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The employment consequences of SMEs' credit constraints in the wake of the Great Recession

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This paper contains research conducted within the Wage Dynamics Network (WDN). The WDN is a research network comprising economists from the European Central Bank (ECB) and the national central banks (NCBs) of the EU countries. It aims to study in depth the features and sources of wage and labour cost dynamics and their implications for monetary policy.

The WDN initially operated from 2006 to 2009 and resumed activities, in part, in 2013. At present, 25 NCBs participate in the WDN, which is chaired by Juan F. Jimeno (Banco de España), with Ana Lamo (ECB) acting as secretary. The WDN's current research focus is to assess labour market adjustments in the period 2010-13 and firms' reactions to the labour market reforms which took place over this period in EU Member States. For this purpose, in 2014 the network launched an ad hoc survey of firms called the "WDN3 survey".

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The paper is hereto released in order to make the results of WDN's research widely available, in preliminary form, to encourage comments and suggestions prior to final publication. The views expressed in the paper are those of the author and do not necessarily reflect those of the ESCB.

Abstract

This article takes advantage of access to confidential matched bank-firm data relative to the Belgian economy to investigate how employment decisions of small- and medium-sized enterprises (SMEs) have been affected by credit constraints in the wake of the Great Recession. Variability in banks' financial health is used as an exogenous determinant of firms' access to credit. Estimates suggest that SMEs borrowing money from pre-crisis less healthy banks were significantly more likely to be affected by a credit constraint and, in turn, to adjust their labour input downwards than pre-crisis clients of more healthy banks. Yet, findings also indicate that employment consequences of credit shortages have been essentially detrimental for SMEs experiencing a negative demand shock or facing severe product market competition. Finally, results show that credit-constrained SMEs adjusted their workforce significantly more at the extensive margin than their non-constrained counterparts, but also that they relied more intensively on temporary layoff schemes.

Keywords: credit constraints, employment, matched bank-firm data, Belgium, Wage Dynamics Network (WDN).

JEL Codes: D22, G01, G21, J21, J23.

Non-Technical Summary

While the outbreak of the Great Recession caused much economic hardship, it also provided a unique opportunity to gain a better understanding of how corporate employment decisions are affected by credit shortages in bad economic times. Almost a decade after the onset of the crisis, evidence on this important issue remains surprisingly limited. This paper takes advantage of access to detailed matched bank-firm data to investigate whether and how employment decisions of SMEs have been affected by credit constraints in the wake of the Great Recession. To do so, we combined rich data from the third wave of the Belgian Wage Dynamics Survey, covering the period 2010-2013, with confidential data from the Central Corporate Credit Register from the National Bank of Belgium.

Our regression analysis clearly shows that credit matters. Estimates indeed suggest that SMEs borrowing money from pre-crisis financially less healthy banks were significantly more likely to be affected by a credit constraint and, in turn, to adjust their labour input downwards than pre-crisis clients of more healthy banks. More precisely, we find that credit-constrained SMEs were *ceteris paribus* between 40 and 65% more likely to reduce their workforce than their opposite numbers not facing such constraints. This result is robust across types of loan applications that were denied credit (i.e. applications to finance working capital, debt or new investments).

Yet, estimates also show that employment consequences of credit shortages are contingent on the environment in which firms operate. Results indeed indicate that credit constraints have been essentially detrimental for employment among SMEs experiencing a negative demand shock or facing severe product market competition. This outcome is in line with traditional bargaining models predicting that employment adjustment increases with the elasticity of labour demand and the price elasticity of demand in the product market.

Finally, our estimates uncover the strategies that have been adopted by credit-constrained firms to adjust their labour input. Despite the fact that aggregate employment has been fairly resilient in Belgium following the 2008 financial crisis, our results clearly show that credit shortage has been a key factor pushing SMEs to reduce their workforce at the extensive margin, and in particular to rely on individual layoffs, early retirement schemes and reduction of temporary employment. However, estimates also show that credit-constrained SMEs have been significantly more likely to adjust employment at the intensive margin, especially through the use of temporary layoff allowances, than their non-constrained counterparts. This outcome is quite interesting as it suggests that temporary layoff schemes have played a significant role in mitigating the employment effects of the financial crisis in Belgium. Overall, it adds to a growing literature indicating that short-time unemployment compensation for economic reasons may effectively contribute to save jobs during recessions.

1. Introduction

Small- and medium-sized enterprises (SMEs) constitute the core of the European economy. In 2013, they totalled more than 99% of all active European firms and employed roughly 70% of the overall labour force (Muller et al., 2014). Therefore, questions related to the performance of SMEs have attracted a large share of attention in debates concerning the post-2008 crisis and the consequent economic recovery. The focus has notably been on the challenges that SMEs face in terms of credit constraints and especially on how these constraints may potentially initiate consequences on broader economic outcomes.

While a large literature documents how capital market imperfections affect real corporate decisions such as capital and R&D investments (Brown et al., 2009; Gerlach-Kirsten et al., 2015; Love, 2003), studies regarding the employment consequences of credit constraints are much scarcer, particularly in the context of the Great Recession (Campello et al., 2010; Chodorow-Reich, 2014; Duygan-Bump et al., 2015; Fabiani et al., 2015; Siemer, 2014). Evidence on this issue is only available for a limited number of countries and many important questions regarding the nexus between credit shortages and employment still deserve to be investigated. The role of moderating factors (such as product demand and competition) in explaining the labour demand decisions of credit-constrained firms is notably quite under-researched. Also very little is known regarding the various strategies that might be implemented by firms to adjust employment when credit is lacking. On top of this, existing studies must often be considered with caution as adequately controlling for the endogeneity of credit constraints remains challenging, but also because these studies do not always rely on direct information to identify whether firms are credit constrained or not. Finally, most studies focus on all firms independently of their size, though some studies suggest that employment effects of credit shortages are likely to be stronger among SMEs (Chodorow-Reich, 2014, Siemer, 2014).

Our paper is one of the first to rely on detailed matched bank-firm data to investigate the employment consequences of credit constraints among SMEs in the aftermath of the 2008 crisis. We combine data from the third wave of the Belgian Wage Dynamics Survey, covering the period 2010-2013, with confidential data from the Central Corporate Credit Register from the National Bank of Belgium (NBB). To identify a causal effect of credit constraints on employment, we adopt two-stage least squares (2SLS) and bivariate probit estimators. More precisely, we use the variability in banks' financial health, following the Great Recession, as an exogenous determinant of firms' access to credit. Our prior is that firms borrowing money

from pre-crisis less healthy banks had a higher likelihood to be affected by a credit constraint during the crisis, and as a consequence, had to reduce employment more substantially than clients of more healthy banks.

Belgium is a particularly interesting case study. Indeed, while this country has been severely hit by the 2008 financial crisis (e.g. three of the country's largest banks – Fortis, Dexia and KBC – were bailed out, sold off and/or nationalised), the drop in employment was of relatively limited scope compared with neighbouring countries such as France, the Netherlands and also with the EU average (Cornille, 2015). Put differently, though business funding has been under considerable pressure (Piette and Zachary, 2015), employment has been fairly resilient. Hence, it deserves to be investigated whether credit constraints among SMEs have had any significant employment effects in this specific context. Moreover, since the preservation of employment in Belgium has been attributed to various flexibility mechanisms (such as temporary lay-off allowances[1]), focusing on the various channels by which credit-constrained SMEs may have had adjusted their labour input is of particular interest.

Our data enable us to estimate and compare the employment effects of different types of credit constraints. More precisely, we test whether employment effects vary according to: i) the type of loan application that was denied (i.e. loans to finance working capital, investments and/or debt), and ii) whether firms faced 'quantitative' or 'cost' credit constraints (i.e. whether credit was not available or whether the conditions to borrow money were too onerous). We also add to the literature by examining the role of two moderating factors, namely demand shocks and product market competition. Theoretically, we expect employment consequences of credit constraints to be stronger among SMEs operating in strong competitive environments and/or hit by a negative demand shock. Finally, we investigate in greater depth the different strategies that might be implemented by credit-constrained firms to adjust employment. We first distinguish between the adjustment of labour at the extensive and intensive margins. Next, we study the different channels that can be used by firms to procure these adjustments.

[1] These are short-time working allowances, also known under the heading 'chômage temporaire' (i.e. 'temporary unemployment'). "These allowances (…) provide a framework in which employers can adjust employees' working time in response to a variety of external circumstances including economic reasons, with the state mitigating the impact on employee remuneration via the state unemployment benefit system. (…) Additional allowances that further cushion the pay of employees on short-time work feature in collective agreements at company and industry level." (Hurley, 2010) Eligibility for these allowances, traditionally restricted to blue-collar workers, has been extended to white-collars in the Law of 19 June 2009 as part of a series of anti-crisis measures.

The remainder of this paper is organised as follows. A literature review is provided in the next section. Sections 3 and 4 describe our data and estimation strategy. Descriptive statistics and econometric results are presented in sections 5 and 6. The last section concludes.

2. Review of the literature

A large literature has been dedicated to identifying factors at the root of firms', and in particular SMEs', financial constraints (Beck et al., 2006, 2008; Fazzari, 1998). Factors put forward to explain differences in firms' access to external financing include, among others, the ownership structure of the firm, its age, size and sectoral affiliation but also certain country-specific characteristics like the degree of development of the financial market (Angelini and Generale, 2008; Coluzzi et al., 2009; Demirgüç-Kunt and Maksimovic, 1998). Overall, this literature suggests that financial constraints are sizeable but quite heterogeneous across firms, industries and countries. Drawing on detailed survey data for the euro area in 2009, Ferrando and Griesshaber (2011) show for instance that age and ownership are the most important predictors of firms' perceived financial obstacles in all investigated countries, while estimates for size and economic branches are found to be less robust. In contrast, using survey data collected by the World Bank between 1999 and 2000 for five major euro area countries (France, Germany, Italy, Portugal and Spain), Colussi et al. (2009) show that young and small firms are significantly more likely to be credit-constrained. They also find substantial differences across sectors within countries, with higher constraints in the manufacturing and construction industries than in the services sector. From a cross-country perspective, estimates of Ferrando and Ruggieri (2015), based on Amadeus accounting data for several EU countries (Belgium, Germany, Spain, Finland, France, Italy, the Netherland and Portugal) over the period 1995-2011, suggest that firms in Italy and Portugal are the most affected by financial constraints, while those in Germany and the Netherland are the most immune.

Another strand of the literature focuses on the economic consequences of financial constraints. Interest in this issue has become particularly critical since 2008. The Great Recession indeed increased the need to better understand how firm's real decisions are affected by a financial crisis and the role of firms' access to credit in boosting economic recovery. Given that the crisis sparked a huge increase in unemployment rates among many advanced economies, a few recent papers have focused on the extent to which firms' credit constraints and employment policies have been interconnected during the Great Recession.

Empirical contributions examining the employment consequences of credit constraints with data from *before* the Great Recession include most notably Hernando and Martinez-Carrascal (2008). Relying on balance sheet data relative to Spanish firms over the period 1985-2001, their GMM-system estimates show that firms facing high financial pressure (assed through firms' debt burden, indebtedness and profitability) have substantial lower employment growth rates. The authors control for the endogeneity of firms' financial position using internal instruments (i.e. lagged values of explanatory variables in levels and first-differences, respectively). Nickell and Nicolitsas (1999) also examined the impact on employment of increases in firm-level financial pressure. Using accounts data for a sample of U.K. manufacturing companies over the period 1972-1986, they find that the ratio of interest payment to cash flow (i.e. financial pressure) has a large negative effect on employment. This effect is identified using as an instrument firms' lagged debt burden interacted with the current shift in the yield on Treasury bills.[2] Also focusing on balance sheet data from U.K. manufacturing companies, but for the 1994-2004 period, Spaliara (2009) finds that the capital-labour ratio is sensitive to firm-specific characteristics (i.e. cash flow, leverage, collateral and interest burden), especially in firms that are more likely to face a financing constraint. Accordingly, the authors conclude that U.K. authorities should help constrained firms to avoid shortage of credit (especially during bad economic times) so as to preserve jobs. This conclusion is drawn on the basis of a GMM first-differenced estimator. Endogeneity is thus controlled for using internal instruments (lagged levels of explanatory variables).

The literature on credit constraints and corporate employment decisions *in the wake of* the Great Recession, i.e. using post-2008 data, is quite limited. Campello et al. (2010) surveyed 1,050 Chief Financial Officers (CFOs) in the U.S., Europe and Asia to assess whether or not their corporations were credit-constrained in 2008 and, in turn, to study if these financial constraints had any real corporate effects, notably on employment. Using a matching estimator approach, i.e. pairing-up constrained and unconstrained companies facing similar economic circumstances, they find that financially constrained firms planned to cut more employment relative to financially unconstrained firms during the crisis. Although quite appealing, their matching approach applied to survey data may not be completely 'bullet-proof' to potential endogeneity issues. Indeed, 'CFOs may by themselves not be able to

[2] The use of lagged values of the debt burden aims to ensure that they are uncorrelated with current employment shocks. Moreover, exogenous shifts in interest rates (i.e. in the Treasury bill yield), instituted by government policy over the sample period, are expected to have a bigger impact, the greater the debt burden faced by the firm.

separate economic from financial effects when responding to a survey' (Campello et al., 2010: 471). Duygan-Bump et al. (2015) investigated the link between small business lending and unemployment during the Great Recession in the U.S.. Combining information from the Current Population Survey with firms' financial data for 2007-2009, they find that workers in small firms were more likely to lose their jobs than their opposite numbers in large firms, but only if they were employed in more financially distressed industries. Identification of credit supply effects is achieved through the use of industry-level measures of external finance dependence. Siemer (2014) also suggests, on the basis of detailed firm-level panel data for 2007-2009, that financial constraints in the U.S. were more detrimental to employment growth in smaller firms. As in Campello et al. (2010), his identification strategy relies on the comparison of estimates for sectors with high and low external finance dependence. The study of Fabiani et al. (2015), based on harmonised data for 9 European countries for 2007-2009, shows that permanent and temporary employees' likelihood to be dismissed was significantly bigger among credit-constrained firms. However, endogeneity of credit constraints is not explicitly addressed in their analysis.

Our paper is more closely related to the few existing studies employing matched bank-firm data to investigate how shocks to bank balance sheets affected firms' employment decisions during the Great Recession. The latter notably include the study of Chodorow-Reich (2014) for the U.S.. The author shows that credit-constrained SMEs were significantly more likely to reduce employment than their non-credit-constrained counterparts. In contrast, they find no significant effect of credit constraints on employment among larger firms. Firm credit constraints are instrumented by lenders' financial health, i.e. the change in the loan supply to each of their borrowers before and after the Great Recession. The analysis of Popov and Rocholl (2015), based on detailed German data, shows that employment decline has been significantly stronger among firms (especially smaller ones) that have been hit by a credit constraint. Their instrument for firm credit constraints is a dummy indicating whether or not the firm had a credit relationship with a bank affected by the U.S. subprime mortgage crisis. Gerlach-Kristen et al. (2015) also find a negative and significant effect of credit constraints on the employment level of SMEs in the Irish economy. Their instrumental variables for credit constraints include: i) two binary indicators for the ownership of the bank, and ii) a dummy taking the value one if the firm believed – on the basis of factors not related to her own experience – such as media reports, lobby groups or business peers – that banks were not lending.

In sum, studies investigating the employment consequences of the 'sharpest credit shortage in nearly a century' (Campello et al., 2010: 486) are scarce and focused on a limited number of countries. Moreover, they leave the door open for further developments. Besides the fact that adequately controlling for the endogeneity of credit constraints remains challenging, a first important avenue for research but also for policy boils down to get a better understanding of moderating factors, and especially of how the nexus between credit shortage and employment is affected by product market demand and competition. Another under-researched issue refers to the channels through which credit-constrained firms might adjust their labour input, e.g. at the extensive or intensive margin. This is an important question for policymakers as adjustment at the intensive margin (e.g. through the various short-time and temporary layoff schemes that have been made available to firms in many advanced economies during the crisis) contributes to mitigate job destruction. The objective of this paper is to improve our comprehension of these key issues taking advantage of access to detailed matched bank-firm data, for a representative sample of SMEs in Belgium, which: i) include direct information on several types of credit constraints and employment adjustment strategies, alongside various covariates for workforce composition, firm characteristics and other aspects of the economic environment, and ii) enable us to instrument firms' access to credit by the variability in banks' financial health following the Great Recession.

3. Data

Our empirical analysis is based on a Belgian firm-level survey undertaken within the Wage Dynamics Network (WDN) of the ESCB (i.e. the European System of Central Banks). This survey (i.e. the so-called 3rd wave of the Belgian WDN survey) has been conducted by the National Bank of Belgium (NBB) in June and September 2014. It includes questions on firms' perception of the nature of the changes in the economic environment that have resulted from the sovereign debt crisis, their reactions to these changes and the role of financial constraints.[3] More precisely, it broaches the changes that occurred in the economic environment during the course of the 2010-2013 period, by identifying the type and intensity of the shocks that might have affected companies. It also provides detailed information on the structure and adaptation of labour forces in the companies questioned.

[3] A copy of the questionnaire can be found on the NBB's website (see www.nbb.be/en/wage-dynamics-network-wdn-3).

The survey covers firms employing at least 5 workers and less than 250 workers in the manufacturing and building industries, trade, business services and the financial sector.[4] The sectors covered by the survey together account for 52% of employment in Belgian firms (excluding self-employed). The survey was sent out by surface mail, with the option of using an electronic format version. In total, 991 firms participated in the survey, giving a response rate of 21%. Given the length of the questionnaire, this can be considered as satisfactory. While the participating firms make up 1.7% of the total number of firms, they account for 5.4% of total employment. Unfortunately, the response rate for the energy sector was zero, while it was relatively high for the financial sector. However, interpretations of the results for the financial sector have to take into account the low number of participating firms.[5] In terms of response behaviour by questions, the response rate is on average higher than 95% and varies between 100% and 83%. The answers are consistent with information from other sources (Cornille, 2015).

The survey results have to be weighted in order to make them representative of the underlying population of firms. To this end, the population has been sub-divided in strata according to sector of activity and number of workers. The weighting coefficients correspond to the ratio of the population of firms within each stratum and the number of firms that replied to the survey questionnaire in each stratum. Descriptive statistics and econometric results presented in this paper are weighted in this way. Around 140 firms had to be left out due to missing replies. Our final sample thus includes circa 850 firms.[6] Overall, it is representative of private-sector firms employing between 5 and 250 workers, with the exception of the energy sector.

To identify a causal effect of credit constraints on employment, endogeneity (i.e. reverse causality) issues have to be addressed. Therefore, we rely on two-stage least squares (2SLS) and bivariate probit models. Following existing research (Chodorow-Reich, 2014; Clarke et al., 2006; Gerlach-Kirsten et al., 2015), our instruments are mainly drawn from the characteristics of the firms' main bank (see next section for more details). This information is not available in the WDN survey. Therefore, the latter has been merged with data from the Central Corporate Credit Register (CCCR) from the NBB. This merger reduces the number of firms in our sample by 36%, i.e. from 850 to around 540 firms. This drop in sample size

[4] Although the sample design did not contain an explicit upper threshold for firm size, in practice almost 99% of firms that were surveyed employed less than 250 workers. Given our focus on SMEs, firms employing 250 workers or more have been dropped.
[5] For more details on the sample design and its representativeness see Cornille (2015).
[6] The exact number of firms varies slightly across regressions as the number of observations with missing replies depends on the type of credit constraint under investigation and on the instrument set.

derives from the fact that a certain number of firms have no bank credit at all, have only bank credits outside Belgium, or are part of bigger corporations which have their own bank credits. The magnitude of the attrition is coherent with more aggregate evidence from credit register data and the distribution of firm size in our sample (Piette and Zachary, 2015). The impact of attrition on the composition of our sample and hence on its representativeness is very limited. Indeed, as discussed below, descriptive statistics remain remarkably stable after sample reduction.

4. Estimation strategy

4.1. Baseline specification

Our empirical investigation is made of two steps. First, we test the employment consequences of credit constraints with a linear probability model (LPM). More precisely, we estimate by ordinary least squares (OLS), the following firm-level equation:

$$Employment_i = \alpha + \beta\ CC_i + \lambda\ X_i + \varepsilon_i \qquad (1)$$

The dependent variable in equation (1) is a dummy taking the value 1 if the firm *i* needed to significantly reduce its labour input or to alter its composition between 2010 and 2013, and 0 otherwise. The main explanatory variable CC_i is a binary variable taking the value 1 if the firm has been affected by a credit constraint between 2010 and 2013, and 0 otherwise. The WDN survey contains different questions to identify credit constraints. Hence, we considered two definitions of credit constraints, namely whether a firm experienced: a) a decrease in access to external financing through the usual financial channels (*Decreased access*$_i$), and b) a quantitative credit constraint, i.e. the firm replied that credit of any type was unavailable (*Quantitative constraint*$_i$).

Firm-level covariates are contained in the vector X_i. In selecting these covariates, we draw on existing research which suggests to control for workforce composition, firm characteristics and other aspects of the economic environment (Chodorow-Reich, 2014; Gerlach-Kirsten et al., 2015; Siemer, 2014).[7] Accordingly, X_i includes the share of the workforce within firm *i* that has at most 5 years of tenure; the proportion of high-skilled

[7] Given the cross-sectional nature of our data, we cannot control for firm time-invariant unobserved heterogeneity.

workers among both blue- and white collars (i.e. ISCO codes 1-3 and 7-8); the sectoral affiliation (4 dummies), age (in years) and size (i.e. the total number of employees) of the firm; a dummy taking the value 1 if the degree of competition on the market for the firm's main product/service is severe or very severe, and 0 otherwise (i.e. if it is moderate or weak); and a binary variable taking the value 1 if the level of demand for the firm's products/services has been decreasing moderately or strongly during 2010-2013, and 0 otherwise (i.e. if it remained unchanged or increased).

OLS estimates of qualitative response models, such as equation (1), are generally considered to be reliable when predicted probabilities are close to 0.5 (Wooldridge, 2002). This is because the underlying conditional expectation function (CEF) is roughly linear in the middle. Moreover, numerous arguments are provided in the literature for preferring the LPM to logit/probit models, e.g. presence of a weighting scheme (Angrist and Pischke, 2009), ease of interpretation (McGarry, 2000) and perfect multicollinearity associated to probit estimates in specific contexts (Reiley, 2005). Nevertheless, the main shortcoming of LPM estimates is that they are not bounded to the unit interval. More precisely, Horrace and Oaxaca (2006) demonstrate that the potential bias associated to the LPM is proportional to the share of LPM predicted probabilities that fall outside the unit interval.[8] Hence, to check the robustness of our results, we systematically examine the concordance of LPM estimates with marginal effects from a probit model.

4.2. Instrumental variables and exclusion restrictions

When studying the employment consequences of credit constraints, an important econometric issue that has to be addressed is endogeneity (i.e. reverse causality). The argument is that firms might reduce their labour input because they faced a credit constraint. Yet, it is also possible that firms don't get the required funding because they have financial difficulties, which led them to lay off workers. Hence, the second step of our estimation strategy boils down to address this potential endogeneity issue. To do so, we first rely on two-stage least-squares (2SLS). This method consists in finding instrumental variables (IV), which are at the same time highly correlated with the endogenous variable (i.e. credit constraints) and uncorrelated with firm-level changes in employment. We use as instruments for credit

[8] However, according to Wooldridge (2002: 455): "If the main purpose is to estimate the partial effect of [the independent variable] on the response probability, averaged across the distribution of [the independent variable], then the fact that some predicted values are outside the unit interval may not be very important".

constraints various characteristics of firms' main banks. More precisely, to measure credit availability to firm *i*, we first rely on the % change in the number of loans made by the firm's *i* main bank to all borrowers other than firm *i* before (i.e. October 2005 – June 2007) and after (i.e. October 2008 – June 2011) the crisis.[9] This variable reflects the financial health of the firm's main bank. The bigger, i.e. the more positive, the value of this variable, the healthier the lender is expected to be. As in Chodorow-Reich (2014), we thus use the variability in lender's health as an exogenous determinant of the firm's access to credit. Our prior is that firms borrowing money from pre-crisis less healthy lenders had a higher likelihood to be affected by a credit constraint during the crisis, and as a consequence, had to reduce their labour input more substantially than clients of more healthy banks.

To address endogeneity, we also use as IV (in some specifications) a binary variable indicating whether the firm's main bank is of foreign origin, i.e. either a branch or a subsidiary of a foreign bank. The literature suggests that foreign-owned lenders may apply different allocation criteria than domestic ones (Clarke et al., 2006; Gerlach-Kristen et al., 2015; Ongena and Sendeniz-Yüncü, 2011). Although the empirical evidence is still unsettled, some papers (e.g. Dell'Ariccia and Marquez, 2004; Gianetti and Ongena, 2012) for instance suggest that foreign-owned banks are less likely to grant loans to soft information borrowers (i.e. borrowers that are more difficult to observe and to monitor), such as smaller enterprises. Moreover, banks of foreign origin all rely, at least partially, on funding from their parent. Hence, their decision to grant loans to domestic firms will be influenced by the financial health of the holding to which they belong. Overall, this implies that firms borrowing money from foreign-owned banks before the crisis may have had a credit constraint between 2010 and 2013 not because of their own economic situation, but due to the financial distress of the parent bank. To strengthen our IV strategy, aiming to capture the variability in lenders' health, we also adopt in some regressions a more direct approach by including dummies identifying the main bank of each firm. In a few specifications, we furthermore control for the number of banks to which firms have been borrowing money during the 2010-2013 period. The intuition is that firms with a more diversified panel of lenders may have had *ceteris paribus* easier access to credit because not all banks had the same financial difficulties and hence the same tight lending criteria during the crisis.

In addition to these bank characteristics, we use as IV the risk of default of each firm as evaluated by its main bank (in 2012 and/or 2013). The rationale for including this variable

[9] To take bank size into account, as in Chodorow-Reich (2014), this % change is normalised by the number of loans made by the firm's main bank before the crisis.

among IVs is that many firms with a somewhat higher, but not excessive, risk of default had more difficulties to borrow money (as most banks reduced their loans and gave priority to their best clients during the crisis) even though the financial situation of those firms didn't require them to adjust their labour input. Finally, in a few specifications, we also include a dummy indicating whether the firm is composed of different establishments. Our prior is that, at given firm size, multi-establishment firms might be less credit constrained than their mono-establishment counterparts because having different sites of production/sales is likely to reduce the overall financial risk. However, it could also be argued that multi-establishment firms have more complex financial accounts, which in turn will make their credit risk, as perceived by lenders, higher.

Various diagnoses tests are performed when running 2SLS regressions. The latter explore respectively the acuteness of the endogeneity issue in our data and the quality of our instruments. More precisely, we first compute the Kleibergen-Paap statistic for weak identification. It is a Wald *F* statistic testing whether the excluded instruments are sufficiently correlated with the endogenous regressor. The null hypothesis is that the instruments are weak. We rely on the standard 'rule of thumb' that weak identification is problematic for F-statistics smaller than 10 (as suggested by van Ours and Stoeldraijer, 2011). Next, we examine the validity of our instruments with Hansen (1982) test of overidentifying restrictions. Under the null hypothesis the instruments are valid, i.e. uncorrelated with the error term. Finally, we compute an endogeneity test with the null hypothesis that the credit constraint can actually be considered as exogenous. The test is based on the difference of two Sargan-Hansen statistics: one for the equation in which the credit constraint is treated as endogenous, and one in which it is treated as exogenous. If the null hypothesis of this test cannot be rejected, then instrumentation is actually not necessary. In order to be as parsimonious as possible, we limit the number of IVs in the first step of our 2SLS regressions. More precisely, we report 2SLS estimates that: i) pass both the weak instruments and over-identification tests, and ii) include the smallest number of instruments.

The traditional approach to control for endogeneity is the 2SLS estimation. However, since both the dependent variable and the potentially endogenous variable are binary the use of 2SLS might be criticized. Therefore, we also use a bivariate probit model to check the robustness of our results. The relevance of the bivariate model compared to the single probit model is verified with a Wald test examining whether the correlation of the error terms of the two probit regressions is significantly different from zero. If the test rejects the null

hypothesis of no correlation between the two error terms, the bivariate probit is recommended.

4.3. Sensitivity analysis

To gain a better understanding of the effect of credit constraints on the adjustment of employment within firms, a series of sensitivity tests are performed.

Our benchmark specification, i.e. equation (1), focusses principally on the employment effects of quantitative credit constraints, i.e. whether credit was available to a firm or not. Yet, the WDN survey also contains information on cost constraints, i.e. whether credit was available but the conditions (interest rates and other contractual terms) were too onerous (*Cost constraint*$_i$). A first sensitivity test thus aims to examine if the employment consequences of quantitative and cost constraints are comparable in terms of magnitude and significance.

The literature suggests a number of channels through which credit constraints may affect the employment decisions of firms (Campello, 2003; Nickell and Nicolitsas, 1999; Spaliara, 2009). A first channel is credit availability to finance working capital. As working capital loans are meant to finance everyday expenses related to the daily operation of a business (e.g. to cover unexpected costs, pay employee wages), they are very likely to have a direct impact on the firm's employment decisions. Another channel is credit to finance investments. If a company cannot borrow as much as she wants to invest in capital goods, she is likely to recruit less workers to complement the new fixed asset. This is the expected outcome if one assumes that capital and labour are complementary inputs, i.e. that the capital-labour ratio remains relatively stable. For higher degrees of substitutability between labour and capital, the outcome may be different. Indeed, the firm could than choose to decrease its capital-labour ratio by hiring more workers than initially planned as a compensation strategy. A third channel is credit availability to refinance debt. Firms willing to refinance their debt may want to take advantage of a better interest rate (reduced monthly payment or term) or to reduce/alter the risk relative to their debt (e.g. by switching from a variable-rate to a fixed-rate loan). However, it may also be a strategy for financial distressed borrowers to restructure their debt, i.e. to free up cash (e.g. by negotiating lower monthly payments for a longer term). Most firms that are denied credit to refinance their debt are probably in the second situation. Hence, the employment consequences of this type of credit constraint are likely to be negative. To sum up, our second sensitivity test aims to examine how these different channels of credit

constraints affect firms' employment responses. To do so, we break down WDN data on financial constraints by type of loan application made, focusing on applications for working capital, new investments and debt refinancing.

Next, we investigate two potentially important moderators. On the one hand, we examine the role of demand shocks. More precisely, we test whether firms experiencing credit constraints had to adjust employment more substantially when they were hit concomitantly by a negative demand shock. To do so, we re-estimate equation (1) separately for: i) firms reporting a moderate or strong decrease in the demand for their main product/service, and ii) those whose demand remained unchanged or increased between 2010 and 2013. Clearly, we expect employment consequences of credit constraints to be stronger among the former group of firms. On the other hand, we test the moderating role of firms' product environment. To do so, we re-estimate equation (1) separately for: i) firms facing severe or very severe competition on their main product/service market, and ii) those facing moderate or weak competition. Traditional bargaining models, e.g. 'right-to-manage' or 'efficient bargaining' (Cahuc and Zylberberg, 2014), suggest that employment adjustment should increase with the elasticity of labour demand and the price elasticity of demand in the product market. Accordingly, we expect employment responses to be stronger among firm operating in more competitive markets. [10]

Finally, we investigate in greater depth the different strategies that can be implemented by firms to adjust employment following a credit constraint. We first distinguish between the adjustment of labour at the extensive and intensive margins. Next, we study the different channels that can be used by firms to procure these adjustments. For the extensive margin, we focus in turn on: collective layoffs, individual layoffs, adjustment of temporary employment and early retirement. As regards the intensive margin, we examine respectively temporary layoffs (for economic reasons) and reductions of working hours (subsidised or not).

[10] Theoretically, *wage* responses to credit constraints are also expected to be stronger in more competitive markets. Although this issue is beyond the scope of our paper, descriptive statistics from the WDN survey show that between 2010 and 2013 (a period characterised by near-zero inflation) only 0.6% (1.6%) of firms cut basic wages (flexible wage components), while 33% of firms reduced their labour input. Overall, this suggests that if credit constraints have had any impact on the labour force in Belgium, it should be in terms of quantity rather than in terms of prices. This conclusion is not surprising in light of earlier findings showing the prevalence of strong real downward wage rigidity in Belgium (Babecky et al., 2010; du Caju et al., 2012).

5. Descriptive statistics

Table 1 presents summary statistics for all variables included in our econometric analysis. Results show that 33% of firms in our sample reduced their labour input or had to alter its composition between 2010 and 2013. 31% of firms declared they adjusted labour at the extensive margin, while 21% did so at the intensive margin. As regards channels to adjust labour at the extensive margin, 28% of firms reported that they relied on individual layoffs and 17% on temporary employment adjustment. Collective layoffs and early retirement schemes have been used by a much smaller proportion of firms (respectively, 1 and 8%). To adjust labour at the intensive margin, firms heavily relied on temporary layoffs (17%). In contrast, only 8% of firms decided to reduce working hours.

About credit constraints, 25% of firms declared that they experienced a moderate or strong decrease in access to external financing between 2010 and 2013, 27% replied that they faced a quantitative constraint (i.e. credit was not available) and 23% a cost constraint (i.e. credit was available but the conditions – interest rate and other contractual terms – were too onerous). In addition, around 15% of firms responded they were denied credit to finance working capital or to refinance their debt, while around 20% could not borrow money to make a new investment. Concerning workforce characteristics, results indicate that firms in our sample have on average 37% of workers with at most 5 years of tenure and 43% of high-skilled workers (among both white and blue collars). On average, firms employ 35 workers and have been established around 36 years ago. The sectoral distribution of firms is as follows: business activities (37%), trade (29%), manufacturing (16%), construction (14%) and financial intermediation (3%). Regarding other aspects of the economic environment, statistics indicate that 52% of firms experienced a moderate or strong decrease in the demand for their products/services between 2010 and 2013, while 81% faced severe or very severe competition on their main product/service market.

[Insert Table 1 about here]

To address potential endogeneity, the WDN survey has been merged with data from the CCCR. As highlighted in section 3, this merger reduces the number of firms from 850 to around 540. The impact of this attrition on the composition of our sample and hence on its representativeness is very limited. Indeed, most descriptive statistics reported in Appendix 1 remain remarkably stable. This said, a few differences can be highlighted. First, we find that

firms are slightly smaller in the merged sample (the average number of employees decreases from 35 to around 30). Second, the share of firms that have experienced a credit constraint becomes somewhat bigger (notably when focussing on the quantitative constraint's variable which increases from 27 to 33%). Finally, the share of firms operating in the financial intermediation sector drops from 3 to 0%.[11] Overall, our sample is representative of firms employing between 5 and 250 workers in the manufacturing and building industries, trade and business services.[12]

6. Regression analysis

6.1. Benchmark estimates

OLS estimates of equation (1) are reported in columns (1) and (2) of Table 2. They show that credit constraints have had a significant positive effect on the likelihood of firms to reduce their labour input between 2010 and 2013.[13] The regression coefficients associated to credit constraints stand respectively at 0.083 and 0.099. This implies that firms facing credit constraints were *ceteris paribus* between 8 and 10 percent more likely to adjust their workforce downwards than their opposite numbers not facing such constraints. As a robustness test, we computed marginal effects from probit regressions. The latter, reported in columns (3) and (4) of Table 2, lead to the same conclusion. The magnitude and significance of employment effects are indeed very similar when applying OLS or probit estimators. Regression coefficients associated to covariates are also generally found to be significant. As anticipated, they notably show that firms experiencing a decrease in the demand for their product or facing strong competition on their market were more likely to reduce their labour force. Moreover, while the probability to adjust labour downwards appears to be significantly bigger among firms employing a larger share of workers with less than 5 years of tenure, the opposite outcome is observed (in the probit regression) for firms with more high-skilled workers. These results are compatible with the idea that firms can more easily lay off workers when adjustment costs are lower, i.e. when workers' tenure and/or skills are more limited.

[11] Descriptive statistics for the instrumental variables (excluding restrictions) used in the 2SLS (bivariate probit) regressions are reported in Appendix 2.
[12] The energy and financial intermediation sectors are not covered.
[13] The dependent variable in Table 2 is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or to alter its composition between 2010 and 2013, and 0 otherwise.

Yet, these estimates should be taken with caution as endogeneity (i.e. reverse causality) could be an issue. Put differently, estimates might be biased because the relationship between employment adjustment and credit constraints could go in both directions. To address this potential issue, we first re-estimated equation (1) with 2SLS using as instruments proxies of banks' financial health in addition to selected firm characteristics (see section 4.2). Results are reported in columns (1) and (2) of Table 3. The *p*-values associated to the endogeneity test are equal to 0.03 and 0.09, respectively. This suggests that the null hypothesis of no endogeneity can be rejected at traditional probability levels, i.e. 2SLS estimates should be preferred to those obtained by OLS. Furthermore, we find that the test statistic for weak identification is always bigger than 10, which implies that our instruments are not weak. This is also illustrated by our first stage regressions. Estimates, reported in columns (1) and (2) of Appendix 3, indeed show that most instruments are significant with the expected sign. For instance, we find that the percentage change in the loan supply of the main bank of a firm (before and after the crisis)[14] decreases significantly the probability of that firm to be effected by a credit constraint. Put differently, results indicate that firms borrowing money from more healthy lenders before the Great Recession (i.e. banks whose loan supply was least affected by the crisis) had a lower likelihood to be credit constrained after the crisis. We also find that many bank dummies are statistically significant in column (2). This again suggests that firms' difficulties to borrow money were at least partly driven by the severity of the financial distress of their main bank. Lastly, estimates confirm that access to credit was tighter among firms whose risk of default (as evaluated by their main bank) was higher. Concerning the quality of our instruments, we further find that the *p*-value associated to the Hansen's *J* overidentification test (see columns (1) and (2) of Table 3) is equal to 0.50 and 0.34, respectively. This implies that our instruments are valid, i.e. we cannot reject the exogeneity of the latter.

As regards 2SLS regression coefficients, they again show that credit constraints have had a highly significant and positive effect on the probability that firms adjusted their labour input downwards between 2010 and 2013. More precisely, they indicate that firms facing credit constraints were *ceteris paribus* between 41 and 68 percent more likely to reduce their labour input. These estimates are much bigger than those obtained by OLS and probit. Accordingly, it appears that causal employment effects of credit constraints are substantially

[14] As noted in section 4.2., the exact definition of this variable is as follows: % change in the number of loans made by the firm's *i* main bank to all borrowers other than firm *i* before (i.e. October 2005 – June 2007) and after (i.e. October 2008 – June 2011) the crisis, normalized by the number of loans made by the firm's *i* main bank before the crisis.

under-estimated when endogeneity is not controlled for. A similar finding is reported by Chodorow-Reich (2014: 41) using U.S. data.

As a robustness test, we computed marginal effects from bivariate probit regressions using the same covariates and excluding restrictions (i.e. instruments) as in our 2SLS specifications. Results, reported in columns (3) and (4) of Table 3, first show that bivariate probit estimates should be preferred to simple probit ones. Wald test statistics are indeed highly significant (*p*-values equal to 0.00) both in columns (3) and (4). Furthermore, estimates confirm the positive and significant effect of credit constraints on employment adjustment. Marginal effects from our bivariate probit regressions are respectively equal to 0.41 and 0.37, which is relatively close to our 2SLS estimates.

In sum, our regression analysis clearly highlights that credit matters. We find indeed that firms borrowing money from pre-crisis less healthy banks were more likely to be affected by a credit constraint and, in turn, to adjust their labour input downwards than pre-crisis clients of more healthy lenders.

6.2. Sensitivity tests

In this section, we test the sensitivity of our findings by: i) examining the employment effects of cost rather than quantitative credit constraints, ii) differentiating quantitative constraints by type of loan application that has been denied, iii) investigating the moderating role of demand shocks and product market competition, and iv) exploring the different strategies that have been implemented by credit-constrained firms to adjust employment (see discussion in section 4.3).

Results in Table 4 show OLS, 2SLS, probit and bivariate probit estimates relative to cost credit constraints, namely a dummy variable taking the value one if a firm declared that credit was available between 2010 and 2013 but that the conditions (interest rates and other contractual terms) were too onerous, and zero otherwise. Independently of the estimator adopted, regression coefficients associated to this variable are always found to be insignificant at standard probability levels. This outcome suggests that firms that had to cope with more stringent credit conditions (i.e. to face cost credit constraints) were still able to borrow enough money, at sufficiently good terms and conditions, so as to keep employment unaffected. It thus appears that cost constraints have had a much less detrimental impact on employment than quantitative constraints.

Regressions examining the employment effects of quantitative credit constraints according to the type of loan application that was denied (i.e. loans to finance working capital, new investments and debt, respectively) are reported in Table 5. OLS estimates (which, according to the endogeneity test, should be preferred to 2SLS results) indicate that firms that have had a credit constraint were, depending on the type of denied credit, between 8 and 13 percent more likely to adjust their workforce downwards than their opposite numbers not affected by such constraint. Similar results are obtained with a discrete choice model (see columns (1'') to (3'') of Table 5). Yet, the magnitude of estimates is much larger in this case. Bivariate probit estimates (which, according to Wald χ^2 statistics, should be preferred to simple probit ones) indeed vary between 0.387 and 0.441.[15] As regards the relative size of employment effects, it appears to be quite similar across types of loan applications. Yet, regression coefficients are found to be significantly, though modestly, bigger (according to the bivariate probit estimator) for credit shortages associated to debt refinancing instead of working capital and new investments.

In order to test the role of demand shocks in explaining employment effects of credit constraints, we re-estimated equation (1) according to whether or not firms reported a decrease in the demand for their products/services between 2010 and 2013. OLS and 2SLS results, reported in Table 6, reveal that credit constraints are only statistically significant among firms that experienced a negative demand shock. More precisely, we find that credit constrained firms, affected by a decrease in their demand, were *ceteris paribus* between 63 and 80 percent more likely to adjust their labour input downwards. On the opposite, estimates show that credit constraints had no significant employment effects among firms with a stable or increasing demand. Results based on probit and bivariate probit regressions, reported in Appendix 4, deliver the same message. Hence, we may conclude that access to credit is mostly important for employment when demand is falling.

Moreover, to examine the role of firms' product environment, we re-estimated equation (1) according to whether or not firms were facing strong competition on their main product/service market between 2010 and 2013. Estimates, shown in Table 7 and Appendix 5, clearly indicate that credit constraints had a substantially stronger impact on employment among firms operating in strongly competitive markets. We find indeed that credit-constrained firms were *ceteris paribus* between 43 and 78 percent more likely to reduce their labour input than not credit-constrained ones when operating in strongly competitive markets.

[15] Note that bivariate probit estimates are probably more reliable than those obtained by OLS and 2SLS as predicted probabilities are in this case less close to 0.5 (see discussion in section 4).

In contrast, credit constraints are found to have a non-significant effect on employment among firms operating in weakly competitive markets. In line with theoretical expectations, our findings thus suggest that credit constraints matter for employment especially among firms facing strong product market competition.

Finally, we explored the different strategies that have been implemented by credit-constrained firms to adjust employment. To do so, we first re-estimated equation (1) using as outcome variable employment adjustment along the extensive and intensive margins, respectively. When focusing on the extensive margin, the dependent variable is a dummy taking the value 1 for firms that relied (marginally, moderately or strongly) on i) collective layoffs, ii) individual layoffs, iii) non-renewal of temporary contracts at expiration and/or reduction of agency work, and/or iv) early retirement schemes between 2010 and 2013; and 0 otherwise. When exploring employment adjustment along the intensive margin, the dependent variable is a dummy taking the value 1 for firms that relied (marginally, moderately or strongly) on i) temporary layoffs (for economic reasons), and/or ii) subsidised and/or non-subsidised reduction of working hours (including reduction of overtime) between 2010 and 2013; and 0 otherwise. To get a better understanding of credit-constrained firms' strategies to reduce their labour input, equation (1) has also been re-estimated using as outcome variable each of these (extensive and intensive) adjustment channels separately.

Estimates regarding employment adjustment at the extensive margin are reported in Table 8. 2SLS estimates and marginal effects from bivariate probit regressions (which, according to the endogeneity and Wald tests should be preferred to OLS and probit estimates) indicate that credit-constrained firms were *ceteris paribus* between 37 and 61 percent more likely to adjust employment at the extensive margin than non-constrained firms. Among the various channels that can be used to attain this goal, results reported in Table 9 show that credit-constrained firms essentially relied on individual layoffs, early retirement schemes and reduction of temporary employment. In contrast, we find no significant effect of credit constraints on collective layoffs.[16]

Table 10 reports the impact of credit constraints on employment adjustment along the intensive margin. Estimates are generally found to be highly significant. However, their magnitude is on average lower than in the extensive margin regressions. Indeed, coefficients fluctuate around 0.30 depending on the estimator and credit constraint variable under

[16] Similar results (available on request) are obtained with probit and bivariate probit estimators.

investigation.[17] Results in Table 11 provide more details on the policies that have been implemented by credit-constrained firms to adjust employment at the extensive margin. They show that the latter were significantly more likely to rely on temporary layoffs (for economic reasons) than their non-constrained opposite numbers. In contrast, firms' likelihood to reduce working hours appears unrelated to whether or not they had a credit constraint.[15]

7. Conclusion

While the outbreak of the Great Recession caused much economic hardship, it also provided a unique opportunity to gain a better understanding of how corporate employment decisions are affected by credit shortages in bad economic times. Almost a decade after the onset of the crisis, evidence on this important issue remains surprisingly limited. This paper takes advantage of access to detailed matched bank-firm data to investigate whether and how employment decisions of SMEs have been affected by credit constraints in the wake of the Great Recession. To do so, we combined rich data from the third wave of the Belgian Wage Dynamics Survey, covering the period 2010-2013, with confidential data from the Central Corporate Credit Register from the National Bank of Belgium.

Our regression analysis clearly shows that credit matters. Two-stage least squares (2SLS) and bivariate probit estimates indeed suggest that SMEs borrowing money from pre-crisis financially less healthy banks were significantly more likely to be affected by a credit constraint and, in turn, to adjust their labour input downwards than pre-crisis clients of more healthy banks. More precisely, we find that credit-constrained SMEs were *ceteris paribus* between 40 and 65% more likely to reduce their workforce than their opposite numbers not facing such constraints. This result is robust across types of loan applications that were denied credit (i.e. applications to finance working capital, debt or new investments).

Yet, estimates also show that employment consequences of credit shortages are contingent on the environment in which firms operate. Results indeed indicate that credit constraints have been essentially detrimental for employment among SMEs experiencing a negative demand shock or facing severe product market competition. This outcome is in line

[17] Endogeneity and Wald test statistics suggest that 2SLS and bivariate probit estimates should be preferred, except when examining the impact of 'Decreased access' with a linear model (see columns (1) and (1') of Table 10). In this case, the endogeneity test is not significant which implies that the focus should be on OLS estimates. However, as highlighted in footnote 15, estimates based on qualitative response models (reported in columns (2), (2'), (4) and (4')) are probably more reliable in this case.

with traditional bargaining models predicting that employment adjustment increases with the elasticity of labour demand and the price elasticity of demand in the product market.

Finally, our estimates uncover the strategies that have been adopted by credit-constrained firms to adjust their labour input. Despite the fact that aggregate employment has been fairly resilient in Belgium following the 2008 financial crisis, our results clearly show that credit shortage has been a key factor pushing SMEs to reduce their workforce at the extensive margin, and in particular to rely on individual layoffs, early retirement schemes and reduction of temporary employment. However, estimates also show that credit-constrained SMEs have been significantly more likely to adjust employment at the intensive margin, especially through the use of temporary layoff allowances, than their non-constrained counterparts. This outcome is quite interesting as it suggests that temporary layoff schemes have played a significant role in mitigating the employment effects of the financial crisis in Belgium. Put differently, it adds to a growing literature indicating that short-time compensation, i.e. pro-rated unemployment benefits for workers whose hours are reduced for economic reasons, may effectively contribute to save jobs during recessions (Abraham and Houseman, 2014; Hurley, 2010).

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Table 1: Firm-level descriptive statistics, sample associated to LPM and probit regressions

Variables	Mean	Std. Dev.
Type of adjustment measure:		
Labour input reduction [a]	0.33	0.47
Extensive margin:	0.31	0.46
Collective layoffs	0.01	0.12
Individual layoffs	0.28	0.45
Temporary employment adjustment	0.17	0.38
Early retirement	0.08	0.27
Intensive margin:	0.21	0.41
Temporary layoffs (for economic reasons)	0.17	0.38
Reduction of working hours (subsidised or not)	0.08	0.27
Type of credit constraint:		
Decreased access	0.25	0.43
Quantitative constraint:	0.27	0.44
To finance working capital	0.16	0.37
To finance new investment	0.22	0.42
To refinance debt	0.16	0.37
Cost constraint:	0.23	0.42
To finance working capital	0.15	0.36
To finance new investment	0.19	0.40
To refinance debt	0.12	0.33
Firm characteristics:		
Share of workers with tenure ≤ 5 years	0.37	0.25
Share of high-skilled workers	0.43	0.33
Firm age (years)	35.7	24.8
Firm size (total number of employees)	35.2	122.0
Industry:		
Manufacturing	0.16	
Construction	0.14	
Trade	0.29	
Business activities	0.37	
Financial intermediation	0.03	
Decrease in demand for firm's products/services	0.52	0.50
Strong competitive pressure for firm's main product/service	0.81	0.39
Number of observations [b]	855	

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Except for 'Decreased access' and 'Cost constraint' variables for which the number of observations is respectively equal to 844 and 854. Weighted descriptive statistics.

Table 2: The impact of credit constraints on labour input reduction [a], LPM estimates and marginal effects from probit regressions

	LPM		Probit	
	(1)	(2)	(3)	(4)
Type of credit constraint [b]:				
Decreased access	**0.083****		**0.081****	
	(0.037)		(0.005)	
Quantitative constraint		**0.099*****		**0.100*****
		(0.034)		(0.005)
Covariates:				
Firm age (in years)	0.000	0.000	0.000*	0.000***
	(0.001)	(0.001)	(0.000)	(0.000)
Firm size (total number of employees)	0.000	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Industry:				
Manufacturing	Reference	Reference	Reference	Reference
Construction	-0.109**	-0.112**	-0.106***	-0.115***
	(0.055)	(0.055)	(0.007)	(0.007)
Trade	-0.066	-0.064	-0.079***	-0.075***
	(0.047)	(0.047)	(0.006)	(0.006)
Business services	-0.138***	-0.113**	-0.146***	-0.119***
	(0.048)	(0.047)	(0.006)	(0.006)
Financial intermediation	0.008	-0.010	0.005	-0.013
	(0.098)	(0.095)	(0.014)	(0.013)
Decrease of demand for firm's products/services	0.291***	0.314***	0.300***	0.320***
	(0.033)	(0.031)	(0.004)	(0.004)
Strong competitive pressure for firm's main product/service	0.122***	0.099**	0.159***	0.134***
	(0.041)	(0.040)	(0.005)	(0.005)
Share of workers with tenure ≤ 5 years	0.002**	0.002**	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
Share of high-skilled workers	-0.000	-0.000	-0.000***	-0.000***
	(0.001)	(0.000)	(0.000)	(0.000)
R-squared	0.16	0.16		
Pseudo R-squared			0.13	0.13
Number of observations	844	855	844	855

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively : i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 3: The impact of credit constraints on labour input reduction [a], 2SLS estimates and marginal effects from bivariate probit regressions [b]

	2SLS		Bivariate probit	
	(1)	(2)	(3)	(4)
Type of credit constraint [c]:				
Decreased access	**0.683*** **		**0.409*** **	
	(0.258)		(0.042)	
Quantitative constraint		**0.411*** **		**0.372*** **
		(0.112)		(0.006)
Covariates [d]:	YES	YES	YES	YES
Weak identification test [e]	10.9	10.2		
Overidentification test [f]	0.50	0.34		
Endogeneity test [g]	0.03	0.09		
Wald test χ^2, p-value			0.00	0.00
R-squared	0.24	0.37		
Number of observations	532	537	537	537

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments for the 2SLS and bivariate probit regressions include (in addition to covariates contained in the vector X_i of equation (1)) the change in firm's main bank loan supply (in columns (1) to (4)); a dummy indicating whether the firm's main bank is of foreign origin, i.e. a branch or a subsidiary of a foreign bank (in columns (1) and (3)); the number of banks to which the firm has borrowed money during 2010-2013 (in columns (1) and (3)); a dummy for the firm's main bank (in columns (2) and (4)); the firm's risk of default in 2012 and 2013 (in columns (2) and (4)); the cross-product of the firm's risk of default in 2012 and 2013 (in columns (2) and (4)); and a dummy for multi-establishment firms (in columns (2) and (4)). [c] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively : i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 4: The impact of cost credit constraints on labour input reduction [a], LPM and 2SLS estimates and marginal effects from probit and bivariate probit regressions

	LPM	2SLS[b]	Probit	Bivariate probit[b]
	(1)	(2)	(3)	(4)
Type of credit constraint [c]:				
Cost constraint	0.013	-0.061	0.013	-0.209
	(0.036)	(0.130)	(0.059)	(0.134)
Covariates [d]:	YES	YES	YES	YES
Weak identification test [e]		11.2		
Overidentification test [f]		0.10		
Endogeneity test [g]		0.32		
Wald test χ^2, p-value				0.10
R-squared	0.15	0.44		
Pseudo R-squared			0.15	
Number of observations	854	538	854	538

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments for the 2SLS and bivariate probit regressions include (in addition to covariates contained in the vector X_i of equation (1)) the change in firm's main bank loan supply, the firm's risk of default in 2012, the average firm's risk of default in 2012-2013, the cross-product of the firm's risk of default in 2012 and 2013, and a dummy for multi-establishment firms. [c] The main explanatory variable is a dummy taking the value 1 if the firm between 2010 and 2013 faced a 'quantitative constraint', i.e. credit was available but the conditions (interest rate and other contractual terms) were too onerous, and 0 otherwise. [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 5: The impact of quantitative credit constraints on labour input reduction, according to the type of loan application made [a], LPM and 2SLS estimates and marginal effects from bivariate probit regressions [b]

	(1)	(1')	(1'')	(2)	(2')	(2'')	(3)	(3')	(3'')
	LPM	2SLS[b]	Bivariate probit[b]	LPM	2SLS[b]	Bivariate probit[b]	LPM	2SLS[b]	Bivariate probit[b]
Quantitative credit constraint to [c]:									
Finance working capital	**0.133***** (0.041)	**0.335***** (0.125)	**0.397***** (0.008)						
Finance new investment				**0.082**** (0.037)	**0.422***** (0.121)	**0.387***** (0.005)			
Refinance debt							**0.104**** (0.041)	**0.363**** (0.163)	**0.441***** (0.005)
Covariates [d]:	YES	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [e]		10.5			12.5			22.1	
Overidentification test [f]		0.32			0.37			0.103	
Endogeneity test [g]		0.39			0.104			0.34	
Wald test χ^2, p-value			0.00			0.00			0.00
R-squared	0.16	0.43		0.15	0.37		0.16	0.42	
Pseudo R-squared									
Number of observations	855	537	537	854	536	536	848	533	533

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments for the 2SLS regressions include (in addition to covariates contained in the vector X_i of equation (1)) the change in firm's main bank loan supply, a dummy for the firm's main bank, the firm's risk of default in 2012 and 2013, and the cross-product of the firm's risk of default in 2012 and 2013. [c] The main explanatory variable is a dummy taking the value 1 if the firm between 2010 and 2013 faced a 'quantitative constraint', i.e. that credit was not available, and 0 otherwise. [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 6: The impact of credit constraints on labour input reduction[a], according to changes in demand for firms' products and/or services, LPM and 2SLS [b] estimates

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
	Δ demand < 0 [c]		Δ demand ≥ 0 [d]		Δ demand < 0 [c]		Δ demand ≥ 0 [d]	
	LPM	2SLS	LPM	2SLS	LPM	2SLS	LPM	2SLS
Type of credit constraint [e]:								
Decreased access	**0.154***** (0.052)	**0.801***** (0.236)	-0.002 (0.054)	-0.029 (0.054)				
Quantitative constraint					**0.210***** (0.051)	**0.629***** (0.168)	-0.049 (0.043)	-0.014 (0.068)
Covariates [f]:	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [g]		18.4		53.6		19.4		12.2
Overidentification test [h]		0.35		0.50		0.14		0.63
Endogeneity test [i]		0.01		0.93		0.02		0.73
R-squared	0.10	0.39	0.05	0.12	0.10	0.42	0.06	0.12
Number of observations	424	264	420	270	434	268	421	269

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments include (in addition to covariates of the second stage regression): the change in firm's main bank loan supply (in Models (1') to (4')); dummies for the firm's main bank (in Models (2') and (4')); a dummy indicating whether the firm's main bank is under foreign (i.e. non Belgian) jurisdiction (in Model (3')), the firm's risk of default in 2012 (in Models (2') and (3')) and in 2013 (in Models (1') to (4')) assessed by the firm's main bank, and the cross-product of the firm's risk of default in 2012 and 2013 (in Model (4')). [c] Sample of firms that have experienced a decreasing demand for their products and/or services between 2010 and 2013. [d] Sample of firms that have experienced an unchanged or increasing demand for their products and/or services between 2010 and 2013. [e] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint , i.e. that credit was not available (Quantitative constraint). [f] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [g] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [h] Overidentification test reports p-value of Hansen J statistic. [i] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively

Table 7: The impact of credit constraints on labour input reduction[a], according to the degree of competition on firm's main product/service market, LPM and 2SLS[b] estimates

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
	Strong competition[c]		Weak competition[d]		Strong Competition[c]		Weak competition[d]	
	LPM	2SLS	LPM	2SLS	LPM	2SLS	LPM	2SLS
Type of credit constraint [e]:								
Decreased access	**0.090****	**0.776*****	0.011	0.016				
	(0.041)	(0.138)	(0.085)	(0.093)				
Quantitative constraint					**0.116*****	**0.640*****	-0.002	**0.244***
					(0.037)	(0.125)	(0.089)	(0.136)
Covariates [f]:	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [g]		16.2		35.3		19.2		14.6
Overidentification test [h]		0.63		0.40		0.68		0.49
Endogeneity test [i]		0.01		0.24		0.03		0.26
R-squared	0.13	0.26	0.17	0.22	0.13	0.28	0.20	0.21
Number of observations	725	460	119	73	733	462	122	75

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments include (in addition to covariates of the second stage regression): the change in firm's main bank loan supply (in Models (1') to (4')); dummies for the firm's main bank (in Models (1') to (4')); the firm's risk of default in 2013 (in Models (1') to (4')) assessed by the firm's main bank; and the cross-product of the firm's risk of default in 2012 and 2013 (in Model (4')). [c] Sample of firms experiencing severe or very severe competition on their main product/service market. [d] Sample of firms experiencing moderate or weak competition on their main product/service market. [e] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [f] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services, share of workers with at most 5 years of tenure, and share of high skilled workers. [g] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [h] Overidentification test reports p-value of Hansen J statistic. [i] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 8: The impact of credit constraints on the extensive margin [a], LPM and 2SLS estimates and marginal effects from probit and bivariate probit regressions [b]

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
	LPM	2SLS[b]	Probit	Bivariate probit[b]	LPM	2SLS[b]	Probit	Bivariate probit[b]
Type of credit constraint [c]:								
Decreased access	**0.073****	**0.614****	**0.070*****	**0.382*****				
	(0.037)	(0.264)	(0.005)	(0.058)				
Quantitative constraint					**0.091*****	**0.434*****	**0.090*****	**0.365*****
					(0.034)	(0.111)	(0.005)	(0.008)
Covariates [d]:	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [e]		10.6				11.1		
Overidentification test [f]		0.73				0.50		
Endogeneity test [g]		0.03				0.07		
Wald test χ^2, p-value				0.00				0.00
R-squared	0.14	0.22			0.14	0.33		
Pseudo R-squared			0.12				0.12	
Number of observations	844	532	844	532	855	536	855	536

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm relied (marginally, moderately or strongly) on collective layoffs, individual layoffs, non-renewal of temporary contracts at expiration, early retirement schemes and/or reduction of agency workers between 2010 and 2013, and 0 otherwise. [b] Instruments in the 2SLS and bivariate probit regressions include (in addition to covariates of the second stage regression): the change in firm's main bank loan supply (in Models (1') to (4')); dummies for the firm's main bank (in Models (3') and (4')); the number of banks to which the firm has borrowed money during 2010-2013 (in Models (1') and (2')); a dummy indicating whether the firm's main bank is under foreign (i.e. non Belgian) jurisdiction (in Model (1') and (2')); the firm's risk of default in 2012 (in Models (1') to (4')) and in 2013 (in Models (1') to (4')) assessed by the firm's main bank; the squared cross-product of the firm's risk of default in 2012 and 2013 (in Models (3') and (4')); and a dummy for multi-establishment firms (in Models (1') to (4')). [c] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 9: The impact of credit constraints on different components of the extensive margin [a], LPM and 2SLS [b] estimates

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')	(5)	(5')	(6)	(6')	(7)	(7')	(8)	(8')
	Collective layoffs[a]				**Individual layoffs[a]**				**Adjustment temporary employment[a]**				**Early retirement[a]**			
	LMP	2SLS[b]	LMP	2SLS[b]	LMP	2SLS[b]	LMP	2SLS[b]	LMP	2SLS[b]	LMP	2SLS[b]	LMP	2SLS[b]	LMP	2SLS[b]
Type of credit constraint [c]:																
Decreased access	-0.001 (0.010)	0.013 (0.019)			**0.079**** (0.036)	**0.308**** (0.137)			**0.052*** (0.030)	-0.007 (0.064)			**0.095***** (0.022)	**0.135*** (0.073)		
Quantitative constraint			-0.004 (0.009)	0.001 (0.029)			**0.115***** (0.033)	**0.321*** (0.181)			0.021 (0.028)	0.105 (0.110)			**0.065***** (0.020)	**0.316**** (0.136)
Covariates [d]:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [e]		19.9		11.2		19.9		11.2		19.9		11.2		19.9		11.2
Overidentification test [f]		0.97		0.42		0.35		0.31		0.70		0.36		0.85		0.30
Endogeneity test [g]		0.86		0.80		0.56		0.48		0.87		0.37		0.85		0.04
R-squared	0.02	0.01	0.02	0.02	0.11	0.32	0.12	0.35	0.13	0.27	0.14	0.27	0.12	0.10	0.10	0.00
Number of observations	844	537	855	537	844	5.37	855	5.37	844	537	855	537	8.44	537	855	537

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm relied (marginally, moderately or strongly) respectively on: i) collective layoffs, ii) individual layoffs, iii) non-renewal of temporary contracts at expiration and/or reduction of agency workers, and iv) early retirement schemes between 2010 and 2013, and 0 otherwise. [b] Instruments include the same variables as in Table 3. [c] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit – not only bank credit – was not available (Quantitative constraint). [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions (weights taken from WDN survey, i.e. variable wb). Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 10: The impact of credit constraints on the intensive margin [a], LPM and 2SLS estimates and marginal effects from probit and bivariate probit regressions [b]

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
	LMP	2SLS[b]	Probit	Bivariate probit[b]	LMP	2SLS[b]	Probit	Bivariate probit[b]
Type of credit constraint [c]:								
Decreased access	0.050	**0.370***	**0.044*****	**0.345*****				
	(0.032)	(0.219)	(0.004)	(0.086)				
Quantitative constraint					**0.061****	**0.236*****	**0.052*****	**0.284*****
					(0.030)	(0.134)	(0.004)	(0.011)
Covariates [d]:	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [e]		10.6				11.1		
Overidentification test [f]		0.47				0.68		
Endogeneity test [g]		0.14				0.08		
Wald test χ^2, p-value				0.09				0.00
R-squared	0.13	0.29			0.13	0.32		
Pseudo R-squared			0.12				0.13	
Number of observations	844	532	832	532	855	537	842	537

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm relied (marginally, moderately or strongly) on temporary layoffs (for economic reasons), subsidised reduction of working hours and/or non-subsidised reduction of working hours (including reduction of overtime) between 2010 and 2013, and 0 otherwise. [b] Instruments in the 2SLS and bivariate probit regressions include (in addition to covariates of the second stage regression): the change in firm's main bank loan supply (in Models (1') to (4')); dummies for the firm's main bank (in Models (3') and (4')); the number of banks to which the firm has borrowed money during 2010-2013 (in Model (1') and (2')); a dummy indicating whether the firm's main bank is under foreign (i.e. non Belgian) jurisdiction (in Model (1') and (2')); the firm's risk of default in 2012 (in Models (1') to (4')) and in 2013 (in Models (1') to (4')) assessed by the firm's main bank; the squared cross-product of the firm's risk of default in 2012 and 2013 (in Models (3') and (4')); and a dummy for multi-establishment firms (in Models (1') to (4')). [c] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Table 11: The impact of credit constraints on different components of the intensive margin [a], LPM and 2SLS [b] estimates

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
		Temporary layoffs (for economic reasons)[a]				**Reduction of working hours[a]**		
	LPM	2SLS[b]	LPM	2SLS[b]	LPM	2SLS[b]	LPM	2SLS[b]
Type of credit constraint [c]:								
Decreased access	**0.086***** (0.030)	**0.424***** (0.138)			0.033 (0.022)	-0.002 (0.030)		
Quantitative constraint			**0.080***** (0.028)	**0.303**** (0.148)			**-0.042*** (0.021)	0.003 (0.076)
Covariates [d]:	YES	YES	YES	YES	YES	YES	YES	YES
Weak identification test [e]		19.9		14.0		19.9		13.6
Overidentification test [f]		0.48		0.76		0.69		0.14
Endogeneity test [g]		0.12		0.06		0.76		0.63
R-squared	0.16	0.23	0.15	0.23	0.05	0.11	0.06	0.15
Number of observations	844	537	855	5.37	844	537	855	537

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm relied (marginally, moderately or strongly) respectively on: i) temporary layoffs (for economic reasons), ii) subsidised reduction of working hours and/or non-subsidised reduction of working hours (including reduction of overtime) between 2010 and 2013, and 0 otherwise. [b] Instruments include the same variables as in Table 3. [c] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [d] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [e] Weak identification test reports Kleibergen-Paap rk Wald F statistic. [f] Overidentification test reports p-value of Hansen J statistic. [g] Endogeneity test shows probability that endogenous regressors can actually be treated as exogenous. Weighted regressions. Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Appendix 1: Firm-level descriptive statistics, sample associated to 2SLS and bivariate probit regressions

Variables	Mean	Std. Dev.
Type of adjustment measure:		
Labour input reduction [a]	0.31	0.46
Extensive margin:	0.29	0.45
Collective layoffs	0.02	0.13
Individual layoffs	0.26	0.44
Temporary employment adjustment	0.17	0.38
Early retirement	0.05	0.21
Intensive margin:	0.22	0.42
Temporary layoffs (for economic reasons)	0.20	0.40
Reduction of working hours (subsidised or not)	0.08	0.27
Type credit constraint:		
Decreased access	0.28	0.45
Quantitative constraint:	0.33	0.47
To finance working capital	0.24	0.42
To finance new investment	0.29	0.45
To refinance debt	0.19	0.39
Cost constraint:	0.31	0.46
To finance working capital	0.20	0.40
To finance new investment	0.25	0.44
To refinance debt	0.16	0.37
Firm characteristics:		
Share of workers with tenure ≤ 5 years	0.37	0.25
Share of high-skilled workers	0.45	0.32
Firm age (years)	36.1	22.8
Firm size (total number of employees)	30.4	135.3
Industry:		
Manufacturing	0.20	0.40
Construction	0.18	0.38
Trade	0.27	0.45
Business activities	0.35	0.48
Financial intermediation	0.00	0.00
Decrease in demand for firm's products/services	0.52	0.50
Strong competitive pressure for firm's main product/service	0.79	0.41
Number of observations [a]	538	

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Except for 'Decreased access', 'Quantitative constraint to finance new investment', 'Quantitative constraint to refinance debt', 'Cost constraint to finance working capital', 'Cost constraint to new investment', 'Cost constraint to refinance debt' variables for which the number of observations is respectively equal to 532, 537, 534, 536, 536 and 534. Weighted descriptive statistics.

Appendix 2: Firm-level descriptive statistics for main instruments, sample associated to 2SLS and bivariate probit regressions

Variables	Mean	St. Dev.
% change in firm's main bank loan supply before (October 2005 – June 2007) and after (October 2008 – June 2011) the crisis [a]	2.07	0.54
Firm's main bank of foreign origin, i.e. branch or subsidiary of a foreign bank (Yes)	0.04	0.20
Number of banks to which the firm has borrowed money between 2010 and 2013	2.30	1.08
Firm's main bank dummies		
Bank 1	0.000	0.022
Bank 2	0.010	0.101
Bank 3	0.001	0.035
Bank 4	0.024	0.152
Bank 5	0.029	0.168
Bank 6	0.007	0.084
Bank 7	0.016	0.127
Bank 8	0.002	0.040
Bank 9	0.012	0.107
Bank 10	0.007	0.085
Bank 11	0.000	0.014
Bank 12	0.009	0.095
Bank 13	0.246	0.431
Bank 14	0.218	0.413
Bank 15	0.418	0.494
Firm's risk of default accessed by the firm's main bank in 2012	1.81	8.76
Firm's risk of default accessed by the firm's main bank in 2013	2.76	10.71
Multi-establishment firm (Yes)	0.14	0.35
Number of observations [b]	538	

Notes: [a] The exact definition of this variable is as follows: % change in the number of loans made by the firm's *i* main bank to all borrowers other than firm *i* before (i.e. October 2005 – June 2007) and after (i.e. October 2008 – June 2011) the crisis, normalized by the number of loans made by the firm's *i* main bank before the crisis. [b] Except for 'Firm's main bank of foreign origin' variable for which the number of observations is respectively equal to 536. Weighted descriptive statistics.

Appendix 3: Determinants of credit constraints, LPM estimates, i.e. first-stage of 2SLS regression estimates for labour input reduction

Dependent variable [a]:	Decreased Access (1)	Quantitative Constraint (2)
Instrumental variables:		
% change in firm's main bank loan supply before (October 2005 – June 2007) and after (October 2008 – June 2011) the crisis [b]	**-0.096***	**-0.123****
	(0.059)	(0.061)
Firm's main bank of foreign origin, i.e. branch or subsidiary of foreign bank (Yes)	-0.061	
	(0.055)	
Number of banks to which the firm has borrowed money between 2010 and 2013	0.012	
	(0.027)	
Firm's main bank dummies:		
Bank 1		**-0.724*****
		(0.148)
Bank 2		**-0.385*****
		(0.120)
Bank 3		**-0.412*****
		(0.081)
Bank 4		**-0.238****
		(0.098)
Bank 5		0.061
		(0.294)
Bank 6		**-0.379*****
		(0.101)
Bank 7		0.425
		(0.359)
Bank 8		-0.247
		(0.169)
Bank 9		-0.191
		(0.179)
Bank 10		-0.209
		(0.341)
Bank 11		**-0.447*****
		(0.105)
Bank 12		-0.043
		(0.235)
Bank 13		-0.065
		(0.081)
Bank 14		0.004
		(0.093)
Firm's risk of default in 2012	**0.007****	**0.010****
	(0.003)	(0.004)
Firm's risk of default in 2013	0.002	**0.012*****
	(0.003)	(0.002)
Cross-product of firm's risk of default in 2012 and 2013		**-0.000*****
		(0.000)
Multi-establishment firm (Yes)	0.010	
	(0.082)	
Other covariates [c]:	YES	YES
Sanderson-Windmeijer (SW) multivariate F-test of excluded instruments [d]	10.86***	10.24***
Number of observations	532	537

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm between 2010 and 2013: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [b] The exact definition of this variable is as follows: % change in the number of loans made by the firm's *i* main bank to all borrowers other than firm *i* before (i.e. October 2005 – June 2007) and after (i.e. October 2008 – June 2011) the crisis, normalized by the number of loans made by the firm's *i* main bank before the crisis. [c] Regressions also control for firm age and size, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. [d] Given that there is a single endogeneous regressor (i.e. the credit constraint), the SW statistic is identical to the Kleibergen-Paap rk Wald statistic for weak identification (as the robust option has been requested in Stata). Robust standard errors reported between parentheses. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Appendix 4: The impact of credit constraints on labour input reduction [a], according to changes in demand for firms' products and/or services. Marginal effects from probit and bivariate probit regressions [b]

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
	Δ demand < 0 [c]		Δ demand ≥ 0 [d]		Δ demand < 0 [c]		Δ demand ≥ 0 [d]	
	Probit	Bivariate probit	Probit	Bivariate probit	Probit	Bivariate probit	Probit	Bivariate probit
Type of credit constraint [e]:								
Decreased access	**0.169*** **	**0.489*** **	0.001	-0.074				
	(0.007)	(0.044)	(0.007)	(0.142)				
Quantitative constraint					**0.222*** **	**0.403*** **	**-0.050*** **	-0.144
					(0.007)	(0.011)	(0.005)	(0.238)
Covariates [f]:	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R-squared	0.08		0.06		0.08		0.07	
Wald test χ^2, p-value		0.00		0.61		0.00		0.68
Number of observations	424	264	420	271	434	268	421	269

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments are the same as in the 2SLS specification reported in Table 6. [c] Sample of firms that have experienced a decreasing demand for their products and/or services between 2010 and 2013. [d] Sample of firms that have experienced an unchanged or increasing demand for their products and/or services between 2010 and 2013. [e] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) faced a 'quantitative' credit constraint , i.e. that credit was not available (Quantitative constraint). [f] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), competitive pressure for firm's main product/service (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. Weighted regressions. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

Appendix 5: The impact of credit constraints on labour input reduction [a], according to the degree of competition on firm's main product/service market. Marginal effects from bivariate probit regressions [b]

	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
	Strong competition [c]		Weak competition [d]		Strong competition [c]		Weak competition [d]	
	Probit	Bivariate probit	Probit	Bivariate probit	Probit	Bivariate probit	Probit	Bivariate probit
Type of credit constraint [e]:								
Decreased access	**0.092***** (0.006)	**0.429***** (0.030)	**0.017**** (0.009)	-0.040 (0.105)				
Quantitative constraint					**0.121***** (0.006)	**0.425***** (0.033)	-0.012 (0.008)	-0.029 (0.130)
Covariates [f]:	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R-squared	0.10		0.20		0.11		0.22	
Wald test χ^2, p-value		0.00		0.14		0.00		0.30
Number of observations	725	460	117	73	733	462	120	75

Notes: [a] The dependent variable is a dummy taking the value 1 if the firm needed to significantly reduce its labour input or alter its composition between 2010 and 2013, and 0 otherwise. [b] Instruments are the same as in the 2SLS specification reported in Table 7. [c] Sample of firms experiencing severe or very severe competition on their main product/service market. [d] Sample of firms experiencing moderate or weak competition on their main product/service market. [e] Main explanatory variables are dummies taking the value 1 if the firm between 2010 and 2013 respectively: i) experienced a moderate or strong decrease in access to external financing through the usual financial channels (Decreased Access), and ii) ii) faced a 'quantitative' credit constraint, i.e. that credit was not available (Quantitative constraint). [f] Covariates include the size and age of the firm, sectoral affiliation (4 dummies), change in demand for firm's products/services (1 dummy), share of workers with at most 5 years of tenure, and share of high skilled workers. Weighted regressions. ***, **, * significant at 1, 5 and 10 percent levels, respectively.

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