Employment Effects of Alleviating Financing Frictions: Worker-level Evidence from a Loan Guarantee Program[†]

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Abstract

This article investigates whether loan guarantee programs mitigate the effect of financing frictions on employment outcomes. Exploiting worker-level panel data combined with plausibly exogenous heterogeneity in treatment intensity across French regions, we find that such programs have a significant and persistent positive impact on workers' employment and earnings trajectories. The program disproportionately benefits high earnings, male and younger workers, due to differences in retention decisions by the initial employer. We estimate the gross cost to preserve a job(-year) to be around €3,200, and a negative net cost when we include the savings on unemployment benefits.

Keywords: Loan Guarantees, Financial Frictions, Labor Market, Employment Trajectory.

JEL Codes: G28, G33, H81, J23, J31, J65

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1 Introduction

Numerous countries facilitate bank lending to small businesses through loan guarantee programs, in which a government agency underwrites a share of the notional of loans issued by partnering private banks to qualifying borrowers (such as the Small Business Agency (SBA) programs in the U.S.; see Beck et al. (2010) for a summary of these programs around the world). These schemes typically aim at supporting employment, as SMEs represent 70% of employment in OECD countries.[1] As private banks retain skin in the game, loan guarantees are designed to address the mis-targeting and rent-seeking that plague direct public lending (see for instance Khwaja and Mian (2005)). Policy-makers' interest in these programs has further increased in the wake of the financial crisis due to concerns that small businesses might be prevented from accessing sufficient capital for them to be resilient, grow, and create jobs (Chen et al., 2017; Bord et al., 2018).[2] Despite their large and growing importance, we know surprisingly little about the effects of these programs on employment, and more specifically whether such programs represent a cost-effective way of mitigating the employment effects of financial frictions.

While there is some empirical evidence that these programs foster job growth at beneficiary firms, such evidence falls short of assessing their effectiveness at mitigating the employment effects of financial shocks, which calls for measuring the impact of these programs on workers' job-to-job mobility and their transitions between employment and unemployment following a credit crunch. The effectiveness of such policy would be low if the job growth at beneficiary firms happens when the frictions associated with job-to-job transitions are low in the first place. In addition, these programs might exacerbate resource misallocation in the

[1] See https://www.oecd.org/mcm/documents/C-MIN-2017-8-EN.pdf

[2] In the U.S., the main Small Business Administration (SBA) 7(a) loan guarantee programs have significantly expanded with the financial crisis. The American Recovery and Reinvestment Act of 2009 (ARRA), provided the SBA an additional $730 million, in order to temporarily subsidize the loan guaranty programs' fees and increase the program's maximum loan guaranty percentage to 90%. The Small Business Jobs Act of 2010, provided $505 million to extend the fee subsidies and 90% loan guaranty percentage through December 31, 2010; and increased the 7(a) program's gross loan limit from $2 million to $5 million. The stock of SBA 7(a) loans has increased from $46 billion in 2007 to $92 billion in 2018. See CRS (2019) for more details.

economy if, for instance, they foster employment in less productive firms (Gopinath et al., 2017; Cong et al., 2019; Rotemberg, 2019). However, if these programs prevent workers from experiencing costly periods of unemployment, and/or from losing job- or industry-specific skills, the benefit of these programs could be large.

In this paper, we use administrative micro data and estimate the impact of a new loan guarantee program implemented in France during the financial crisis on workers' employment and earnings trajectories. Our data tracks a representative sample of individual workers across jobs over time, as well as their transitions between employment and unemployment. At a macro level, the data allows us to implement a cost-benefit analysis of the program that includes both the ex post cost of guarantees and the savings associated with reduced unemployment insurance, which we can benchmark against the cost of other types of employment policies.[3]

Launched in the midst of the financial crisis, the Recovery Loan Guarantee Program offers a public guarantee for French small and medium-sized enterprises (SMEs) to rollover and extend their short-term debt. This new program, administered by Bpifrance, the French equivalent to the SBA, was announced in the last quarter of the year 2008 and extended until the end of 2010. As regional offices for the program screen applications in a decentralized manner, we observe plausibly exogenous variation in the intensity of the program at the regional level. We exploit this heterogeneity and interact it with a regional border discontinuity approach in order to estimate the causal impact of the program on workers at firms benefiting from a loan guarantee. The identifying assumption is that workers in firms located on each side of a regional border would have experienced similar labor market outcomes in the absence of the loan guarantee program.

We first provide strong evidence that the regional intensity of the loan guarantee program translates into a higher take-up of loan guarantees at the firm level within the regional

[3]It is beyond the scope of this analysis to attempt to quantify the net effect of these programs on social welfare. To undertake a welfare analysis, one would need for instance to weigh the effects of these programs during downturns against the inefficiencies that government credit policies might cause the rest of the time.

border area. Consistent with regional differences in loan screening intensity driving this variation in treatment, we observe that beneficiary firms include more high-credit-risk firms in high-treatment-intensity regions. We exploit balance-sheet data and find that firms in more exposed regions increase their quantity of bank debt relative to the counterfactual. Using comprehensive bankruptcy data, we also find that these firms are less likely to be liquidated during the 2009-2015 period. Both these facts are consistent with a relaxation of SME's financial constraints, the intended effect of the program. We then leverage our longitudinal worker-level data to evaluate how this program affects the employment and earnings trajectories of workers until 2015. The granularity of our data allows us to decompose worker employment spells by firm, industry, and place of work, and to examine variation in the impact of the policy according to firm and worker characteristics.

We find that the program has a significant and positive impact on workers' employment and earnings trajectories. Quantitatively, when extrapolating our estimates to the average treatment at the firm level, we obtain that individual workers initially employed by a treated firm receive earnings that are 25% higher on average over the 2009-2015 period, compared to a counterfactual set of workers initially employed by non-treated SMEs. This finding mostly reflects an employment margin: workers exposed to the program are significantly less likely to separate from their initial employer, and to be unemployed over the sample period. Half of the reduction in separations can be traced down to the reduction in liquidations resulting from the program. In turn, the amount of unemployment benefits received by workers more exposed to the program are significantly lower: they represent one third of the earnings difference between the two groups. This estimate highlights the large indirect cost-saving dimension of the guarantee program in terms of unemployment insurance.

We conduct several empirical checks to support our assumption that regional exposure to the loan guarantee program on each side of the border is uncorrelated with worker and firm characteristics, as well as other factors potentially affecting local economic outcomes. First, we find no correlation between our treatment and the level or change in workers' earnings,

firm performance or aggregate economic activity prior to the year 2009. Second, the estimates are only weakly affected when we control for firm-level observable characteristics, such as firm size and firm age, industry-fixed effects, and worker-level observable characteristics, such as age, occupation, and gender. Third, the estimates are robust to the inclusion of a set of comprehensive controls mitigating concerns over possible confounding factors: local government debt, taxes, and investment at the regional level, lending activity by local banks, national public programs targeting employment such as subsidies for short-term work, regional subsidies from the European Union, other programs implemented by Bpifrance, as well as political preferences at the regional level.

By matching our worker-level data with firms' financial statements, we can also evaluate how the program differentially affects workers depending on firms' ex-ante financial constraints. Consistent with the idea that the program allows financially-constrained firms to access bank debt and avoid layoffs resulting from financial distress, we find a strong effect on workers' employment and earnings of financially-constrained firms, but virtually no effect for workers employed by unconstrained firms. Unconstrained firms' take-up does not seem to respond to regional differences in the intervention intensity, as should be expected from the non-zero cost of the guarantee.

Next, we decompose the effect between firm retention policy and labor market frictions outside of the initial firm. We confirm that workers more exposed to the guarantee program are more likely to stay at their initial firm, consistent with our result on separations. For workers more likely to be laid off in the counterfactual, moving to another firm in the same industry appears to be the main margin of adjustment, which suggests the existence of industry-specific skills. We also find that workers adjust by moving to other firms outside their original commuting zone. Hence, the large effect on cumulative employment and earnings at the initial firm is partially undone through job mobility. However, workers only succeed in offsetting around half of the employment and earnings differences observed at the initial employer.

We then turn to the cross-section of workers and estimate heterogeneous treatment effects separately for high versus low earnings workers, young versus old workers, and female versus male employees. We observe that high earnings, young, and male workers benefit more from the intervention, as the effects on both cumulative earnings and employment are more pronounced for these sub-groups. When decomposing along the adjustment margins, this heterogeneity appears to result mostly from the retention decision of the firm initially employing the worker, rather than from differences among these groups in labor market frictions outside of the firm benefiting from the loan guarantee.

Finally, we investigate the costs associated with the program. We first document that while regions with higher treatment intensity extend loan guarantees to marginally riskier borrowers, ex-post default rates on the guaranteed loans are not significantly larger in these regions. We also investigate whether an expansion of the program might tilt it towards less productive firms, or might reduce the reallocation of workers from treated firms towards more productive jobs. We find no evidence that more generous regions disproportionally target less productive firms, or that workers from the counterfactual appear to move towards more productive or larger firms than their initial firm, or start being employed by new firms. These results mitigate concerns over potential misallocation effects of such programs.

We conclude our study by providing an aggregate cost-benefit analysis of the loan guarantee program. We estimate that the program had a positive impact on French aggregate employment on the order of around 210,000 jobs(-year), while the ex-ante cost was the provision of a 683 million euro fund. The ex post cost of the guarantee program can be estimated as the difference between the guarantee payments made by Bpifrance for defaulting loans minus the premiums paid to Bpifrance at origination for all guaranteed loans, which equals €207 million. This corresponds to a gross cost to preserve a job(-year) of either €3,200 or €950 (when compared to respectively the ex-ante or ex-post cost). We also estimate savings for the unemployment national fund to be around €1.3 billion, as the loan guarantee program reduced workers' unemployment spells. This translates into a negative net cost for

the policy when savings on unemployment benefits are included.

Our work builds on a large body of empirical studies estimating the employment effects of credit-supply shocks. Chodorow-Reich (2014) shows that firms with pre-crisis lending relationships with weaker banks face restrictions in credit supply and reductions in employment following the collapse of Lehman Brothers in 2008. Duygan-Bump et al. (2015), Greenstone et al. (2015) and Bentolila et al. (2018) find that shocks to the supply of bank credit to (small) businesses during the Great Recession are associated with reductions in employment. Recent studies (Berton et al., 2018; Fonseca and Van Doornik, 2019; Barbosa et al., 2019; Caggese et al., 2019; Baghai et al., 2019; Babina, 2019; Acabbi et al., 2020) use longitudinal linked-employer-employee data that allows to estimate the heterogeneous effect of financial shocks on the cross-section of individual workers. Our findings support loan guarantee programs as being effective at mitigating these employment effects, and speaks to the heterogeneity in effectiveness at both the firm and worker level.

Our research also contributes to the literature on government programs and small business lending (Zia, 2008; Banerjee and Duflo, 2014; Bach, 2014; Ru, 2018; Jiménez et al., 2018), and loan guarantees in particular (de Andrade and Lucas, 2009; Beck et al., 2010; Lelarge et al., 2010; Mullins and Toro, 2016; Brown and Earle, 2017; D'Acunto et al., 2017; de Blasio et al., 2018; Bachas et al., 2019; Gonzalez-Uribe and Wang, 2019), by shifting the focus from firm-level to worker-level outcomes. By estimating the difference in long-run outcomes between workers from exogenously treated firms to a relevant control group, our analysis identifies the causal effect of the loan guarantee program on the trajectories of individual workers' earnings and employment, and allows to measure the overall impact on employment from such programs. Relatedly, we add to the empirical debate on the effectiveness of public policies aiming to protect or stimulate employment in downturns, such as hiring credits (Cahuc et al., 2019; Neumark and Grijalva, 2017), and subsidies for short-term work (Cahuc et al., 2018; Giupponi and Landais, 2018). We show that loan guarantees have a positive impact on workers' employment and earnings, in particular for financially-constrained firms,

at a relatively low cost.

Last, our article relates to a large literature on the long-run consequences of job loss or job market entry timing for individual workers' outcomes. Starting with the seminal study of Jacobson et al. (1993), it also includes Couch and Placzek (2010); Autor et al. (2014); Lachowska et al. (2017); Yagan (2018). The existing body of work has also shown that earnings losses after job displacement have an important cyclical component, that is long-term earnings losses due to job loss occurring in recessions are significantly larger than when it occurs in booms (Davis and Wachter, 2011; Schmieder et al., 2018). In the same vein, workers graduating in a recession earn persistently less than those graduating nearby peaks (Kahn, 2010; Oreopoulos et al., 2012). Our study expands this stream of research by fleshing out the long-term effects on worker outcomes of alleviating firms' financial frictions.

Our study proceeds as follows: In section 2, we provide institutional details on loan guarantee programs and specifically on the French one that underlies our study. In section 3, we describe the data we use and detail the identification strategy we implement to establish the causal effect of loan guarantee programs on employment. Section 4 provides our baseline results at the micro level while section 5 decomposes the effects into firm retention decisions and labor market frictions and examines heterogeneity in the consequences of the program by individual characteristics. Section 6 assesses direct and indirect costs of the program and develops a cost-benefit analysis at the macro level. Section 7 concludes.

2 Institutional Background

2.1 Public Loan Guarantee Programs

Numerous governments, including the US, provide loan guarantees to small firms. These programs are usually implemented through a specialized entity, such as the Small Business Administration (SBA) in the US or Bpifrance in France, which partners with banks. In 2017, the amount of new loans guaranteed by the SBA and Bpifrance was respectively USD

25 billion in the US, and USD 4.5 billion in France.

The economic rationale for such programs is typically threefold: mitigating financing frictions specific to small businesses, fostering economic activity that creates positive externalities, and alleviating firm behavior that can create negative externalities. Access to credit for small firms might be limited by adverse selection (Stiglitz and Weiss, 1981), moral hazard (Holmstrom and Tirole, 1997), and transaction costs. Positive externalities from small firms typically include innovation and offering job opportunities in peripheral areas. On the contrary, layoffs might generate negative externalities when frictions on the labor market prevent the efficient reallocation of the workforce.

Loan guarantees by a government-backed entity have several advantages over direct public lending. First, this public intervention design typically delegates screening and monitoring to private banks. Relying on banks' expertise and infrastructure mitigates the risk that political considerations drive the allocation of credit. Second, as the guarantees are partial, banks retain skin-in-the-game when screening loans. Last, guarantees do not require the guarantor institution to disburse cash and raise capital at the time of their implementation, although they do create regulatory capital requirements.

One potential risk of credit guarantee schemes is that they might attract excessively risky borrowers and worsen the pool of firms accessing external financing through adverse selection. They might also deteriorate banks incentives to properly monitor borrowers in the presence of moral hazard. Both these issues need to be considered when assessing the efficiency of such programs.

2.2 The French Public Guarantor: Bpifrance

Bpifrance is the entity managing public loan guarantee programs in France. Bpifrance (previously named Sofaris, and then Oseo-Garantie) was created in 1982 as a French equivalent of the SBA. Bpifrance is a government-backed entity, whose two shareholders are the French State and the *Caisse des Depots et Consignations* - the long term investing arm of the French

government - and aims at financing companies from seed phase to maturity. Bpifrance activities are therefore mostly targeted towards SMEs and encompass, in addition to loan guarantees, direct lending, providing grants, and investing in equity (VC and Private Equity).[4] Bpifrance does not collect deposits, but funds itself in the wholesale market.

Bpifrance works with a network of partner banks that include all major French banks, and relies on them to source loan applications. As of 2017, Bpifrance possesses 48 local branches that process the loan guarantee applications provided by the banks.

For the purpose of our empirical analysis, we focus on a new loan guarantee program created at the end of the year 2008, which specifically aimed at allowing firms to access short and medium term debt during the credit crunch.

2.3 The Recovery Plan

The French recovery plan of 2009-2010 led to the creation of a large short-term credit guarantee program managed by Bpifrance (under the Oseo-Garantie name at that time). As illustrated in Figure 1, the plan guaranteed €5.3bn of new bank debt between 2008Q4 and 2010Q4, which represents 0.2% of GDP. The plan targeted new lines of credit with a term between 12 and 18 months, as well as the restructuring of existing short-term debt into new loans with maturity between 2 and 7 years. 4,000 firms received guarantees on their new lines of credit for an amount of €1.8 bn, and 17,000 firms received guarantees on their medium-term new loans for an amount of €3.5 bn. A guarantee extended by Bpifrance covers between 50 and 90% of a loan notional. Bpifrance charges an average insurance premium of around 1% per annum of the loan notional in exchange for such a guarantee. This cost to the issuer needs to be compared to the ex post default rate: 26% of recipients had at least one euro of default as of end 2015, which illustrates that the guarantee was subsidized on average.

[INSERT FIGURE 1]

[4] Bpifrance also has an activity of funds of funds to support the VC industry.

3 Empirical Strategy

3.1 Data

We use four complementary sources of data, which we obtain from Bpifrance and the French Statistical Office (INSEE): an exhaustive file of individual loan guarantees, the exhaustive firm registry, a matched worker-firm panel covering 1/12th of the French workforce, and the exhaustive list of firm bankruptcies.

3.1.1 Loan guarantees

We use proprietary data provided by Bpifrance on the whole universe of firms benefiting from loan guarantee programs since 2002.[5] This data provides a unique firm identifier (SIREN), and information on the guarantee characteristics, including the date and amount of the loan, whether the guarantee was part of the recovery plan, the type of loan underlying the guarantee, and the fraction of the loan covered by the guarantee. Bpifrance data do not include information on interest rates, but includes information on default: whether the loan benefiting from the guarantee defaults over its life, and the loss amount. The dataset does not include unsuccessful application data, as Bpifrance did not collect such data.

3.1.2 Firm-level tax filings

We use administrative microdata extracted from tax files available until 2015. The data includes the balance sheets and profit and loss statements for the universe of French firms. The data is not publicly available, but is available for academic research through a procedure similar to accessing Census data in the US. We track firms through time using their unique identifying number ascribed by the French Statistical Office (INSEE). We retrieve industry classification using a historical four-digit industry classification code ascribed to each firm by the French Statistical Office itself, which is similar to the SIC coding system in the US. This

[5]The data sharing agreement does not grant Bpifrance any form of control over the findings of this study or their publication.

data exhibits a discontinuity in the number of firm-level variables available for researchers from 2010, which means that we observe the breakdown of firm debt between bank debt and other debt only until 2009.

3.1.3 Worker-level data

We rely on matched worker-firm longitudinal data ("DADS Panel"), built by the French Statistical Office (INSEE) from social security contribution declarations of firms. The sample covers all individuals born in October of each year, i.e. 1/12th of the French workforce. Each year firms declare the employment spells, the number of hours worked, and the associated wages for each worker. For workers who have multiple jobs in a given year, we aggregate earnings across all jobs and retain the identifier of the employer that accounted for the largest share of the worker's earnings. Data on unemployment benefits are available since 2008.

3.1.4 Bankruptcy data

Last, we extract the whole universe of bankruptcies in France for the period 2009 to 2015 from the official publication of legal announcements, the *Bulletin officiel des annonces civiles et commerciales* ("BODACC Data"). This data allows us to identify which firms enter into bankruptcy or liquidation, when they do so, and when this proceeding is closed and why. We merge it to the rest of our data using the unique firm identifier previously mentioned.

3.2 Data Filtering

We apply the following filters to the data at the firm and individual level. At the firm level, we first restrict the sample to SMEs (defined as firms with less than 250 employees), and exclude firms from the financial and real estate sectors, as well as utilities, non-profit, and regulated sectors. SMEs represent virtually all the beneficiaries from the recovery plan. Second, for the purpose of our identification strategy, we restrict the firm sample to firms with all their employees in the same region and located within a 10 miles distance to a

regional border, which leaves 28,587 firms in the sample.

At the worker level, we restrict the sample to workers with high labor force attachment (as e.g. in Autor et al. (2014); Yagan (2018)), in our case workers with earnings above €10,000 in 2006, 2007 and 2008. To avoid measurement errors due to entry and exit from the workforce, we focus on workers that were at least 24 years old in 2008 and at most 58 years old in 2015, that is workers who were born between 1957 and 1984. We also restrict our analysis to French citizens in order to alleviate concerns over unobserved employment in foreign countries. This filtering leaves 38,034 workers in the sample, which are by construction representative of 12 times more workers, or 456,288.

3.3 Descriptive Statistics

Table 1 presents descriptive statistics for the data obtained after filtering.

Panel A provides information on the exposure to the loan guarantee program, both at the regional and firm level. $Guarantee_{region,2009-2010}$ corresponds to the average ratio of loan guarantees under the recovery plan to firm assets, computed across all eligible firms in a given region, excluding firms within 10 miles of a regional border. The generosity of the program appears to vary significantly across regions, with firms from the least generous region receiving on average 0.1% of their total assets in guarantee, while firms from the most generous region receive 7.5 times more.

Turning to the treatment at the firm level, we observe that 4% of the firms in our sample receive a loan guarantee. The average treatment conditional on being treated is 8% of assets (see Table A.1 in the online appendix).

The average worker has worked for 6.5 years during the 2009-2015 period, received earnings equal to 6.5 times their initial annual earnings (average annual earnings over the 2006-2008 period), and received 0.2 times their initial annual earnings in unemployment benefits. The average worker is 38 years old, works 1,868 hours, and earns €23,630 per year.[6]

[6]Earnings include all wages earned during the year net of social contributions and exclude unemployment

We also present a number of firm characteristics measured in 2008. The average firm in our sample has 20 employees in 2008, is 18 years old, has assets of €3.3 million, and return over assets of 10%. The likelihood of the firm being liquidated during the 2009-2015 period is 4.5%. Table A.1 presents the same characteristics separately for firms receiving and not receiving a loan guarantee.

[INSERT TABLE 1]

By construction, our main sample includes only SMEs and associated workers located within a 10 miles distance to a regional border. One possible concern is that this sample is not representative of the whole universe of SMEs. In order to shed light on this potential issue, we first compare firm and worker characteristics in our sample of SMEs within a 10 miles distance to a regional border with the universe of French SMEs in Table A.2. Overall, the characteristics of the two groups are closely comparable. Still, we note that firms in the border sample are slightly more likely to receive a loan guarantee from the program, and are slightly older. Workers' annual earnings are also lower in the sample of SMEs within a 10 miles distance (on average 23,630 euros against 25,613 euros for the rest of French SMEs), most likely because high-paid jobs are over-represented in large metropolitan areas, that are rarely located close to regional borders. In Table A.3, we present the distribution of SMEs across a list of 18 industries for both groups. Overall, these distributions are similar, with some exceptions like Manufacturing which is overweighted in our sample, and Professional, Scientific and Technical Activities, which is instead underweighted in our sample. Taken together, these statistics suggest that our sample of firms located within a 10 miles distance to a regional border is reasonably representative of the universe of French SMEs. We therefore expect the results presented below to be informative for the overall impact of the program.

benefits. Variables are expressed in 2015 Euros.

3.4 Empirical Design

3.4.1 Setting

Studying the effects of a loan guarantee program requires to overcome an empirical challenge: receiving a loan guarantee is most likely correlated with firm characteristics, either observables or unobservables. A naive OLS regression of worker outcomes on firm-level guarantee treatment is therefore prone to endogeneity, for instance due to the selection of treated firms on distress.

For the purpose of causal identification, we exploit plausibly exogenous variation of loan guarantee volumes at the regional level, interacted with a geographical regression discontinuity design that absorbs the effect of local economic conditions. Specifically, we predict firms' exposure to the loan guarantee program on a given side of a regional border with the average treatment intensity of firms from the same region outside of the border band.

We obtain the longitude and latitude coordinates of the centroid of each municipality, and calculate the minimum distance from the population centroid of the municipality to the regional border. The grey area in Figure 2 represents the territory of the municipalities whose centroid lies within 10 miles of a regional border. These municipalities form a land strip on both sides of the border of fairly uniform width. Our baseline sample includes all workers working at establishments located in one of these border municipalities.

Figure 2 also displays the treatment intensity at the regional level – that is, the average ratio of loan guarantees under the recovery plan scaled by assets in 2008, computed across all eligible firms in each region, except firms within 10 miles of a regional border. Our empirical strategy exploits this regional variation in treatment intensity as source of identification.

[INSERT FIGURE 2]

The geographic variation in treatment intensity likely results from differences in the level of application screening intensity for regional offices. Each regional branch of Bpifrance indeed has autonomy over the processing of the applications it receives. Bpifrance's annual

reports mention that 90% of applications are screened at the regional branch level, without any intervention of the central headquarter. Data limitations previously mentioned prevent both the econometrician and Bpifrance from observing applications' acceptance rates at the regional Bpifrance branch level. The absence of data collection on unsuccessful applications suggests no formal process within Bpifrance to ensure a uniform level of screening across regions.

In Figure 3, we plot the likelihood of receiving a loan guarantee from Bpifrance by decile of ex ante credit risk, measured by the inverse of the interest coverage ratio as of 2008. Panel A plots this quantity at an aggregate level, and confirms that the program is tilted towards high-credit risk firms, except for the riskiest ones. Panel B breaks down this probability for regions with high vs. low treatment intensity. High-credit-risk firms are significantly more likely to get a loan guarantee in high-treatment-intensity regions than in low-treatment-intensity regions, whereas this gap is insignificant for low-credit-risk firms. This fact is consistent with heterogenous screening intensity of applications across regions.[7]

[INSERT FIGURE 3]

3.4.2 Specifications

Our empirical strategy is akin to a difference-in-difference estimation where areas are differentially exposed to the short-term loan guarantee program. The exclusion restriction relies on the regional loan guarantee exposure only affecting workers' outcomes through the subsidized access to new lines of credit and bank loans offered by the program to their employers in 2009 and 2010. In particular, regional exposure to the program needs to be orthogonal to other local shocks that would otherwise affect workers' outcomes. This motivates our regional discontinuity approach which largely mitigates the possibility that unobserved local economic shocks might confound our findings.

[7] This difference in credit risk composition among beneficiary firms across low and high treatment intensity regions does not challenge the validity of our identification strategy. However, it matters for the interpretation of the results: our empirical setting estimates the joint impact of the shift in guarantee supply and the associated risk composition of beneficiary firms.

Our first stage boils down to the following cross-sectional regression on the set of firms located within 10 miles of a regional border:

$$Guarantee_{firm,2009-2010} = \beta.Guarantee_{region,2009-2010} + \delta_1.X_f + \delta_2.X_r + \gamma_s + \epsilon_f, \qquad (3.1)$$

where $Guarantee_{firm,2009-2010}$ is the ratio of the amount of loan guarantee received by firm f from Bpifrance through the recovery plan over the firm total assets in 2008, $Guarantee_{region,2009-2010}$ is the average of the same ratio across all eligible firms in region r (excluding firms located within 10 miles of the regional border), X_f is a vector of firm characteristics including the logarithm of firms' total assets in 2008, the logarithm of firm age in 2008, as well as industry fixed effects (for 56 2-digit industries). X_r is a vector of regional characteristics including the regional 2008-10 per-capita change in public debt, state contributions, local public investment, and taxes. γ_s are department-pair fixed effects (a finer geographic division than regions) to absorb local shocks. Our identification therefore comes from within (short) sections of the border band we study. We cluster the error term, ϵ_f, at the treatment level: regions.

We then estimate a similar cross-sectional specification as (3.1) with employment and earnings outcomes at the worker level as dependent variables:

$$y_{w,2009-2015} = \beta.Guarantee_{r,2009-2010} + \delta_1.X_f + \delta_2.X_r + \delta_3.X_w + \gamma_s + \epsilon_w, \qquad (3.2)$$

where y denotes an employment or related outcome over our sample period 2009-2015 for worker w employed as of 2008 in a firm located within 10 miles of a regional border. Following Autor et al. (2014) and Yagan (2018), one of our main variables of interest – cumulative earnings – are normalized by workers' initial earnings, that is, over the period 2006-2008. β, our coefficient of interest, measures the causal effect of initial regional exposure to the loan guarantee program on workers' outcomes. We also include X_w, a vector of worker characteristics including worker age, gender, and occupation fixed effects all measured in

2008.

The main identifying assumption is that firms, and their workers, would have experienced similar labor market outcomes in the absence of treatment. We first note that if labor markets are frictionless and workers can easily move to another region and obtain identical compensation in alternative firms, we should see no earnings or employment impact at the worker level from differences in their regional exposure to the French loan guarantee program in the period 2009-2010.

We then check that worker and firm characteristics are not correlated with the treatment variable. For this, we run the same cross-sectional specification as (3.1) with workers' and firms' outcomes as dependent variables, all measured in 2008. We present the results in the appendix in Table A.4. The differences across low and high exposure regions in workers' earnings, hours worked, unemployment benefits (Panel A), as well as firm age, firm size, and firm return on assets (Panel B), all measured in 2008, are all small and statistically insignificant. We also test for the presence of pre-trends in economic activity correlated with our treatment variable. We measure economic activity as the sum of the value-added of firms located in the border area of each region, scaled by the corresponding population. In Table A.5, we observe no correlation between the log change in economic activity and treatment intensity at the regional level. This test further illustrates that our empirical setting is immune to potential heterogeneity in regional economic activity.

3.5 First-Stage Evidence

3.5.1 Predicting firm-level intervention using regional volume of guarantees

We start by establishing the internal validity of our empirical setting. Table 2 displays the regression coefficients of the first stage as described in equation (3.1), at the firm level. In columns 1 to 3, the coefficients on $Guarantee_{region,2009-2010}$ are significant and positive, which confirms that higher treatment intensity at the regional level (excluding border areas) translates into higher treatment intensity at firms located close to regional borders. We

progressively introduce regional, and firm level controls, which leaves the coefficient of interest mostly unchanged. The coefficient of interest is around 0.7, which suggests that the intensity of intervention is comparable in the border area to the rest of the region, with a slight attenuation. Columns 4 to 6, where the dependent variable is an indicator variable for receiving a guarantee, illustrate that the regional intensity is associated with a significantly higher likelihood of receiving a guarantee.

[INSERT TABLE 2]

3.5.2 Intended effects of the loan guarantee program

To further strengthen the validity of our first stage, we study whether regional variation in the intervention is associated with the intended effects of the program: a better access to bank debt, and a lower probability of ending up liquidated. We indeed find that a higher regional exposure to the loan guarantee program is associated with higher growth in bank debt on firms' balance sheets relative to firms from the counterfactual, and a lower probability of being liquidated over the 2009-2015 period.

We first run a specification similar to our first stage where the dependent variable is the firm-level growth rate of bank debt over 2008-2009, and the explanatory variable is the regional total amount of guarantee over total firm assets in 2009 only. Due to data limitations, we can only observe the debt composition of firms until the end of 2009, and therefore can only measure the effect on bank debt in the first year of the program. Columns 1 to 3 of Table 3 display the regression coefficients. Higher exposure to the loan guarantee program is indeed associated with a significantly higher growth in bank debt, which is consistent with a relaxation of the financial constraint for the treated group. This result is robust to using total debt growth rate over 2008-2010 as a dependent variable and $Guarantee_{region,2009-2010}$ as the explanatory variable, which covers the whole treatment period, but does not zoom in on the part of debt directly affected by the program.

Second, we run a similar specification where the dependent variable is an indicator vari-

able for the firm being liquidated in the period 2009 to 2015. Columns 4 to 6 of Table 3 display the regression coefficients. Treated firms are significantly less likely to be liquidated over the 2009-2015 period.

[INSERT TABLE 3]

4 Impact of Loan Guarantees on Employment and Earnings

We now turn to the analysis the impact of exposure to the loan guarantee program on workers' employment and earnings.

4.1 Baseline

We run our baseline specification (3.2) to study the causal impact of this program on worker employment trajectories. Coefficients are displayed in Table 4. Panel A studies cumulative effects over the period 2009-2015, whereas panel B explores the 2015 snapshot. All specifications include department-pair fixed effects. We progressively add regional controls in columns 2 and 6, firm-level controls in columns 3 and 7, and worker-level controls in columns 4 and 8.

We find a positive and statistically significant relationship between workers' exposure to the loan guarantee program in 2009-2010, and both their average cumulative employment (in columns 1 to 4) and earnings (in columns 5 to 8) over the period 2009-2015. The effects are economically sizable. Relative to the pre-crisis period, workers in a region with the average treatment experience a total gain in cumulative earnings of at least 6 percentage points of their initial annual earnings over the 2009-2015 period, e.g. around 1% per year, when compared to a hypothetical region with no exposure to the program.[8] The coefficient of

[8]The average regional treatment is equal to 0.28% of total firm assets, which we multiply by the most conservative point estimate of our regression, 22%.

interest remains stable across specifications. When extrapolating this point estimate to the average treatment at the firm level *conditional* on obtaining a loan guarantee (8% of assets, see Table A.2. in online appendix), we find that exposure to the average treatment intensity is associated with additional cumulative earnings of 1.7 times workers' initial annual income. This corresponds to 25% higher earnings per year over the 2009-2015 period for workers at a firm exposed to the average treatment intensity.

In addition to being large, the effects of the loan guarantee program are also persistent. In the 2015 snapshot displayed in Panel B, i.e. 7 years after the beginning of the program, the likelihood of being employed is still significantly higher for workers initially employed in firms more exposed to the loan guarantee program. The persistence of this effect speaks to the long-run effects that financial shocks have on workers' outcomes, and to the effectiveness of the loan guarantee program at mitigating them.

[INSERT TABLE 4]

In Table 5, we run a similar specification using an indicator variable for workers no longer being employed as of 2015 at the firm that they were working at in 2008. The likelihood of separation appears to be significantly lower for workers initially employed in firms more exposed to the loan guarantee program. Comparing the coefficient in column 4 of Table 5 with column 4 in Panel B of Table 4 indicates that around 40% of the workers separated from their initial employer are still unemployed as of 2015, meaning that the other 40% has found a new job. We study this reallocation mechanism in more detail in Section 5. Another informative comparison of this point estimate is with the ones from columns 4 to 6 of Table 3, which suggests that around half of the reduction in workers' separation rates are coming from the reduction in liquidations resulting from the program.

[INSERT TABLE 5]

4.2 Effect on Welfare Benefits

Earning losses due to involuntary unemployment are typically partly mitigated by unemployment insurance. In France, unemployment benefits cover a fraction of the initial wage, are subject to eligibility criteria, and are earned for up to two years. In our dataset, we can isolate earnings coming from unemployment benefits, which allows us to both estimate the fraction of earning losses in the counterfactual offset by unemployment insurance, and estimate the savings in unemployment benefits for the government that result from offering loan guarantees. We measure the effect of the intervention on worker unemployment benefits by using the number of years the worker receive such benefits, and the cumulated amount of unemployment benefits (scaled by initial earnings), during 2009-2015 as the dependent variables in our baseline specification. Results are displayed in Table 6.

We find that workers from treated firms obtain unemployment insurance for a significantly shorter period of time, and collect significantly lower cumulated amounts of unemployment benefits over the period. In economic terms, this point estimate indicates that unemployment insurance offsets one third of the gap in earnings between the treated group and the counterfactual. The same extrapolation exercise as in the previous subsection yields a cumulative reduction in unemployment benefits representing around 50% of the initial annual income, or 7% per annum, over the 2009-2015 period for workers employed in a treated firm in 2008. This finding is consistent with the large effect on employment we document, and is of first order importance for the net cost of the intervention estimated in Section 6.

[INSERT TABLE 6]

4.3 Dynamics

We study the year-to-year impact of the loan guarantee program on worker outcomes. We first plot the estimated effect of exposure to the loan guarantee program for each year from 2004 to 2015 on annual worker earnings in Figure 4, and on the probability of being separated

from the initial employer in Figure 5.

[INSERT FIGURE 4 AND FIGURE 5]

We then present the same point estimates in Table 7, which displays the yearly effect of loan guarantees on worker earnings (Panel A), the associated cumulative effect over time for both earnings (Panel B) and the probability of separation (Panel C). As evidenced in Panel A, exposure to the loan guarantee program is associated with a large and statistically significant effect on annual earnings in the first years following the introduction of the program. The impact on annual earnings is still positive in the second part of our sample period, but smaller and statistically insignificant. Reassuringly, the coefficients for the year 2004 to 2009 are all insignificant, which supports the absence of pre-trends and our interpretation of a causal impact of the guarantees on workers' earnings trajectories. As annual earnings are higher post treatment for the treated group, the cumulative effect on earnings keeps growing over that period, as evidenced in Panel B. Overall, the effects of the policy on earnings are immediate and most pronounced in the years immediately following the treatment. The effects on separations exhibit a similar pattern with a partial reversion after a few years, which is consistent with workers from the treated group changing jobs once the labor market has improved.

[INSERT TABLE 7]

4.4 Firm Heterogeneity

We then split our sample along proxies for firm financial constraints. We run our baseline specification on each of these sub-samples and present the regression results in Table 8. In Panel A we use the number of years employed as the dependent variable, while using cumulative earnings in Panel B. To robustly capture the degree of financial constraints a SME faces, we consider three proxies for financial constraints (measured in 2008) widely used in the literature: having low cash flows in column 1 (versus high cash flows in column

2), not paying dividends in column 4 (versus paying dividends in column 5), and having a low share of tangible assets (that can be used as collateral) in column 7 (versus a high share of tangible assets in column 8).[9] Columns 3, 6 and 9 test for the statistical significance of the difference in the coefficients on $Guarantee_{region,2009-2010}$ between the sub-samples.

[INSERT TABLE 8]

Consistent with the notion that the loan guarantee program mitigates SMEs financial frictions, the effects on workers employment and earnings we document are more pronounced for firms with low cash flows, low-collateral firms, and firms not paying dividends, all measured in 2008.[10] The difference between the coefficients is economically large, and statistically significant for both workers' employment and earnings, between firms with low versus high cash flows.

Similarly, we split the sample of firms with respect to their credit risk measured in 2008 and repeat the same exercise in Table 9. Reassuringly, we find virtually no effect of higher treatment intensity on workers initially employed in low-credit risk firms. This is in line with the evidence in Figure 3 that the share of low credit risk firms receiving a loan guarantee from Bpifrance is unaffected by the intensity of the program at the regional level.

[INSERT TABLE 9]

4.5 Robustness

We also conduct a set of robustness tests that we report in Tables A.6 and A.7 in the online appendix.

First, we ensure that our results are robust to our definition of regional border areas. We use a cutoff of 5 miles instead of 10 miles from the regional border to define a border

[9] See Fazzari et al. (1988) for an early use of these proxies and Almeida et al. (2004), and Chaney et al. (2012) for recent examples.

[10] By running the first stage along the same dimensions of firm heterogeneity, we observe that the more pronounced effect for financially constrained firms is driven by their higher take-up of the program. Results are displayed in table A.8 in the online appendix.

area, and find consistent results, even though the sample size substantially drops. Second, we check that our results are not picking up different economic trends between Paris and its surrounding area, and the rest of France. To do so, we exclude the $Ile-de-France$ region that includes Paris and its suburbs, from our analysis. Again, our coefficients are virtually unchanged. Third, one may be concerned that the program distorts competition in product markets in favor of firms located in regions more exposed to the guarantee program. Under this hypothesis, our coefficients would also reflect business-stealing effects between more and less exposed firms on each side of the regional borders. We address this concern by removing non-tradable industries from our sample (e.g. restaurants), where demand local spillovers could bias (upward) our estimates. Reassuringly, our baseline results are quantitatively comparable when we restrict the sample to tradable industries only.

In additional to regional government spending policies that we control for in our baseline specifications, variations in regional treatment intensity during the crisis period might coincide with other policy shocks that could bias our estimates. We thus test in table A.7 whether our baseline results are robust to controlling for potential confounding factors such as regional subsidies from the European Union, a concomitant program targeting short term work, variation in regional bank lending activity, other programs from Bpifrance, and regional left-party vote share, to control for potential unobserved public actions driven by political preferences. We find that introducing these controls has no effect on the statistical significance, nor the economic magnitude of our point estimates.

5 Tracing Down Labor Market Frictions

Having established the causal effect of the loan guarantee program on worker employment and earnings, we next decompose these effects to assess the respective role of firms' labor retention policy, and labor market frictions outside the firm.

5.1 Adjustment Margins

We follow Autor et al. (2014) to disentangle firm retention decisions from labor market frictions by pinning down the adjustment margins of employment in Table 10. We decompose the overall effect on years employed and cumulated earnings displayed in column 1, which corresponds to the results from Table 4, into the share coming from the firm in which the worker is initially employed as of 2008 in column 2, and the share coming from other firms in column 3. We further flesh out the adjustment coming from employment in other firms by industry in columns 4 and 5, and by commuting zone in columns 6 and 7.

The point estimate of column 2 indicates the differences in employment and earnings obtained by workers at their initial employer. The baseline coefficients of Table 4, reproduced in column 1, are lower than these effects at the initial firm, and reflect the fact that the relative employment and earning gains at the initial firm for treated workers are partially offset with counterfactual workers' mobility to other firms. Indeed, as shown in column 3, workers less exposed to the loan guarantee program are more likely to work and receive earnings from other employers over the sample period. As shown in columns 4 and 5, the adjustment occurs through workers' employment within the same industry, which suggests the existence of industry-specific skills among workers. This friction likely prevents counterfactual workers from fully recouping the differences in earnings with the treated group.

We also find evidence for geographic reallocation: workers appear to adjust by moving to other firms outside their original commuting zone. In summary, the large effect on cumulative employment and earnings at the initial firm is partially undone through the mobility of workers to firms in the same industry, or to other firms outside their original commuting zone. However, workers only partially succeed in offsetting the employment and earnings differences observed at the initial employer (around half of the initial differences), which explains why the loan guarantee program has a net positive impact on workers' employment and earnings trajectories.

[INSERT TABLE 10]

5.2 Worker-level Heterogeneity

Next, we explore the heterogeneity in the main effect and in adjustment margins according to worker characteristics: age, earnings capacity (within age cohort), and gender.[11]

This heterogeneity analysis allows to identify which groups of workers benefit most from the program, and whether these differences come from firms' labor retention policies or labor market frictions. In the three panels of table 11, we compare the impact of exposure to the loan guarantee program on employment and earnings separately for young and old workers in Panel A, below and above median earnings workers (within each age cohort) in Panel B, and men and women in Panel C. We first measure the main effect for each sub-group in columns 1 and 3, and then flesh out the component coming from the initial employer of the worker in columns 2 and 4. We test for the statistical significance of the difference between the two sub-groups in columns 5 and 6.

From columns 1, 3 and 5, we observe that younger workers, workers with high earnings capacity, and male workers, seem to benefit more from the intervention overall, as the effects on years of employment and particularly on cumulative earnings are statistically higher for these sub-groups. When focusing on the effect coming from the initial employer, we find much larger effects for high earnings, young and male workers, suggesting that the difference in the overall effect is mainly driven by firm's retention decisions.

[INSERT TABLE 11]

Overall, our findings in the cross-section of workers provide evidence on the distributional consequences of loan guarantee programs, that primarily benefit high earnings, young and male workers. We also document that most of the cross-sectional variation stems from differences in firm retention policies rather than labor market mobility patterns.

[11]The sample split on earnings capacity within age cohorts allows to capture differences among workers based on ability rather than experience and seniority.

6 Assessing the Costs of the Program

While the previous section documents the benefits of the loan guarantee program in terms of employment for the workers and savings in welfare payments for the government, these benefits need to be contrasted with the cost of the program to assess the efficiency of this public policy.

6.1 High Treatment Intensity: Higher Credit Risk, Similar Ex Post Default

We estimate the extent to which an expansion of the loan guarantee program leads to a deterioration in the quality of the beneficiary pool. For this, we first regress a firm's credit risk decile dummy in 2008 on our measure of regional treatment intensity. Columns 1 to 3 in Table A.9 provide the coefficients. Consistent with Figure 3, we find that firms located in a region with higher treatment intensity appear to extend loan guarantees to riskier borrowers. One potential concern is that this result is simply driven by the fact that firms' credit risk in 2008 was higher in regions with higher treatment intensity. Reassuringly, this is not the case as shown in columns 4 to 6.

The inverse of the interest coverage ratio that we use to proxy for credit risk could instead proxy for low firm productivity. In Table A.10 we therefore investigate whether firms that receive a guarantee are of lower operating quality in regions with higher treatment intensity. We find no statistically significant difference in return on assets (ROA), in prior sales, employment and asset growth, nor in firm age. These findings suggest that regional expansions of the loan guarantee program were not associated with the selection of firms with low performance or low growth opportunities.

While firms in regions with higher exposure seem ex ante slightly riskier, we test in Table 12 whether they have a higher likelihood of ex post default. We regress the defaulted amount normalized by the guaranteed loan amount (columns 1, 2 and 3), and a dummy for

default (columns 4, 5 and 6) over the period 2009-2015 on our regional treatment variable, in the sample of firms that received a loan guarantee. Across specifications, coefficients are not statistically different from zero. Hence, despite of their higher riskiness ex ante, firms exposed to higher treatment intensity do not default more. This finding suggests that the scale of the program could have been at least marginally increased without significantly altering its relative cost.

[INSERT TABLE 12]

6.2 Preventing Efficient Re-allocation of Workers?

The loan guarantee program might prevent an efficient reallocation of workers, from firms in distress to more productive or new firms. Since our data allows us to track workers even when they change jobs, we can observe to which type of firms workers get reallocated in our counterfactual. In Table 13, we study workers' employment and earnings outcomes outside their initial employer. If anything, we find larger negative coefficients on our treatment variable for employment and earnings at low cash flow firms, which indicates that workers from the counterfactual are more likely to move to low, rather than high cash flow firms. We do not find much differences along the firm size dimension, nor on firm creation. Overall, these results suggest that workers displaced during the crisis are not particularly likely to move to more productive or new firms, and are hard to reconcile with the hypothesis that the loan guarantee program acts as a barrier to an efficient allocation of workers in the economy.

[INSERT TABLE 13]

6.3 Cost per Job(-year) at the Aggregate Level

Moving to the macro level, we perform an aggregate cost-benefit analysis of the loan guarantee program. This exercise ignores potential fiscal externalities and spill-over effects. As our analysis is conducted at the worker level, we multiply the average treatment of 0.28 (%

of total assets) by the coefficient estimated in our baseline specification (0.21) to calculate the average effect by worker. This calculation corresponds to an average gain of 0.06 years of employment per worker. As the full-time employee equivalent employment at SMEs in 2008 in France was 3.7 million, we obtain an estimate of 217,000 job(-years) preserved over the period 2009-15 ($3.7m \times 0.28 \times 0.21$).

This benefit needs to be compared to the cost of the intervention. The ex ante cost to the French government was the provision of a €683M fund, which translates into an estimate for the gross cost per job(-year) of around €3200.[12] The ex post cost of the guarantee program can be estimated as the difference between the amount of Bpifrance payments to the banks of defaulting firms, net of commissions. Banks have claimed guarantee payments for an aggregate amount of €333M, and Bpifrance has received commissions for an aggregate amount of €126M. The net cost is therefore €207M, which translates into an estimate for the gross cost per job(-year) around €950.[13]

This cost-per-job is significantly smaller than estimates from the literature on fiscal multipliers in the US (Suárez Serrato and Wingender, 2016; Chodorow-Reich et al., 2012), which are closer to $30,000 per job. It is also smaller than estimates from the US loan guarantee program 7.(a) in Brown and Earle (2017), who find a cost-per-job of around $25,000 (over three years). Finally, it is of the same order of magnitude as the gross cost per job estimated for other employment policies implemented in France in 2009: €2,619 for short-time work subsidies (Cahuc et al., 2018), and €8,000 for hiring credits (Cahuc et al., 2019). Overall, our analysis suggests that loan guarantee programs for short-term debt might be a cost-effective form of stimulus.

The gross cost per job(-year) we calculate ignores the savings in unemployment benefits and social benefits, as well as the avoided reduction in social contributions, i.e., compulsory

[12] Following Lucas and McDonald (2010), one can alternatively value the ex ante cost of the program as a put option using derivative pricing methods. Assuming a risk-free rate of 3.5%, time to maturity of 2 years, volatility of 40%, the Black-Scholes value of a 70% guarantee on €5.3bn loans is €640M.

[13] These cost estimates do not account for potential distortions associated with raising the taxes used to finance the program nor do they account for potential increases in the operating cost of the Bpifrance branches due to the program.

payments by firms and employees, resulting from the loan guarantee program. We can easily adjust for the savings in unemployment benefits that we estimate in Section 4, and include a lower bound of the avoided reduction in social contributions.

Using a real discount rate of 10%, and the average treatment associated with a NPV of unemployment benefits of 1.6% of 2008 annual earnings, the savings amount to €350 per worker on average.[14] When applied to the existing 3.7 million jobs in SMEs in 2008, we obtain an estimate of €1.3 bn savings in unemployment benefits, i.e. almost six times the non-discounted value of the ex post losses on the program. Turning to the avoided reduction in social contributions, we apply a 20% rate, the amount of social contribution for the lowest income bracket, to the gain in earnings we can attribute to the program. Again we multiply the average treatment of 0.28%, the coefficient obtained on earnings in Table 4, the average initial earnings in our sample, the full-time employee equivalent employment at SMEs, and 20%, which yields an avoided reduction in social contributions of €1 bn.

This calculation therefore yields a negative net cost for the program and the jobs it helps preserve. Despite its caveats, this exercise supports the loan guarantee program as a cost effective intervention to support employment in downturns, in particular in contexts where financial shocks hinder SMEs access to external funds.

7 Conclusion

In this paper, we use administrative data at the worker level and examine how exposure to a new loan guarantee program implemented in France during the 2008-2009 financial crisis affects the employment and earnings trajectories of workers over the medium run. We find that exposure to the program results in a significantly higher likelihood of being employed over the next seven years, which translates into significantly higher cumulated earnings, and lower unemployment benefits. The effect of the policy is immediate and persistent, and

[14] We derive the NPV of unemployment benefits from discounting the yearly effects of the average treatment on unemployment benefits. The un-discounted associated value is the point estimate given in column (8) of table 6 multiplied by 0.28, the average regional treatment intensity, and equals 2.2%.

points to the presence of sizable frictions in both credit and labor markets.

Turning to the cross-section of workers, we observe that high earnings, young workers, and men, benefit more from the intervention, as the effects on cumulative earnings and employment are more pronounced for these sub-groups. When decomposing the effects along the adjustment margins, this heterogeneity appears to result mostly from differences in labor retention decisions by the initial employer rather than differences in labor market frictions in the cross-section of workers. Finally, we perform an aggregate cost-benefit analysis of the loan guarantee program, and estimate the gross cost to preserve a job(-year) to be around €3,200 and a negative net cost when we include the savings on unemployment benefits and avoided reduction in social contributions.

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8 Graphs and tables

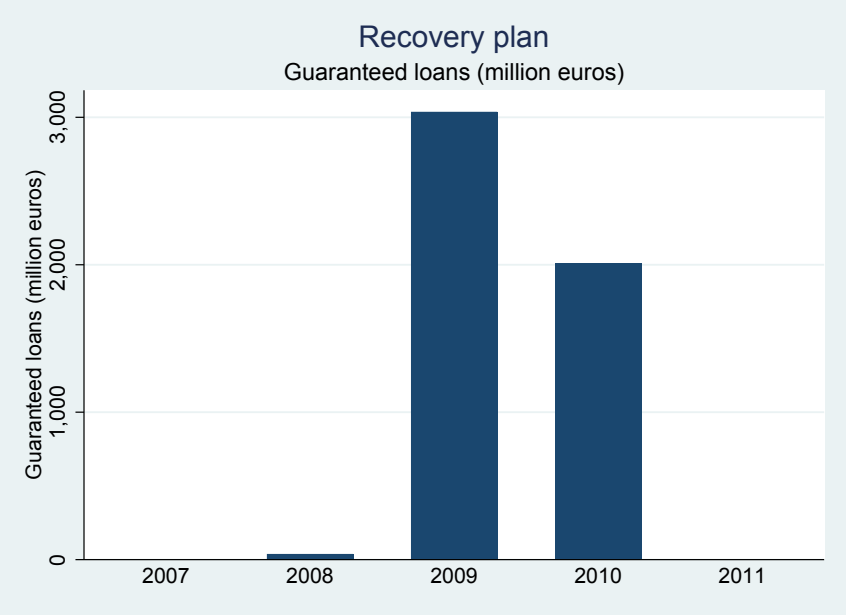


Figure 1
Yearly Volume of Guarantees of the Recovery Plan

Note: This figure displays the total volume of guarantees by Bpifrance as part of the recovery plan.

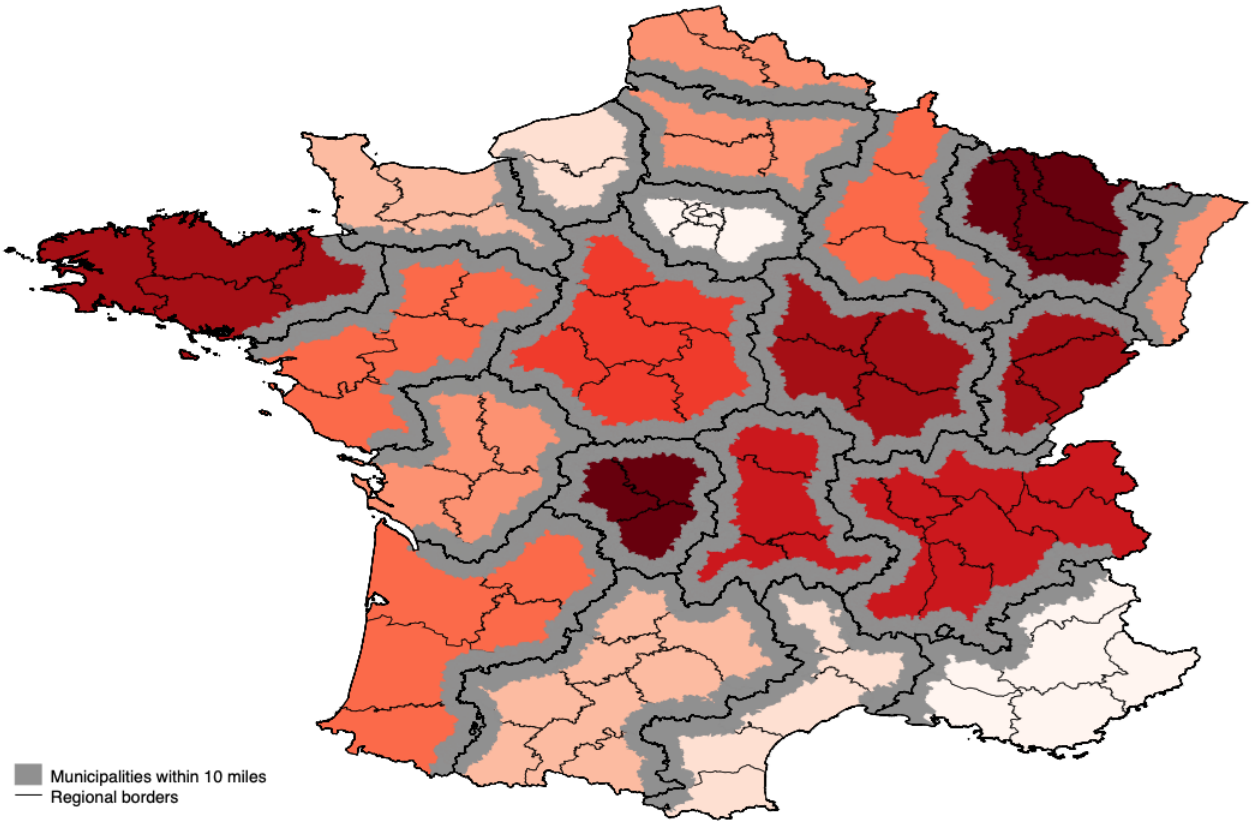
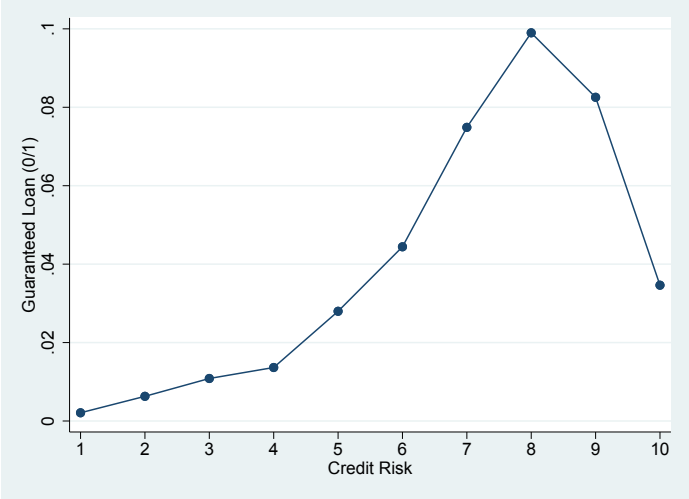


Figure 2
Regional Intensity of Loan Guarantee Intervention

Note: This figure displays the regional intensity of intervention by Bpifrance, as measured by the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. The grey area corresponds to municipalities within 10 miles of a regional border. Thin lines in black represent department boundaries within regions.

Panel A: Aggregate



Panel B: High Treatment Regions vs. Low Treatment Regions

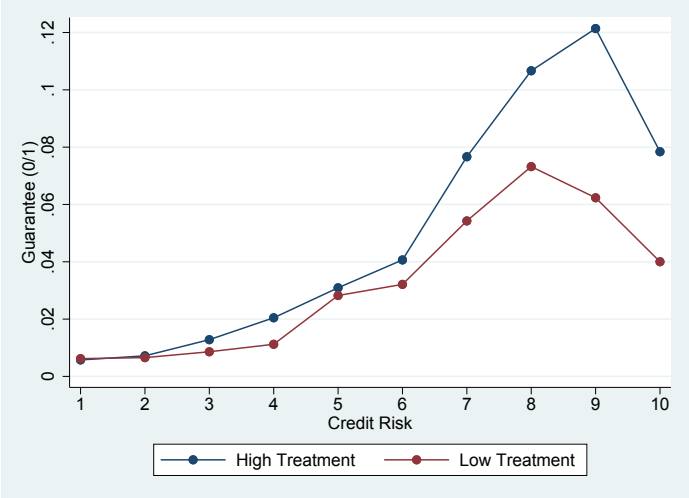


Figure 3
Probability of Loan Guarantee Intervention by Deciles of Credit Risk

Note: This graph plots the probability of receiving a loan guarantee from Bpifrance under the recovery plan for each decile of credit risk. Credit risk is measured as the inverse of the interest coverage ratio as of 2008. The interest coverage ratio is defined as EBITDA over interest expenses. The sample consists of all firms in our sample of municipalities within 10 miles of a regional border. Panel A conducts this exercise for the whole sample, while Panel B breaks it down between regions with above-median treatment intensity and below-median treatment intensity.

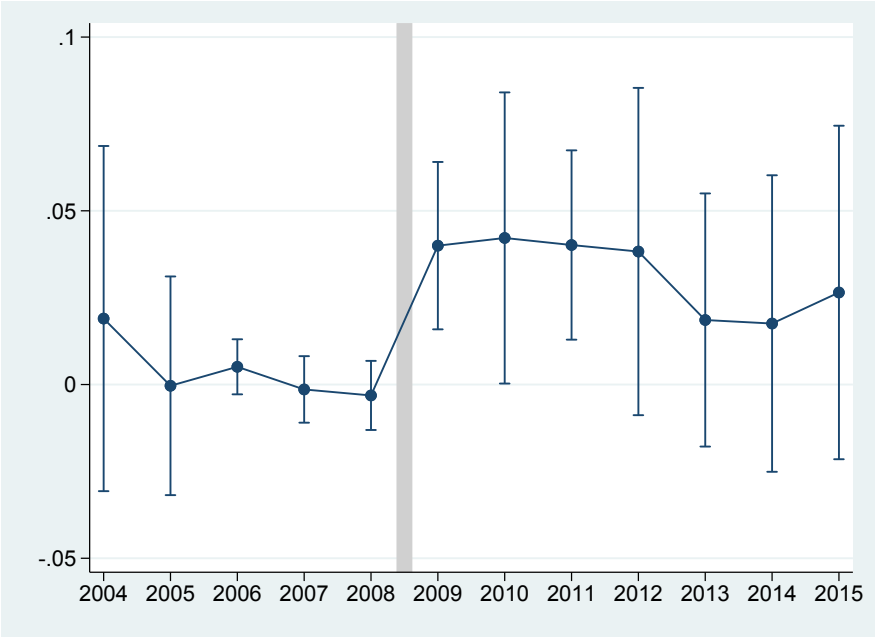


Figure 4
Dynamics: Effect on Earnings

Note: This figure plots regression coefficients and 95% confidence intervals from twelve regressions of earnings that a worker obtains in the year indicated on the x-axis, expressed in percentage points of the worker's average annual earnings in 2006-2008, on our measure of regional exposure to the 2009-2010 loan guarantee program, $\text{Guarantee}_{region,09-10}$. All regressions include department-pair fixed effects, the distance from the regional border, changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), as well as firm and worker controls measured in 2008.

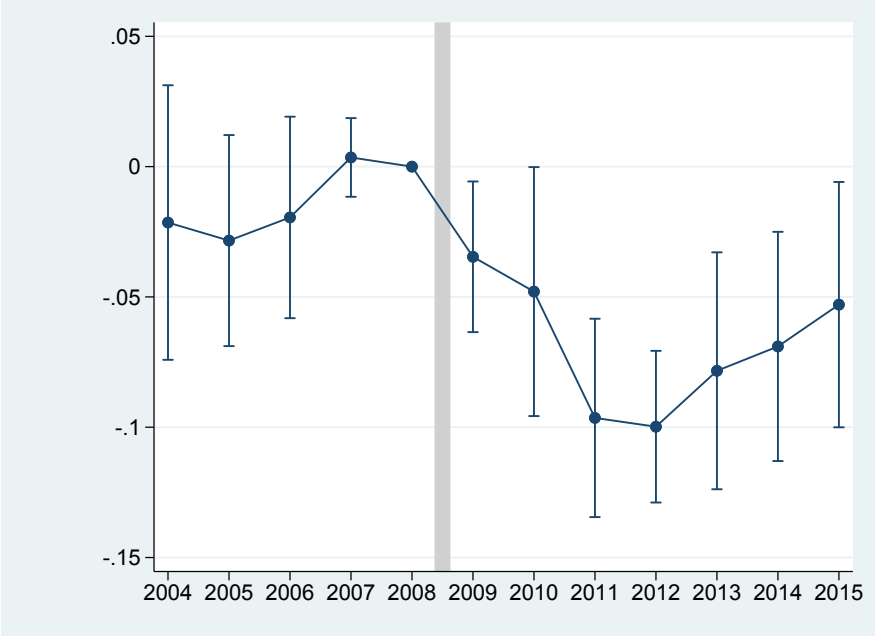


Figure 5
Dynamics: Effect on Separations

Note: This figure plots regression coefficients and 95% confidence intervals from twelve regressions of the likelihood that a worker does not work for the employer in 2008 in the year indicated on the x-axis on our measure of regional exposure to the 2009-2010 loan guarantee program, $\text{Guarantee}_{region,09-10}$. All regressions include department-pair fixed effects, the distance from the regional border, and changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), as well as firm and worker controls measured in 2008.

Table 1
Summary Statistics

	(1)	(2)	(3)	(4)	(5)	(6)
	Obs.	Mean	SD	p1	p50	p99
Panel A: Loan guarantee exposure						
$\text{Guarantee}_{region,09-10}$ (over assets in %)	21	0.280	0.156	0.099	0.240	0.759
$\text{Guarantee}_{firm,09-10}$ (over assets in %)	28,587	0.315	1.742	0.000	0.000	12.956
Guarantee (1/0)	28,587	0.040	0.195	0.000	0.000	1.000
$\text{Default Amount}_{firm}$ (over assets in %)	28587	0.030	0.394	0.000	0.000	0.000
Default on Guaranteed Loan (1/0)	28587	0.009	0.095	0.000	0.000	0.000
Panel B: Main outcome variables, 2009-2015						
$\text{Years Employed}_{2009,2015}$	38,024	6.520	1.284	1.000	7.000	7.000
$\text{Earnings}_{2009,2015}$	38,024	6.507	2.160	0.169	7.090	11.019
$\text{Separation}_{2009,2015}$ (1/0)	38,024	0.485	0.500	0.000	0.000	1.000
$\text{Unemployment Benefits}_{2009,2015}$	38,024	0.216	0.477	0.000	0.000	2.155
$\text{Years with Unemployment Benefits}_{2009,2015}$	38,024	0.596	1.262	0.000	0.000	6.000
Panel C: Worker characteristics in 2008						
Earnings	38,024	23,630	12,816	12,084	20,680	71,540
Hours	38,024	1,868	215	1,150	1,839	2,470
Age	38,024	38	7.7	24	39	51
Panel D: Firm characteristics in 2008 and outcomes						
$\frac{\Delta_{08-09} BankDebt}{BankDebt_{08}}$	19,103	-0.077	0.840	-1.00	-0.174	2.611
$\text{Liquidation}_{2009,2015}$	28,587	0.045	0.208	0.000	0.000	1.000
Nb Employees	28,587	20.464	29.835	0.000	9.750	163.750
Assets (€'000s)	28,587	3,290	79,462	41	731	30,188
ROA	28,587	0.104	0.192	-0.656	0.100	0.749
Firm Age	28,587	18.042	13.014	1.000	16.000	54.000
Dividend/Sales	28,544	0.016	0.037	0.000	0.000	0.222
PPE/Assets	28,587	0.461	0.333	0.000	0.386	1.000

Note: This table presents summary statistics at the regional and firm level (Panel A), at the worker level (Panel B, C), and firm level (Panel D). The sample includes 1/12th of employees who were working in SMEs located within a 10 miles distance to a regional border in 2008.

Table 2

First Stage: Firm-level exposure to the loan guarantee program

	(1)	(2)	(3)	(4)	(5)	(6)
	Guarantee$_{firm,09-10}$			Guarantee (1/0)		
Guarantee$_{region,09-10}$	0.650***	0.707***	0.701***	0.066***	0.071***	0.069***
	(4.70)	(6.03)	(5.73)	(4.42)	(5.64)	(5.40)
Distance to border	0.000	-0.000	0.001	0.000	0.000	0.000
	(0.01)	(-0.10)	(0.37)	(0.66)	(0.54)	(1.02)
Department-Pair FE	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y		Y	Y
Firm-level Controls			Y			Y
Observations	28587	28587	28587	28587	28587	28587
R^2	0.009	0.009	0.024	0.009	0.010	0.029

Note: This table reports the results of the first stage OLS regressions. The dependent variable is the amount of guaranteed loans the firm received due to the 2009-2010 recovery plan scaled by 2008 firm assets in columns (1) to (3), and a dummy variable equal to one if the firm received any loan guarantee from the recovery plan in 2009-2010 in columns (4) to (6). The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects. Changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population) are added in columns (2) and (5). Firm-level controls added in columns (3) and (6) include log of assets, log of firm age, and two-digit industry fixed effects. Firm controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 3

Effects of loan guarantees on firm balance-sheet and liquidation likelihood

	(1)	(2)	(3)	(4)	(5)	(6)
	$\frac{\Delta_{08-09} BankDebt}{BankDebt_{08}}$			Liquidation $_{09,15}$		
Guarantee$_{region,09}$	0.147**	0.172**	0.180**			
	(2.39)	(2.48)	(2.61)			
Guarantee$_{region,09-10}$				-0.027*	-0.033**	-0.027**
				(-1.83)	(-2.42)	(-2.16)
Department-Pair FE	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y		Y	Y
Firm-level Controls			Y			Y
Observations	19103	19103	19103	28587	28587	28587
R^2	0.006	0.007	0.013	0.006	0.016	0.041

Note: This table reports OLS regression results of the effect of loan guarantees on firms' bank debt and liquidation probability. The dependent variable is the change in bank debt from 2008 to 2009, scaled by 2008 bank debt in columns (1) to (3), and a dummy variable equal to one if the firm was liquidated in the years 2009 to 2015 in columns (4) to (6). The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009 in columns (1) to (3) and the average regional ratio of loans guaranteed under the recovery plan in 2009-2010 in columns (4) to (6), computed across SMEs outside the border area. All regressions include department pair fixed effects and distance to the border. Column (2) adds changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Column (3) adds firm-level controls (log of assets, log of firm age, and two-digit industry fixed effects). Firm controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 4

Worker-level employment effects: baseline

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Cumulative effects	Years Employed $_{09,15}$				Earnings $_{09,15}$			
Guarantee$_{region,09-10}$	0.233***	0.256***	0.216***	0.213***	0.296***	0.329***	0.238**	0.216**
	(3.13)	(3.14)	(2.97)	(2.85)	(3.51)	(3.54)	(2.65)	(2.26)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y	Y		Y	Y	Y
Firm-level Controls			Y	Y			Y	Y
Worker-level Controls				Y				Y
Observations	38024	38024	38024	38024	38024	38024	38024	38024
R^2	0.006	0.006	0.028	0.035	0.007	0.007	0.042	0.054
Panel B: In 2015	Employed $_{15}$				Earnings $_{15}$			
Guarantee$_{region,09-10}$	0.042**	0.044***	0.033**	0.032**	0.059**	0.055**	0.033	0.026
	(2.82)	(2.87)	(2.22)	(2.09)	(2.81)	(2.48)	(1.49)	(1.15)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y	Y		Y	Y	Y
Firm-level Controls			Y	Y			Y	Y
Worker-level Controls				Y				Y
Observations	38024	38024	38024	38024	38024	38024	38024	38024
R^2	0.007	0.007	0.035	0.038	0.006	0.006	0.038	0.054

Note: This table reports reduced-form OLS regression results of the effect of loan guarantees on worker-level outcomes. Panel A presents the cumulative effects on years employed and earnings 2009-2015. Cumulative earnings are the sum of earnings 2009-2015 scaled by average annual earnings 2006-2008. Panel B presents the effects on employment and earnings in 2015. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects and distance to the border. Columns (2) and (6) add changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Firm-level controls added in columns (3) and (7) include log of assets, log of firm age, and two-digit industry fixed effects. Worker-level controls added in columns (4) and (8) include worker age, gender, and occupation fixed effects. Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 5
Effects on employee separation

	(1)	(2)	(3)	(4)
	Separation $_{09,15}$			
Guarantee$_{region,09-10}$	-0.058**	-0.077***	-0.050**	-0.056**
	(-2.19)	(-3.36)	(-2.21)	(-2.48)
Department-Pair FE	Y	Y	Y	Y
Regional Controls		Y	Y	Y
Firm-level Controls			Y	Y
Worker-level Controls				Y
Observations	38024	38024	38024	38024
R^2	0.010	0.011	0.050	0.063

Note: This table reports reduced-form OLS regression results of the effect of loan guarantees on workers' likelihood to separate from their initial employer. The dependent variable is a dummy equal to one if the worker did not work the entire period from 2009-2015 at the initial firm in 2008. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects and distance to the border. Column (2) adds changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Column (3) adds firm-level controls (log of assets, log of firm age, and two-digit industry fixed effects). Column (4) adds worker-level controls (worker age, gender, and occupation fixed effects). Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 6
Effects on unemployment insurance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Years with UB $_{09,15}$				UB $_{09,15}$			
Guarantee$_{region,09-10}$	-0.197**	-0.249***	-0.230***	-0.239***	-0.065*	-0.085***	-0.078***	-0.080***
	(-2.13)	(-2.90)	(-2.92)	(-3.04)	(-1.85)	(-2.94)	(-3.12)	(-3.11)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y	Y		Y	Y	Y
Firm-level Controls			Y	Y			Y	Y
Worker-level Controls				Y				Y
Observations	38024	38024	38024	38024	38024	38024	38024	38024
R^2	0.011	0.011	0.039	0.049	0.012	0.012	0.037	0.046

Note: This table reports reduced-form OLS regression results of the effect of loan guarantees on unemployment benefits. Columns (1) to (4) show the effects on years with positive unemployment benefits. Columns (5) to (8) show the effects on cumulative unemployment benefits. Cumulative unemployment benefits are the sum of unemployment benefits 2009-2015 scaled by average annual earnings 2006-2008. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects and distance to the border. Columns (2) and (6) add changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Firm-level controls added in columns (3) and (7) include log of assets, log of firm age, and two-digit industry fixed effects. Worker-level controls added in columns (4) and (8) include worker age, gender, and occupation fixed effects. Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 7
Dynamics

Panel A: Yearly Earnings	04	05	06	07	08	09	10	11	12	13	14	15
$\text{Guarantee}_{region,09-10}$	0.019	-0.000	0.005	-0.001	-0.003	0.040***	0.042**	0.040***	0.038	0.019	0.018	0.026
	(0.80)	(-0.02)	(1.34)	(-0.31)	(-0.66)	(3.46)	(2.10)	(3.08)	(1.70)	(1.06)	(0.86)	(1.15)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Full Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	38024	38024	38024	38024	38024	38024	38024	38024	38024	38024	38024	38024
R^2	0.090	0.062	0.038	0.012	0.035	0.036	0.031	0.034	0.038	0.042	0.050	0.054
Panel B: Yearly Separations	04	05	06	07	08	09	10	11	12	13	14	15
$\text{Guarantee}_{region,09-10}$	-0.021	-0.028	-0.019	0.004		-0.035**	-0.048**	-0.096***	-0.100***	-0.078***	-0.069***	-0.053**
	(-0.85)	(-1.46)	(-1.05)	(0.49)		(-2.50)	(-2.09)	(-5.29)	(-7.15)	(-3.60)	(-3.27)	(-2.35)
Department-Pair FE	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
Full Controls	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
Observations	38024	38024	38024	38024		38024	38024	38024	38024	38024	38024	38024
R^2	0.164	0.129	0.096	0.033		0.030	0.035	0.046	0.049	0.054	0.058	0.061
Panel C: Cum. Earnings						09	10	11	12	13	14	15
$\text{Guarantee}_{region,09-10}$						0.040***	0.080**	0.118***	0.156***	0.174***	0.192**	0.216**
						(3.46)	(2.74)	(3.55)	(3.46)	(2.92)	(2.52)	(2.26)
Department-Pair FE						Y	Y	Y	Y	Y	Y	Y
Full Controls						Y	Y	Y	Y	Y	Y	Y
Observations						38024	38024	38024	38024	38024	38024	38024
R^2						0.036	0.036	0.039	0.042	0.046	0.050	0.054

Note: This table reports the effect of loan guarantees on earnings and separations by year. Panel A reports yearly earnings, Panel B yearly separations from the initial employer in 2008, and Panel C cumulative earnings. Earnings are scaled by average earnings in 2006-2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 8
Firm heterogeneity: financial constraint

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A: Years Employed $_{2009,2015}$								
	Cash-Flows			Dividends			Tangibility		
	Low	High	Diff	No Div	Div> 0	Diff	Low	High	Diff
Guarantee$_{region,09-10}$	0.414***	0.010	0.403***	0.271***	0.077	0.194	0.349**	0.120	0.230
	(4.57)	(0.11)	(3.80)	(3.02)	(0.81)	(1.58)	(2.62)	(1.39)	(1.55)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Worker-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	18885	18884	37769	24037	13981	38018	18890	18872	37762
R^2	0.037	0.049	0.043	0.038	0.037	0.042	0.042	0.042	0.042
	Panel B: Cumulative Earnings $_{2009,2015}$								
	Cash-Flows			Dividends			Tangibility		
	Low	High	Diff	No Div	Div> 0	Diff	Low	High	Diff
Guarantee$_{region,09-10}$	0.527***	-0.017	0.543**	0.331**	-0.023	0.354*	0.314*	0.106	0.207
	(3.90)	(-0.10)	(2.45)	(2.81)	(-0.16)	(1.88)	(1.99)	(0.98)	(1.10)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Worker-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	18885	18884	37769	24037	13981	38018	18890	18872	37762
R^2	0.072	0.063	0.070	0.054	0.053	0.063	0.060	0.066	0.063

Note: This table reports the effect of loan guarantees on worker employment and earnings trajectories for sub-samples along proxies for financial constraints. Panel A presents the effects on years employed and Panel B on cumulative earnings 2009-2015. Cumulative earnings are the sum of earnings 2009-2015 scaled by average annual earnings 2006-2008. Column (1) and (2) show the results for sub-samples of firms below and above the median firm profitability (profit scaled by assets) in 2008, respectively. Column (3) and (4) split the full sample based on a dummy variable equal to one if the firm paid dividends in 2008. Column (5) and (6) show the results for sub-samples of firms below and above the median firm tangibility, respectively. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), firm (log of assets, log of firm age, and two-digit industry fixed effects), and worker controls (worker age, gender, and occupation fixed effects). Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 9
Firm heterogeneity: credit risk

	(1)	(2)	(3)	(4)	(5)	(6)
	Low Credit Risk			High Credit Risk		
	Guarantee	Years Employed	Earnings	Guarantee	Years Employed	Earnings
$\text{Guarantee}_{region,09-10}$	0.097	0.069	0.077	1.428***	0.401***	0.532***
	(0.96)	(0.74)	(0.54)	(2.85)	(4.22)	(4.34)
Department-Pair FE	Y	Y	Y	Y	Y	Y
Regional Controls	Y	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y	Y
Worker-level Controls	Y	Y	Y	Y	Y	Y
Observations	19239	19239	19239	15656	15656	15656
R^2	0.030	0.044	0.056	0.071	0.043	0.080

Note: This table reports the first stage results and the effect of loan guarantees on worker employment and earnings trajectories separately for firms with low and high ex-ante credit risk. Columns (1), (2) and (3) show the results for firms with low credit risk in 2008. Columns (4), (5) and (6) show the results for firms with high credit risk in 2008. Credit risk is measured as the inverse of the interest coverage ratio in 2008. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), firm (log of assets, log of firm age, and two-digit industry fixed effects), and worker controls (worker age, gender, and occupation fixed effects). Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 10
Adjustment margins

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(N=38,024)	all firms	initial firm	other firm	other firm same industry	other firm other industry	other firm same CZ	other firm other CZ
Years employed	0.213***	0.479***	-0.267*	-0.315***	0.048	-0.020	-0.246*
	(2.85)	(4.47)	(-2.11)	(-4.04)	(0.55)	(-0.19)	(-1.82)
Cumulative earnings	0.216**	0.429***	-0.212	-0.185**	-0.027	0.053	-0.266**
	(2.26)	(3.49)	(-1.54)	(-2.14)	(-0.37)	(0.50)	(-2.55)

Note: This table reports the effect of loan guarantees on employment and earnings at the initial firm and at other firms. Cumulative earnings are the sum of earnings 2009-2015 scaled by average annual earnings 2006-2008. Column (1) shows the effect across all firms. Column (2) measures employment and earnings at the initial firm (in 2008). Column (3) measures employment and earnings at other firms. Column (4) measures employment and earnings at other firms in the same two-digit industry as the initial firm. Column (5) measures employment and earnings at other firms in different two-digit industries than the initial firm. Column (5) measures employment and earnings at other firms which are located in the same commuting zone (CZ) as the initial firm. Column (6) measures employment and earnings at other firms which are located in a different CZ than the initial firm. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), firm (log of assets, log of firm age, and two-digit industry fixed effects), and worker controls (worker age, gender, and occupation fixed effects). Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 11
Heterogeneous effects across workers

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Age						
	Old		Young		*Diff*	
	all firms	initial firm	all firms	initial firm	all firms	initial firm
Years employed	0.133	0.471**	0.371***	0.695***	0.238***	0.224
	(1.65)	(2.65)	(3.85)	(5.01)	(2.88)	(1.03)
Cumulative earnings	0.067	0.286	0.524***	0.820***	0.457**	0.534**
	(0.76)	(1.58)	(3.43)	(5.28)	(2.73)	(2.55)
Panel B: Earnings Capacity						
	Low		High		*Diff*	
	all firms	initial firm	all firms	initial firm	all firms	initial firm
Years employed	0.201**	0.411*	0.312***	0.746***	0.112	0.335
	(2.09)	(2.05)	(2.89)	(4.77)	(0.91)	(1.27)
Cumulative earnings	0.148	0.328	0.570***	0.849***	0.422*	0.521
	(1.20)	(1.53)	(3.54)	(4.09)	(1.98)	(1.66)
Panel C: Gender						
	Women		Men		*Diff*	
	all firms	initial firm	all firms	initial firm	all firms	initial firm
Years employed	0.221**	0.212	0.290***	0.699***	0.069	0.487*
	(2.66)	(0.96)	(2.93)	(4.91)	(0.65)	(1.83)
Cumulative earnings	0.036	-0.021	0.480***	0.791***	0.443**	0.813**
	(0.27)	(-0.08)	(3.55)	(4.64)	(2.13)	(2.46)

Note: This table reports the effect of loan guarantees on employment and earnings at all firms and at the initial firm for sub-groups of workers. Columns (1) and (3) show the effect across all firms. Columns (2) and (4) measure employment and earnings at the initial firm (in 2008). Columns (5) and (6) show the difference between sub-groups for all firms and at the initial firm respectively . Young (old) is a dummy equal to one for workers aged 24-39 (40-51) in 2008. Low (high) is a dummy equal to one for workers with below (above) median earnings in 2008, within their age cohort. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, and changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 12
Default

	(1)	(2)	(3)	(4)	(5)	(6)
	Default Rate			Default (1/0)		
$\text{Guarantee}_{region,09-10}$	0.030	0.031	0.024	0.076	0.030	0.027
	(0.80)	(0.76)	(0.55)	(0.71)	(0.27)	(0.22)
Department-Pair FE	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y		Y	Y
Firm-level Controls			Y			Y
Observations	1119	1119	1119	1119	1119	1119
R^2	0.092	0.097	0.164	0.096	0.102	0.192

Note: This table shows the effect of loan guarantees on default within the sample of firms receiving a loan guarantee. The dependent variable is default amount scaled by the guaranteed loan amount in columns (1) to (3) and a default dummy in columns (4) to (6) over the sample period 2009-2015. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects and distance to the border. Changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population) are added in columns (2) and (5). Firm-level controls added in columns (3) and (6) include log of assets, log of firm age, and two-digit industry fixed effects. Firm controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table 13
A barrier to efficient worker allocation?

	(1)	(2)	(3)	(4)	(5)	(6)
	Adjustment margin: other firms by firm type					
	Cash-Flows		Firm Size		Firm Creation	
	Above	Below	Larger	Smaller	New	Existing
Years employed	-0.038	-0.243*	-0.107	-0.184	-0.060	-0.206
	(-0.31)	(-1.89)	(-0.84)	(-1.56)	(-0.59)	(-1.69)
Cumulative earnings	-0.011	-0.227*	-0.075	-0.163	-0.076	-0.162
	(-0.09)	(-1.92)	(-0.56)	(-1.51)	(-0.80)	(-1.24)

Note: This table reports the effect of loan guarantees on employment and earnings at other firms. Columns (1) and (2) show worker outcomes at firms with profitability above and below the initial firm in 2008. Columns (3) and (4) show worker outcomes at firms larger and smaller than the initial firm, measured by firm assets. Columns (5) and (6) show worker outcomes at firms created after 2008 and existing firms in 2008. All regressions include department pair fixed effects, distance to the border and changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Appendix - For Online Publication

A DATA ACCESS

The French employment registers (DADS) and the fiscal data (FICUS-FARE), used in this paper, can be accessed by researchers. Authorization must be obtained from the *comité du secret*. The procedure is described at https://www.comite-du-secret.fr. Then researchers use a remote secure server (CASD) to work on the data. The "Bpifrance files" that contain information on the firms receiving guarantees, is produced and owned by the Banque Publique d'Investissement.

B Tables

Table A.1
Summary Statistics - No loan guarantee vs. Treated

	No loan guarante			Treated			Equality Test
	Obs.	Mean	SD	Obs.	Mean	SD	P-value
Panel A: Firm Sample							
Guarantee$_{firm,09-10}$ (over assets in %)	27454	0.000	0.000	1133	7.938	4.002	328.780
Default Amount$_{firm,09-10}$ (over assets in %)	27454	0.000	0.000	1133	0.745	1.838	67.226
Default on Guaranteed Loan (1/0)	27454	0.000	0.000	1133	0.230	0.421	90.646
$\frac{BankDebt}{TotalAssets}_{08}$	26069	0.150	0.212	1091	0.194	0.178	6.690
$\frac{\Delta_{08-09}BankDebt}{BankDebt_{08}}$	18227	-0.095	0.832	876	0.298	0.907	13.604
Nb Employees	27454	20.057	29.557	1133	30.319	34.489	11.371
Assets (€'000s)	27454	3,308	81,079	1133	2,850	4,810	-0.190
ROA	27454	0.106	0.193	1133	0.048	0.140	-10.108
Firm Age	27454	18.485	15.215	1133	20.040	15.857	3.366
Dividend/Sales	27413	0.017	0.038	1131	0.006	0.018	-9.241
PPE/Assets	27453	0.460	0.334	1133	0.472	0.320	1.197
Panel B: Worker Sample							
Years Employed$_{2009,2015}$	36110	6.518	1.288	1914	6.556	1.210	1.254
Earnings$_{2009,2015}$	36110	6.514	2.164	1914	6.363	2.084	-2.978
Unemployment Benefits $_{2009,2015}$	36110	0.213	0.474	1914	0.280	0.532	6.036
Earnings 2008	36110	23624	12864	1914	23752	11873	0.424
Hours 2008	36110	1868	215	1914	1872	206	0.687
Age 2008	36110	38.320	7.761	1914	38.654	7.574	1.836

Note: This table compares summary statistics at the firm (Panel A) and worker level (Panel B) for SMEs that received no guarantee under the recovery plan to SMEs that received guarantees under the recovery plan. The sample includes SMEs within a 10 miles distance to a regional border in 2008.

Table A.2
Summary Statistics - Below versus Above 10 miles

	Our Sample			SMEs $\geq$ 10 miles			Equality Test
	Obs.	Mean	SD	Obs.	Mean	SD	P-value
Panel A: Firm Sample							
Guarantee$_{firm,09-10}$ (over assets in %)	28587	0.315	1.742	117062	0.252	1.524	-6.063
Default Amount$_{firm,09-10}$ (over assets in %)	28587	0.030	0.394	117062	0.027	0.385	-0.862
Guarantee (1/0)	28587	0.040	0.195	117062	0.032	0.176	-6.290
Default on Guaranteed Loan (1/0)	28587	0.009	0.095	117062	0.008	0.090	-1.500
$\frac{BankDebt}{TotalAssets_{08}}$	27160	0.152	0.211	110825	0.156	2.310	0.315
$\frac{\Delta_{08-09}BankDebt}{BankDebt_{08}}$	19103	-0.077	0.840	76169	-0.084	0.888	-0.948
Nb Employees	28587	20.464	29.835	117062	20.035	29.668	-2.188
Assets (€'000s)	28587	3.290	79.462	117062	4.089	100.369	1.252
ROA	28587	0.104	0.192	117062	0.100	0.206	-3.351
Firm Age	28587	18.546	15.243	117062	17.616	15.589	-9.080
Dividend/Sales	28544	0.016	0.037	116781	0.018	0.042	6.853
PPE/Assets	28586	0.461	0.333	117046	0.393	0.327	-31.357
Panel B: Worker Sample							
Years Employed$_{2009,2015}$	38024	6.520	1.284	146256	6.474	1.344	-6.058
Earnings$_{2009,2015}$	38024	6.507	2.160	146256	6.510	2.287	0.265
Unemployment Benefits$_{2009,2015}$	38024	0.216	0.477	146256	0.229	0.484	4.444
Earnings 2008	38024	23630	12816	146256	25613	16672	21.588
Hours 2008	38024	1868	215	146256	1861	219	-5.593
Age 2008	38024	38.337	7.752	146256	37.959	7.686	-8.513

Note: This table compares summary statistics at the firm (Panel A) and worker level (Panel B) for employees working in SMEs located within a 10 miles distance to a regional border in 2008 to employees working in SMEs located outside a 10 miles distance to a regional border in 2008.

Table A.3
Industry Composition

	Our Sample		SMEs $\geq$ 10 miles	
Agriculture, forestry and fishing	5	(0.0%)	18	(0.0%)
Mining and quarrying	77	(0.3%)	254	(0.2%)
Manufacturing	7574	(26.5%)	22235	(19.0%)
Electricity, gas, steam and air conditioning supply	12	(0.0%)	62	(0.1%)
Water supply; sewerage, waste management and remediation activities	162	(0.6%)	666	(0.6%)
Construction	4565	(16.0%)	17838	(15.2%)
Wholesale and retail trade; repair of motor vehicles and motorcycles	8210	(28.7%)	33512	(28.6%)
Transportation and storage	1801	(6.3%)	6056	(5.2%)
Accommodation and food service activities	1682	(5.9%)	8106	(6.9%)
Information and communication	282	(1.0%)	3263	(2.8%)
Financial and insurance activities	117	(0.4%)	654	(0.6%)
Real estate activities	427	(1.5%)	2790	(2.4%)
Professional, scientific and technical activities	1537	(5.4%)	10209	(8.7%)
Administrative and support service activities	803	(2.8%)	4766	(4.1%)
Education	197	(0.7%)	1185	(1.0%)
Human health and social work activities	426	(1.5%)	1653	(1.4%)
Arts, entertainment and recreation	212	(0.7%)	1123	(1.0%)
Other service activities	496	(1.7%)	2673	(2.3%)
	28585		117063	

Note: This table presents the industry composition of SMEs. Panel A compares SMEs located within a 10 miles distance to a regional border in 2008 to SMEs located outside a 10 miles distance to a regional border in 2008.

Table A.4
Firm/worker characteristics and treatment variable

	(1)	(2)	(3)
Panel A: Worker Characteristics	Ln(Wage)_{08}	Ln(Hours)_{08}	Ln(UI)_{08}
$\text{Guarantee}_{region,09-10}$	-0.032	-0.001	0.021
	(-1.28)	(-0.16)	(0.44)
Department-Pair FE	Y	Y	Y
Regional Controls	Y	Y	Y
Observations	38024	38024	38024
R^2	0.045	0.008	0.005
Panel B: Firm Characteristics	Ln(FirmAge)_{08}	Ln(Assets)_{08}	$\text{EBITDA/Assets}_{08}$
$\text{Guarantee}_{region,09-10}$	0.066	0.249	0.006
	(1.24)	(1.70)	(0.77)
Department-Pair FE	Y	Y	Y
Regional Controls	Y	Y	Y
Observations	28587	28587	28587
R^2	0.012	0.012	0.007

Note: This table reports OLS regressions of worker and firm characteristics in 2008 on loan guarantees under the recovery plan in 2009-2010. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, and changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table A.5
Regional economic activity pre-trends correlated with treatment?

	(1)	(2)	(3)
	$\text{Ln(VA/Capita)}_{08}$	$\Delta_{07-08}\text{Ln(VA/Capita)}$	Δ_{05-08} Ln(VA/Capita)
$\text{Guarantee}_{region,09-10}$	-0.250	0.021	0.049
	(-0.75)	(0.34)	(0.75)
Observations	21	21	21
R^2	0.012	0.012	0.007

Note: This table reports OLS regressions of log changes in regional economic activity on loan guarantees under the recovery plan in 2009-2010. VA/Capita is the sum of value-added of all firms operating in municipalities within ten miles of the regional border, scaled by the population in the same area. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, and changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table A.6
Employment Effects: Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Distance <= 5 miles	Years Employed $_{09,15}$				Earnings $_{09,15}$			
Guarantee$_{region,09-10}$	0.206**	0.233**	0.262***	0.263***	0.323**	0.248*	0.276**	0.265*
	(2.20)	(2.35)	(2.95)	(2.92)	(2.69)	(1.79)	(2.30)	(2.07)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y	Y		Y	Y	Y
Firm-level Controls			Y	Y			Y	Y
Worker-level Controls				Y				Y
Observations	18680	18680	18680	18680	18680	18680	18680	18680
R^2	0.011	0.012	0.038	0.046	0.010	0.010	0.049	0.060
Panel B: Excluding Regional Pairs with Ile-de-France	Years Employed $_{09,15}$				Earnings $_{09,15}$			
Guarantee$_{region,09-10}$	0.249**	0.272***	0.275***	0.268***	0.257**	0.305**	0.312**	0.306**
	(2.90)	(2.99)	(3.21)	(3.04)	(2.61)	(2.83)	(2.75)	(2.40)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y	Y		Y	Y	Y
Firm-level Controls			Y	Y			Y	Y
Worker-level Controls				Y				Y
Observations	24851	24851	24851	24851	24851	24851	24851	24851
R^2	0.008	0.008	0.031	0.037	0.008	0.008	0.045	0.056
Panel C: Excluding Non-Tradable Industries	Years Employed $_{09,15}$				Earnings $_{09,15}$			
Guarantee$_{region,09-10}$	0.253***	0.274***	0.227**	0.207**	0.496***	0.495***	0.388**	0.333*
	(3.33)	(3.03)	(2.37)	(2.17)	(4.09)	(3.47)	(2.44)	(2.04)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y	Y		Y	Y	Y
Firm-level Controls			Y	Y			Y	Y
Worker-level Controls				Y				Y
Observations	17200	17200	17200	17200	17200	17200	17200	17200
R^2	0.009	0.009	0.025	0.032	0.012	0.013	0.047	0.063

Note: This table reports robustness tests for the baseline results. See table 4 for detailed descriptions.

Table A.7
Employment Effects: Controlling for Regional Confounders

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Years Employed $_{09,15}$					Earnings $_{09,15}$				
Guarantee$_{region,09-10}$	0.276***	0.219***	0.205**	0.229**	0.235**	0.314***	0.230**	0.216**	0.275**	0.344**
	(3.43)	(2.93)	(2.71)	(2.63)	(2.52)	(3.14)	(2.22)	(2.17)	(2.39)	(2.69)
ΔEU funds$_{08-10}$	-0.090*					-0.14*				
	(-1.99)					(-1.99)				
Short-term work$_{09}$		0.010**					0.023**			
		(2.23)					(2.40)			
ΔRegional bank lending$_{08-10}$			0.145					0.012		
			(1.00)					(0.05)		
Other Bpifrance programs$_{region,09-10}$				-0.024					-0.088	
				(-0.51)					(-1.14)	
Left-Party Vote-Share					-0.001					-0.006
					(-0.43)					(-1.46)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Worker-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	38024	38024	38024	38024	38024	38024	38024	38024	38024	38024
R^2	0.035	0.035	0.035	0.035	0.035	0.054	0.054	0.054	0.054	0.054

Note: This table reports reduced-form OLS regression results of the effect of loan guarantees on worker-level outcomes, controlling for EU structural funds, subsidies for short-term work, regional bank lending, other Bpifrance programs, and the 2004 regional election. ΔEU funds$_{08-10}$ is the log change of EU structural funds per capita in the region from 2008 to 2010. Short-term work$_{09}$ is the amount of short-term work subsidies per capita in the region in 2009. ΔRegional bank lending$_{08-10}$ is the average log change of loans by the four regional banks (Banque Populaire, Caisses d'Epargne, Credit Agricole, Credit Mutuel) in the region from 2008 to 2010. Other Bpifrance programs$_{region,09-10}$ is the average regional ratio of other Bpifrance programs in 2009-2010 scaled by SME assets, computed excluding firms within 10 miles of a regional border. Left-Party Vote-Share is the vote-share of the left-party in the 2004 regional election. Cumulative earnings are the sum of earnings 2009-2015 scaled by average annual earnings 2006-2008. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), firm-level controls (log of assets, log of firm age, and two-digit industry fixed effects), and worker-level controls (worker age, gender, and occupation fixed effects). Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table A.8
Firm Heterogeneity: First Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Guarantee$_{firm,09-10}$								
	Cash-Flows			Dividends			Tangibility		
	Low	High	Diff	No Div	Div> 0	Diff	Low	High	Diff
Guarantee$_{region,09-10}$	1.115***	0.180	0.935**	1.276***	-0.095	1.372***	0.720**	0.536**	0.184
	(2.95)	(1.36)	(2.70)	(4.72)	(-0.27)	(3.30)	(2.10)	(2.59)	(0.53)
Department-Pair FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Regional Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Worker-level Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	18885	18884	37769	24037	13981	38018	18890	18872	37762
R^2	0.042	0.061	0.049	0.053	0.044	0.056	0.046	0.052	0.049

Note: This table reports first stage OLS regression results for sub-samples along proxies for financial constraints. The dependent variable is the amount of loans a firm received under the recovery plan 2009-2010, scaled by firm assets in 2008. Column (1) and (2) show the results for sub-samples of firms below and above the median firm profitability (profit scaled by assets) in 2008, respectively. Column (3) and (4) split the full sample based on a dummy variable equal to one if the firm paid dividends in 2008. Column (5) and (6) show the results for sub-samples of firms below and above the median firm tangibility, respectively. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border, changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population), firm (log of assets, log of firm age, and two-digit industry fixed effects), and worker controls (worker age, gender, and occupation fixed effects). Firm and worker controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table A.9
Ex ante credit risk of beneficiary firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Firm Credit Risk$_{08}$					
	Sample of firms receiving loan guarantee			All firms $\leq$ 10 miles		
Guarantee$_{region,09-10}$	1.396***	1.208***	1.093**	0.159	0.115	0.189
	(3.51)	(2.96)	(2.61)	(0.68)	(0.66)	(0.99)
Department-Pair FE	Y	Y	Y	Y	Y	Y
Regional Controls		Y	Y		Y	Y
Firm-level Controls			Y			Y
Observations	1115	1115	1115	26282	26282	26282
r2	0.095	0.098	0.163	0.006	0.007	0.056

Note: This table shows the results of regressing firms' initial credit risk in 2008 on the regional treatment intensity. The dependent variable is a firm's decile of credit risk, measured as the inverse of the interest coverage ratio in 2008. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects and distance to the border. Changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population) are added in columns (2) and (5). Firm-level controls added in columns (3) and (6) include log of assets, log of firm age, and two-digit industry fixed effects. Firm controls are measured in 2008. Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

Table A.10
Zombie Lending?

	(1)	(2)	(3)	(4)	(5)
	ROA_{08}	$\Delta Ln(Sales)_{05-08}$	$\Delta Ln(Emp)_{05-08}$	$\Delta Ln(PPE)_{05-08}$	$Ln(Firmage)_{08}$
$Guarantee_{region,09-10}$	-0.030	-0.144	-0.086	0.213	0.217
	(-1.15)	(-0.85)	(-0.57)	(0.73)	(0.94)
Department-Pair FE	Y	Y	Y	Y	Y
Regional Controls	Y	Y	Y	Y	Y
Observations	1119	1035	1035	1035	1119
R^2	0.090	0.104	0.128	0.092	0.085

Note: This table shows the results of regressing firms' pre-period characteristics on the regional treatment intensity within the sample of firms receiving a guarantee. The main explanatory variable is the average regional ratio of loans guaranteed under the recovery plan in 2009-2010, computed across SMEs outside the border area. All regressions include department pair fixed effects, distance to the border and changes in regional controls from 2008 to 2010 (local taxes, equipment expenditures, public debt, and state contribution, all scaled by population). Standard errors are clustered by region. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.