracts. This is consistent with the hypothesis that difficulty in accessing capital markets following the crisis led financially constrained firms to place a higher value on the flexibility of fixed-term workers to adjust future employment, given the higher uncertainty.

4.3 Effect of the crisis on fixed-term employment: worker-level

In this section we exploit worker-level information to investigate whether workers hired by firms in industries characterized by intrinsically higher financial vulnerability were more likely to be hired with a fixed-term contract after the crisis, relative to comparable workers hired by firms in industries with lower financial vulnerability. For that purpose, we use the sample of workers that were hired during the period of analysis, and estimate a model for the probability of a fixed-term hiring contract. We estimate Eq. (2), where the dependent variable takes the value of 1 if the worker was hired with a fixed-term contract in year t, and zero if hired with a permanent contract.[23] Since we include firm or worker fixed effects, along with year fixed effects, we obtain OLS estimates given concerns of biases arising from nonlinear estimates with fixed-effects. Our estimates control for the same firm-level observable characteristics as before, and additionally for worker characteristics: gender, educational level, skill level, experience and its square, and whether the worker is a foreign national.

Table 7 reports results for the three measures of financial vulnerability: external finance dependence, SA index, and reliance on short-term debt. In Panel A we include firm fixed effects, along with year fixed effects and observable firm and worker characteristics. The coefficient on the interaction term between the post-crisis dummy and $extfin$, the RZ measure of external finance dependence, is positive and statistically significant (columns 1 and 2). That is, workers hired by firms in industries with above-median dependence on external finance are more likely to be employed with a fixed-term contract after the crisis, than workers hired by firms in industries with below-median dependence. The results remain robust when we control for the real sales growth interaction. The point estimate of 0.031 implies that the impact of the crisis was to increase the probability of a fixed-term hiring contract by 3.1 percentage points for workers hired by firms in industries with above-median dependence on external funds, relative to comparable workers hired by other firms. This corresponds to a 5 percent increase relative to the sample mean of 64.8 percent, reported in Table A.3.

[Table 7 about here]

Columns (3) and (4) report results for the Hadlock and Pierce (2010) SA index. We find that workers hired in industries where firms have a higher size-age index, and thus are

[23] The sample includes observations for a worker only for the years when the worker was newly hired by a firm.

financially more vulnerable, were more likely to be hired with a fixed-term contract after the crisis. The coefficient on the interaction term of main interest remains positive and statistically significant after controlling for real sales growth, and is of similar magnitude to that for the $extfin$ measure.

The results in columns (5) and (6) are for the measure of financial vulnerability based on firms' precrisis reliance on short-term debt. Consistent with the other two measures, we obtain a positive and statistically significant coefficient on the interaction with the crisis dummy. This implies an increased probability of a fixed-term hiring contract after the crisis for workers hired by firms with heavier reliance on short-term debt.

Panel B of Table 7 presents results that control for worker fixed effects, in addition to the other variables and controls discussed above. The fact that some workers were hired more than once over the period of analysis allows us to obtain estimates that control for potential biases arising from workers' unobserved time-invariant characteristics, which could be related to the probability of being hired with a fixed-term contract. As shown, all the results remain robust when we control for worker fixed effects. In particular, we continue to find that workers hired by firms in industries with above-median dependence on external finance, SA index, or reliance on short-term debt were more likely to be hired with a fixed-term contract after the crisis.

In sum, the results in this section, using data at the worker-level to estimate the effect on the probability of a fixed-term hiring contract, are consistent with the firm-level results reported in the previous section. They suggest that the crisis led financially constrained firms to place a higher value on the flexibility of fixed-term workers than unconstrained firms.

In a framework where fixed-term and permanent workers are perfect substitutes but the latter are more productive, there are two effects of financing frictions on the composition of employment. On the one hand, financially constrained firms require higher productivity, leading to an increased demand for the more productive permanent workers. On the other hand, increased uncertainty leads to higher demand for the more flexible fixed-term workers. Our results suggest that following the 2008-9 crisis firms facing financial constraints placed a higher value on the flexibility of fixed-term workers to adjust future employment than on the productivity gain from hiring permanent workers. This is of particular relevance given labor market rigidities in European countries.

4.4 Robustness checks

4.4.1 Effect of the crisis on fixed-term employment, by firm size

Our results reported above show that following the 2008-9 crisis, firms in industries with higher external finance dependence increased the relative use of fixed-term employment contracts, compared to other firms. In this section we report further robustness checks for the main results of the paper. We start by assessing the role of financial constraints on the share of fixed-term hiring for small versus large firms. Although we already account for the role of size and age in firms' financial vulnerability with the SA index of financial constraints, here we estimate the main specifications of the paper (reported in Table 4) separately for small and for large firms. Arguably, small firms are potentially more financially constrained than large firms. Moreover, lending to small businesses was significantly reduced after the onset of the crisis in many countries.[24]

In Table 8 we consider the sample of micro and small firms - firms with less than 50 employees, in accordance with the Eurostat main firm size-classes. As shown, we obtain results that are similar to those reported in Table 4 for the full sample of firms. In particular, also for small firms, those firms with above-median financial constraints - measured by external finance dependence, reliance on short-term debt or SA index - increased the relative use of fixed-term workers after the crisis, compared to unconstrained firms.

[Table 8 about here]

In Table 9 we repeat the analysis but considering the sample of medium and large firms - those with 50 or more employees. We continue to obtain positive and statistically significant coefficients on the $Crisis_t \times FinVuln_s$ interaction. This finding shows that for the sample of large firms also, the crisis had a positive differential effect on the share of fixed-term hires for firms with high financing constraints, relative to those with low constraints. We identify the role of financing constraints through the interaction term between the crisis dummy and the industry measures of external finance dependence; this could explain the fact that the results are obtained for both large and small firms. In sum, the results in this section confirm the findings obtained previously for the full sample of firms: financially constrained firms increase the share of fixed-term workers disproportionately after the crisis compared to unconstrained firms.

[24] For example, small business loans by commercial banks fell by over $40 billion in the U.S. (Duygan-Bump et al., 2015).

[Table 9 about here]

4.4.2 The 2001 ICT crisis as a placebo test

Our results on the effect of the 2008-9 financial crisis on firms' employment decisions are consistent with the role of shocks to credit supply. This section provides additional evidence that our findings are driven by differential financial dependence across industries. We perform similar analysis to that reported in previous sections, but using the 2001 recession, which was triggered by the bursting of the bubble in the information and communications technology (ICT) sector.[25] The 2001 recession did not affect firms' access to credit, as the 2008-9 crisis did, and as such serves as a placebo test of our main results if changes in fixed-term employment shares are not related to financial dependence across industries after the ICT crisis. Therefore, we should find no statistically significant differential effect for firms in industries with above-median financing constraints, relative to firms in other industries after the 2001 crisis. That is, we expect the coefficient on the interaction term $Crisis_t \times FinVuln_s$ to be statistically insignificant for the 2001, ICT-driven, crisis.

We estimate specifications similar to Eq. (1), for our three preferred measures of financing constraints - $extfin$, SA index and short-term debt ratios - but the post-shock dummy, $Crisis_t$, is now defined for the period after the 2001 crisis. The variable in the QP data which distinguishes the workers' contract of employment (fixed-term or permanent) has been collected only since 2000, and the data was not collected in 2001. As such, we use the period from 2000 to 2003 for the placebo test, and define the $Crisis_t^{2001}$ variable to take the value of 1 for the years from 2001 to 2003, and zero for 2000.

Table 10 reports estimation results of similar specifications as those reported in Table 4, with the main findings of the paper, but for the 2001 crisis. We continue to control for the same covariates and fixed effects as before. The dependent variable in Panel A is the share of fixed-term hires in total hires. The coefficient on the interaction term between the post-2001 crisis dummy and the measures of financial vulnerability is statistically insignificant (at the 5% level) for all measures. Financing constraints are thus statistically insignificant in explaining firms' employment mix between fixed-term and permanent hires following the 2001 crisis. This provides additional support for our main results, for the 2008-9 financial crisis.

[25] Duygan-Bump et al. (2015) perform a similar robustness test.

The dependent variable in Panel B is the ratio of fixed-term over permanent hires. We continue to obtain statistically insignificant coefficients on the 2001-crisis interaction term of interest for all measures of financial vulnerability once we account for the sales growth interaction (even-numbered columns). Overall, the results in this section support the role of financing constraints in firms' decision of whether to hire fixed-term or permanent workers following shocks to credit supply.

[Table 10 about here]

5 Discussion

Our results show that financing constraints play a role in firms' decision in terms of the optimal mix between fixed-term and permanent workers after the 2008-9 crisis. In particular, financially constrained firms increased the share of fixed-term hiring contracts following the crisis, relative to other firms. Our findings are consistent with the hypothesis that facing financial difficulties in accessing capital markets following the crisis, financially constrained firms placed a higher value on the flexibility of fixed-term workers than financially unconstrained firms. Given increased uncertainty and expectation of future financing constraints, this type of labor allows firms to adjust future employment without incurring significant firing costs. In this section we discuss a framework to rationalize and interpret our results.

Caggese and Cuñat (2008) develop a model to analyze the interaction between financing constraints, firing costs and the hiring of fixed-term and permanent workers. Assuming that fixed-term and permanent workers are perfect substitutes but permanent workers are relatively more productive, firms without financing constraints would hire permanent workers up to the point where firing costs equal the productivity gain relative to fixed-term workers. The model predicts two opposing effects of financing frictions on the mix between fixed-term and permanent contracts. On the one hand, financially constrained firms require greater productivity to increase the value of internally generated funds; this would lead to an increased demand for the more productive permanent workers. This effect is stronger if firms expect to be less constrained in the future. On the other hand, cash-strapped firms with expectation of future financing constraints value more highly the flexibility of fixed-term contracts, thus increasing demand for fixed-term workers.

To assess the potential trade-off between flexibility and productivity in our data, we report in Table A.6 statistics showing that fixed-term workers have higher job separation rates and lower real hourly wages than permanent workers. Assuming that wages are perfectly correlated with productivity, the lower hourly wages of fixed-term workers would reflect lower productivity. To further investigate this, Table A.7 regresses labor productivity (real sales per worker) at the firm-year level on the share of fixed-term workers. We use continuous fixed-term employment shares or a dummy variable that takes the value of 1 for observations with above-median fixed-term share, and zero otherwise. We control for firms' observable characteristics and include year as well as industry or firm fixed effects. Although the results do not imply causality, we find that larger shares of fixed-term workers are associated with lower sales per worker, both within firms and across firms in an industry. In sum, in our data fixed-term workers have higher job separation rates, lower real hourly wages and are associated with lower firm productivity than permanent workers. This suggests that firms face the two opposing effects of financial frictions discussed above, and the trade-off between productivity and flexibility when hiring new workers.

Our empirical results shed light on these two effects following a shock to credit supply. The finding that after the 2008 crisis financially constrained firms increase the proportion of fixed-term hires with respect to permanent hires suggests that they value the flexibility of fixed-term workers more highly than the larger productivity of permanent workers.[26] Future expected financing constraints are an important determinant of employment decisions, and financial frictions increase expected firing costs, inducing firms to hire fixed-term instead of permanent workers. This is particularly important given labor market rigidities in Europe, since fixed-term contracts offer the flexibility to adjust future employment without incurring significant firing costs.[27]

The results in our paper have important policy implications given that fixed-term

[26] Our results are consistent with the findings of Caggese and Cuñat (2008) for Italy over the 1990-2000 period.

[27] Since the wages of fixed-term workers are on average lower, financially constrained firms might hire relatively more fixed-term workers after the crisis also to reduce labor costs. This hypothesis is hard to establish conclusively and that is beyond the scope of this paper. Borowczyk-Martins and Lalé (2016) show that part-time employment is countercyclical and increased markedly in the U.S. and U.K. in the aftermath of the 2008-9 crisis. This is consistent with employers reducing labor costs during downturns by moving some full-time employees to part-time jobs. We instead focus on the choice between fixed-term and permanent workers, both of which are predominantly on full-time jobs in Portugal (average weekly hours are 39 and 40, respectively, and did not change significantly over the period). As discussed in Bentolila et al. (2012), Booth et al. (2012), Bentolila and Saint-Paul (1992), among many others, fixed-term contracts are a mechanism that enhances labor market flexibility, allowing firms to adjust the workforce by varying the number of temporary workers. Our results show that Portuguese firms used this mechanism following the 2008 crisis.

workers tend to earn lower wages and move from one contract to another with repeated spells of unemployment. These contracts affect mostly young, women and less educated workers (see e.g. Bentolila and Dolado, 1994; Portugal and Varejão, 2009). The finding that the use of this type of contract increased after the crisis implies on the one hand that their availability allowed firms to continue to hire in an uncertain environment given their flexibility. On the other hand, the increase in fixed-term employment may uncover additional costs of the shock with potential long-term effects in terms of exposure to labor market frictions and decreased accumulation of human capital.

6 Conclusion

This paper investigates how the financial crisis of 2008-9, and the resulting financing constraints imposed on firms, affected firms' decision in terms of employment composition, when fixed-term and permanent contracts are available when hiring new workers. Labor market responses to the crisis have been large in European labor markets, characterized by strict employment protection for regular contracts and by flexible temporary contracts. However, evidence on the effects of financial constraints, and in particular of the recent crisis, on firms' decision regarding the composition of employment, and the mix between fixed-term and permanent workers is very scant.

We exploit the 2008-9 crisis, which affected firms differently according to their precrisis dependence on external finance, as a quasi-natural experiment. We study the link between financing constraints and the proportion of fixed-term hires with respect to permanent hires within firms. We also estimate, at the worker level, the effect of financing constraints on the probability of a fixed-term hiring contract after the crisis.

We use employer-employee data for the universe of private sector firms and workers in Portugal for our analysis. Credit supply effects are identified by industry-level external finance dependence (following Rajan and Zingales, 1998), the Hadlock and Pierce (2010) size-age index of financial constraints, and reliance on short-term debt. These measures are computed over the precrisis period, to avoid changes in firm behavior after the crisis to affect the measures of financial vulnerability.

We find that firms in industries with above-median dependence on external finance increase the share of fixed-term hires with respect to permanent hires after the 2008-9 crisis, relative to firms with below-median external finance needs. We account for firms' fixed effects, which absorb unobserved characteristics and any systematic differences across

firms, and for aggregate trends. Our results are robust for the Hadlock and Pierce (2010) size-age index and for precrisis reliance on short-term debt. At the worker-level, workers employed by firms in industries with above-median financial vulnerability are more likely to be hired with a fixed-term contract after the crisis, relative to comparable workers hired by unconstrained firms.

In a framework where fixed-term and permanent workers are perfect substitutes but permanent workers are more productive, there are two effects of financing frictions on the composition of employment. On the one hand, financially constrained firms require higher productivity, and thus demand more permanent workers. On the other hand, expectation of future financing constraints leads to higher demand for the more flexible fixed-term workers (Caggese and Cuñat, 2008). Our finding that following the 2008-9 crisis financially constrained firms increase the share of fixed-term hires suggests that they value the flexibility of fixed-term labor more highly since it allows them to adjust future employment given a negative shock.

Whilst our findings are based on micro-level data, they have broader relevance and policy implications. Financial constraints and the availability of credit are important determinants of firms' employment decisions. Empirical research has found that fixed-term workers earn lower wages and have repeated spells of unemployment. The finding that the use of these contracts increased after the crisis suggests, on the one hand, that their availability allowed firms to continue to hire in an uncertain environment given their flexibility. On the other hand, it may uncover additional costs of the shock with potential long-term effects in terms of decreased accumulation of human capital and productivity.

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8 Tables

Table 1: Hiring per year and share of fixed-term hires

Year	Fixed-term+Permanent hires	% Fixed-term
2003	355,794	60.87
2004	383,770	62.32
2005	464,490	63.31
2006	487,213	64.02
2007	554,589	65.32
2008	574,961	68.48
2009	466,728	66.98
2010	436,837	54.24
2011	405,874	55.73
2012	291,372	58.47

The Table reports the number of fixed-term and permanent workers hired each year and the share of fixed-term hires. Own calculations based on Portugal, MTSS (2002-2012).

Table 2: Effect of the crisis on firm-level employment

Dependent variable:	**ln(employment)**$_{jt}$	
	(1)	(2)
Crisis	-0.041***	-0.060***
	(0.001)	(0.001)
Constant	-4.089***	-0.233***
	(0.012)	(0.014)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure	
Industry FE	yes	
Firm FE		yes
R^2	0.568	0.060
Nb. Obs.	2,235,938	2,235,938

Crisis takes the value of 1 from 2008 to 2012 and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 3: Effect of the crisis and of financial vulnerability on employment level

Dependent variable:	**Panel A: ln(employment)$_{jt}$**									
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**		**TCRED**		**TANG**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Crisis	-0.066***	-0.074***	-0.071***	-0.073***	-0.103***	-0.115***	-0.061***	-0.061***	-0.054***	-0.056***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
$Crisis \times FinVuln^{ab\text{-}med}$	0.011***	0.016***	0.014***	0.011***	0.064***	0.068***	0.001	-0.051***	-0.040***	-0.039***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
$Crisis \times Salesg^{ab\text{-}med}$		0.015***		0.009***		0.022***		0.058***		0.004**
		(0.002)		(0.002)		(0.002)		(0.004)		(0.002)
Constant	-0.235***	-0.230***	-0.233***	-0.230***	-0.236***	-0.229***	-0.233***	-0.229***	-0.233***	-0.232***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure									
Firm FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.061	0.061	0.061	0.061	0.062	0.063	0.060	0.061	0.061	0.061
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938

Dependent variable:	**Panel B: ln(employment)$_{jt}$**									
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**		**TCRED**		**TANG**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Crisis \times FinVuln^{ab\text{-}med}$	0.010***	0.014***	0.012***	0.009***	0.065***	0.068***	-0.001	-0.051***	-0.038***	-0.037***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
$Crisis \times Salesg^{ab\text{-}med}$		0.014***		0.008***		0.021***		0.056***		0.003*
		(0.002)		(0.002)		(0.002)		(0.004)		(0.002)
Constant	-0.210***	-0.206***	-0.208***	-0.206***	-0.212***	-0.205***	-0.209***	-0.205***	-0.208***	-0.207***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure									
Year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.067	0.067	0.067	0.067	0.069	0.069	0.067	0.068	0.068	0.068
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). TCRED measures access to supplier credit and is the ratio of total accounts payable over cost of goods sold. TANG measures tangible assets and is the share of net plant, property and equipment in total book assets. SA index is the Hadlock & Pierce (2010) size-age index, where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006) following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding $FinVuln$ (Sales growth) measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 4: Effect of the crisis on the share of fixed-term hires (firm-level)

Dependent variable:	**Panel A: (Fixed-term hires/Total hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.016***	0.015***	0.018***	0.020***	0.012***	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$Crisis \times Salesg^{ab\text{-}med}$		-0.007**		-0.013***		-0.008***
		(0.003)		(0.003)		(0.003)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.007	0.007	0.007	0.007	0.007	0.007
Nb. Obs.	734,174	734,174	734,174	734,174	734,174	734,174

Dependent variable:	**Panel B: (Fixed-term hires/Permanent hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.501***	0.354***	0.722**	0.862**	0.559***	0.386**
	(0.176)	(0.131)	(0.323)	(0.370)	(0.212)	(0.160)
$Crisis \times Salesg^{ab\text{-}med}$		-0.573***		-0.793***		-0.538***
		(0.197)		(0.279)		(0.179)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.001	0.001	0.001	0.002	0.001	0.001
Nb. Obs.	400,303	400,303	400,303	400,303	400,303	400,303

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006), following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 5: Effect of the crisis on the share of fixed-term hires; alternative dependent variables (firm-level)

Dependent variable:	**Panel A: (Fixed-term hires/Employment)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.003***	0.002***	0.003***	0.003***	0.004***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Crisis \times Salesg^{ab\text{-}med}$		-0.003***		-0.003***		-0.002***
		(0.000)		(0.000)		(0.000)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.007	0.007	0.007	0.007	0.007	0.007
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938
Dependent variable:	**Panel B: (Permanent hires/Employment)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.001	0.000	-0.002***	-0.002***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Crisis \times Salesg^{ab\text{-}med}$		-0.001***		-0.001***		-0.000
		(0.000)		(0.000)		(0.000)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.007	0.007	0.007	0.007	0.007	0.007
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938
Dependent variable:	**Panel C: (Nb. fixed-term workers hired)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.093**	0.090***	0.045	0.045	0.114**	0.117***
	(0.043)	(0.035)	(0.068)	(0.068)	(0.048)	(0.038)
$Crisis \times Salesg^{ab\text{-}med}$		-0.009		-0.035		0.007
		(0.042)		(0.049)		(0.038)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.001	0.001	0.001	0.001	0.001	0.001
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938
Dependent variable:	**Panel D: (Nb. permanent workers hired)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	-0.095**	-0.054	-0.279***	-0.280***	-0.119**	-0.070*
	(0.045)	(0.034)	(0.080)	(0.080)	(0.055)	(0.042)
$Crisis \times Salesg^{ab\text{-}med}$		0.148***		0.165***		0.139***
		(0.046)		(0.055)		(0.040)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.000	0.000	0.000	0.000	0.000	0.000
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938

Notes as in Table 4.

Table 6: Effect of the crisis on the share of fixed-term employment (firm-level)

Dependent variable:	**Panel A: (Fixed-term employment/Total employment)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.006***	0.005***	0.005***	0.005***	0.006***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$Crisis \times Salesg^{ab\text{-}med}$		-0.006***		-0.007***		-0.005***
		(0.001)		(0.001)		(0.001)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.015	0.015	0.015	0.015	0.015	0.015
Nb. Obs.	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938	2,235,938

Dependent variable:	**Panel B: (Fixed-term employment/Permanent employment)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.050***	0.034***	0.059***	0.061***	0.070***	0.053***
	(0.010)	(0.009)	(0.016)	(0.017)	(0.013)	(0.010)
$Crisis \times Salesg^{ab\text{-}med}$		-0.056***		-0.067***		-0.047***
		(0.012)		(0.013)		(0.011)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.001	0.001	0.001	0.001	0.001	0.001
Nb. Obs.	1,837,439	1,837,439	1,837,439	1,837,439	1,837,439	1,837,439

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006), following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 7: Effect of the crisis on the probability of fixed-term hiring contract (worker-level)

Panel A: Firm fixed effects (LPM)						
Dependent variable:	**Probability[Fixed-term hiring contract]$_{it}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.052***	0.031***	0.067***	0.057***	0.057***	0.036***
	(0.016)	(0.012)	(0.017)	(0.014)	(0.016)	(0.011)
$Crisis \times Salesg^{ab\text{-}med}$		-0.046***		-0.048***		-0.042***
		(0.012)		(0.013)		(0.011)
Additional worker controls	gender, experience, experience^2, education, skill-level, foreign					
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.033	0.034	0.034	0.034	0.033	0.034
Nb. Obs.	3,423,322	3,423,322	3,423,322	3,423,322	3,423,322	3,423,322

Panel B: Worker fixed effects (LPM)						
Dependent variable:	**Probability[Fixed-term hiring contract]$_{it}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.063***	0.035***	0.080***	0.066***	0.064***	0.033***
	(0.011)	(0.008)	(0.011)	(0.009)	(0.011)	(0.007)
$Crisis \times Salesg^{ab\text{-}med}$		-0.060***		-0.060***		-0.058***
		(0.009)		(0.009)		(0.008)
Additional worker controls	experience, experience^2, skill-level					
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure, region, industry					
Year FE	yes	yes	yes	yes	yes	yes
Worker FE	yes	yes	yes	yes	yes	yes
R^2	0.049	0.050	0.050	0.051	0.049	0.050
Nb. Obs.	3,423,322	3,423,322	3,423,322	3,423,322	3,423,322	3,423,322

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006), following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 8: Effect of the crisis on the share of fixed-term hires; sub-sample of micro and small firms (firm-level)

Dependent variable:	**Panel A: (Fixed-term hires/Total hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.013***	0.012***	0.013***	0.014***	0.007***	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$Crisis \times Salesg^{ab\text{-}med}$		-0.004		-0.010***		-0.006**
		(0.003)		(0.003)		(0.003)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.008	0.008	0.008	0.008	0.008	0.008
Nb. Obs.	686,323	686,323	686,323	686,323	686,323	686,323
Dependent variable:	**Panel B: (Fixed-term hires/Permanent hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.101***	0.093***	0.026	0.036	0.056**	0.042*
	(0.027)	(0.026)	(0.039)	(0.042)	(0.028)	(0.025)
$Crisis \times Salesg^{ab\text{-}med}$		-0.028		-0.059*		-0.039
		(0.027)		(0.031)		(0.025)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.002	0.002	0.002	0.002	0.002	0.002
Nb. Obs.	371,585	371,585	371,585	371,585	371,585	371,585

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006), following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. The estimation sample includes firms with less than 50 workers in the first year they are observed in the sample. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 9: Effect of the crisis on the share of fixed-term hires; sub-sample of medium and large firms (firm-level)

Dependent variable:	**Panel A: (Fixed-term hires/Total hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.035***	0.031***	0.020***	0.035***	0.029***	0.029***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)
$Crisis \times Salesg^{ab\text{-}med}$		-0.042***		-0.054***		-0.044***
		(0.008)		(0.008)		(0.008)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.025	0.027	0.025	0.027	0.025	0.026
Nb. Obs.	47,851	47,851	47,851	47,851	47,851	47,851

Dependent variable:	**Panel B: (Fixed-term hires/Permanent hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	3.071**	2.491**	3.795*	5.421**	3.651**	3.398**
	(1.459)	(1.267)	(2.046)	(2.639)	(1.660)	(1.570)
$Crisis \times Salesg^{ab\text{-}med}$		-5.728***		-7.220***		-5.824***
		(2.049)		(2.747)		(2.096)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.007	0.008	0.007	0.009	0.007	0.008
Nb. Obs.	28,718	28,718	28,718	28,718	28,718	28,718

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006), following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. The estimation sample includes firms with 50 or more workers in the first year they are observed in the sample. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table 10: Effect of the 2001 ICT crisis on the share of fixed-term hires (firm-level)

Dependent variable:	**Panel A: (Fixed-term hires/Total hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.004	0.012*	0.010*	0.007	-0.011*	-0.010*
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
$Crisis \times Salesg^{ab\text{-}med}$		0.037***		0.035***		0.035***
		(0.006)		(0.006)		(0.006)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.029	0.029	0.029	0.029	0.029	0.029
Nb. Obs.	159,253	159,253	159,253	159,253	159,253	159,253

Dependent variable:	**Panel B: (Fixed-term hires/Permanent hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.061	0.073	0.360**	0.362*	0.256	0.257
	(0.124)	(0.118)	(0.174)	(0.192)	(0.164)	(0.163)
$Crisis \times Salesg^{ab\text{-}med}$		0.050		-0.014		0.038
		(0.172)		(0.191)		(0.172)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
R^2	0.001	0.001	0.001	0.001	0.001	0.001
Nb. Obs.	101,884	101,884	101,884	101,884	101,884	101,884

The analysis in this table covers the period 2000-2003, as the data distinguishes between fixed-term and permanent employment contracts only since 2000 (the data were not collected in 2001). *Crisis* takes the value of 1 from 2002 onwards, and zero otherwise. The financial vulnerability measures are calculated over the pre-2001 crisis period (1997-2000). EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations. SA index is the Hadlock & Pierce (2010) size-age index, where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the sector is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

A Appendix

Table A.1: Descriptive statistics, employment shares

		All firms		Hiring Firms			
Year	Nb. of firms	FoT	FoP	FoTH	FoPH	FhoT	PhoT
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2003	196,887	0.127	0.322	0.496	0.917	0.047	0.049
2004	211,981	0.135	0.348	0.509	1.022	0.050	0.050
2005	222,591	0.144	0.352	0.517	1.130	0.054	0.052
2006	232,946	0.147	0.371	0.538	1.203	0.056	0.049
2007	237,089	0.163	0.413	0.551	1.353	0.063	0.053
2008	244,558	0.170	0.441	0.577	1.472	0.066	0.049
2009	246,912	0.172	0.434	0.586	1.230	0.055	0.041
2010	212,150	0.124	0.283	0.522	0.960	0.052	0.049
2011	219,554	0.139	0.309	0.556	1.024	0.053	0.044
2012	211,270	0.143	0.316	0.585	0.976	0.048	0.036

The statistics are for the firm-level estimation sample, with 2,235,938 firm-year observations. FoT is the share of fixed-term over total employment; FoP is the ratio of fixed-term over permanent employment. FoTH and FoPH are the share of fixed-term hires in total or in permanent hires, respectively. FhoT and PhoT are the share of fixed-term and permanent hires, respectively, over total employment within the firm. The table reports averages across firms. Own calculations based on Portugal, MTSS (2002-2012).

Table A.2: Descriptive statistics - firm-level estimation samples' means

Dependent variable:	FoT	FoP	FoTH	FoPH	FhoT	PhoT	Nb. FT hires
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mean of dependent variable	0.148	0.361	0.544	1.143	0.055	0.047	0.994
extfin	0.532	0.517	0.506	0.490	0.532	0.532	0.532
tcred	2.294	2.252	2.307	2.321	2.294	2.294	2.294
tang	0.314	0.324	0.342	0.353	0.314	0.314	0.314
SA index	-7.229	-7.235	-7.240	-7.248	-7.229	-7.229	-7.229
Short-term debt ratio	0.956	0.956	0.955	0.953	0.956	0.956	0.956
extfin$^{ab\text{-}med}$	0.498	0.485	0.471	0.450	0.498	0.498	0.498
tcred$^{ab\text{-}med}$	0.458	0.453	0.483	0.493	0.458	0.458	0.458
tang$^{ab\text{-}med}$	0.145	0.159	0.178	0.197	0.145	0.145	0.145
SA index$^{ab\text{-}med}$	0.737	0.733	0.724	0.718	0.737	0.737	0.737
Short-term debt ratio$^{ab\text{-}med}$	0.596	0.588	0.567	0.546	0.596	0.596	0.596
Crisis	0.507	0.510	0.490	0.473	0.507	0.507	0.507
$\ln(\text{sales})_{t-1}$	11.984	12.144	12.716	12.731	11.984	11.984	11.984
Legal nature							
individual name	0.212	0.218	0.138	0.141	0.212	0.212	0.212
uniperson quota society	0.037	0.035	0.035	0.037	0.037	0.037	0.037
anonymous society	0.037	0.042	0.073	0.077	0.037	0.037	0.037
singular person	0.011	0.011	0.004	0.004	0.011	0.011	0.011
other	0.025	0.028	0.037	0.033	0.025	0.025	0.025
Ownership							
public	0.001	0.002	0.003	0.003	0.001	0.001	0.001
foreign	0.046	0.050	0.043	0.043	0.046	0.046	0.046
Multi-establishment	0.083	0.092	0.141	0.137	0.083	0.083	0.083
Nb. Obs.	2,235,938	1,837,439	734,174	400,303	2,235,938	2,235,938	2,235,938

The table reports means (proportions) of the dependent variable and of the covariates for the estimation sample with the dependent variable in the first row; e.g. the share of fixed-term employment in total employment (FoT, column 1); fixed-term over permanent employment (FoP, column 2); fixed-term hires in total hires (FoTH, column 3); fixed-term hires in permanent hires (FoPH, column 4). The size of the estimation sample varies with the dependent variable under analysis. Own calculations based on Portugal, MTSS (2002-2012).

Table A.3: Descriptive statistics - worker-level estimation sample means

Variable	Mean
Fixed-term contract	0.648
extfin	0.498
tcred	3.140
tang	0.329
SA index	-7.209
Short-term debt ratio	0.962
extfin$^{ab\text{-}med}$	0.399
tcred$^{ab\text{-}med}$	0.583
tang$^{ab\text{-}med}$	0.159
SA index$^{ab\text{-}med}$	0.581
Short-term debt ratio$^{ab\text{-}med}$	0.461
Crisis	0.516
Female	0.450
Experience	15.920
Educational level	
secondary	0.289
high-school	0.248
university	0.120
Skill level	
medium	0.328
high	0.131
Foreign national	0.093
ln(sales)$_{t-1}$	14.871
Legal nature	
individual name	0.047
uniperson quota society	0.025
anonymous society	0.296
singular person	0.001
other	0.048
Ownership	
public	0.014
foreign	0.139
Multi-establishment	0.426
Nb. Obs.	3,423,322

The statistics are for the worker-level estimation sample, which uses observations only for the year a worker is newly hired in a firm. Own calculations based on Portugal, MTSS (2002-2012).

Table A.4: Precrisis share of permanent workers hired (firm-level)

Dependent variable:	**(Permanent hires/Employment)$_{j,precrisis}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$FinVuln$	0.013***		0.018***		0.094***	
	(0.001)		(0.001)		(0.007)	
$FinVuln^{ab\text{-}med}$		0.006***		0.002**		0.001
		(0.001)		(0.001)		(0.001)
$Constant$	0.095***	0.094***	0.232***	0.095***	0.011	0.096***
	(0.001)	(0.001)	(0.007)	(0.001)	(0.007)	(0.001)
Additional controls	median sales growth, multi-estab., ownership, legal structure, region					
R^2	0.023	0.022	0.024	0.021	0.023	0.021
Nb. Obs.	402,683	402,683	402,683	402,683	402,683	402,683

The dependent variable is the precrisis (2002-2007) average share of permanent hires in total employment for each firm. The financial vulnerability measures are also calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index, where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). The short-term debt ratio is short-term debt/total debt. We then construct the indicator variables for above-median financial vulnerability, which take the value of 1 if the industry is above the median of the respective FinVuln measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table A.5: Effect of the crisis on the share of fixed-term hires (firm-level); industry fixed-effects

Dependent variable:	**Panel A: (Fixed-term hires/Total hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.023***	0.020***	0.025***	0.026***	0.013***	0.009***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
$Crisis \times Salesg^{ab\text{-}med}$		-0.007***		-0.015***		-0.010***
		(0.002)		(0.002)		(0.003)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes
R^2	0.028	0.028	0.028	0.028	0.028	0.028
Nb. Obs.	734,174	734,174	734,174	734,174	734,174	734,174

Dependent variable:	**Panel B: (Fixed-term hires/Permanent hires)$_{jt}$**					
Fin.Vuln. measure:	**EXTFIN**		**SA index**		**ST debt ratio**	
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis \times FinVuln^{ab\text{-}med}$	0.309***	0.241***	0.344**	0.386**	0.299***	0.213**
	(0.094)	(0.071)	(0.172)	(0.187)	(0.113)	(0.085)
$Crisis \times Salesg^{ab\text{-}med}$		-0.252**		-0.355***		-0.241***
		(0.100)		(0.133)		(0.091)
Additional firm controls	ln(sales)$_{t-1}$, multi-establishment, ownership, legal structure					
Year FE	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes
R^2	0.022	0.022	0.022	0.022	0.022	0.022
Nb. Obs.	400,303	400,303	400,303	400,303	400,303	400,303

Crisis takes the value of 1 from 2008 to 2012, and zero otherwise. The financial vulnerability measures are calculated over the precrisis period. EXTFIN measures the dependence on external finance and is the share of total capital expenditure that is not financed by internal cash flows from operations (as in Rajan and Zingales, 1998). SA index is the Hadlock & Pierce (2010) size-age index, where size is the firm's inflation-adjusted book assets (windsorized at 4.1 billion euro) and age is the number of years of existence of the firm (windsorized at 37). Short-term debt ratio is short-term debt/total debt. The sales growth measure is also calculated over the precrisis period (2002-2006) following the same methodology as in RZ and for the other financial vulnerability measures. We first calculate the average for each firm over the period and then take the industry-level median of the firm-level averages. $FinVuln^{ab\text{-}med}$ ($Salesg^{ab\text{-}med}$) takes the value of 1 if the industry is above the median of the corresponding *FinVuln* (Sales growth) measure, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.

Table A.6: Separation rates and hourly wages of fixed-term and permanent workers

	Job separation rates		**Hourly wage**	
year	**Fixed-term**	**Permanent**	**Fixed-term**	**Permanent**
2002	34.74	16.77	4.75	6.01
2003	35.37	16.79	4.73	5.97
2004	35.10	16.80	4.80	6.16
2005	34.85	15.32	4.93	6.23
2006	35.44	14.36	4.88	6.25
2007	35.96	15.10	4.89	6.29
2008	36.37	14.78	5.06	6.40
2009	37.57	17.98	5.29	6.73
2010	36.43	15.47	4.97	6.51
2011	37.52	17.40	4.86	6.44

The table reports average separation rates and hourly wage for fixed-term and permanent workers in each year. Separation rates are not defined for 2012, the last year of our sample. Own calculations based on Portugal, MTSS (2002-2012).

Table A.7: Productivity effect of fixed-term workers (firm-level)

Dependent variable:	**(sales/employment)**$_{jt}$			
	(1)	(2)	(3)	(4)
Fixed-term share	-0.013***		-0.150***	
	(0.004)		(0.006)	
Fixed-term share$^{ab\text{-}med}$		-0.267***		-0.217***
		(0.003)		(0.003)
Additional controls	ln(sales)$_{t-1}$, multi-estab., ownership, legal structure			
Year FE	yes	yes	yes	yes
Industry FE	yes	yes		
Firm FE			yes	yes
R^2	0.322	0.337	0.010	0.023
Nb. Obs.	757,043	757,043	757,043	757,043

The dependent variable is labor productivity (measured by sales per worker). *Fixed-term share* is the share of fixed-term workers by firm-year. The estimation period is precrisis, over 2002-2006. Standard errors, clustered at the firm level, are reported in parentheses. * p<0.10; ** p<0.05; *** p<0.01.