The role of the financial constraint in STW policy success during and after the great recession

Nathan Vieira

March 2022

Aix-Marseille School of Economics

PRELIMINARY DRAFT: PLEASE DO NOT CIRCULATE

Just one year after the subprime crisis, and despite being one of the most impacted countries in the world, Germany displayed the highest GDP growth rate among EU countries and maintained it at its level for two years. Combined with a surprisingly small variation in unemployment rates over this period, some press articles have nicknamed the impressive German economic recovery the "second German miracle". In this paper, I produce empirical evidence of the role played by short-time work in the "German miracle". By exploiting firm-level data, I show that short-time work programs should target firms facing huge financial constraints and difficult business conditions. To these conditions, short-time work programs can preserve employment during a crisis and allow a greater take-up afterward.

JEL Classification: E24; J22; J24; J65;

Keywords: Short-time work; Employment; Financial constraint; Hysteresis;

1 Intro

Using French firm-level data during the great recession, I produce empirical evidence of the positive impact of short-time work (STW) policies on firms' activity levels during recovery periods. I show that this positive effect only happens when firms were facing huge financial constraints and/or were strongly exposed to a drop in growth rate of sales during the shock. Otherwise, STW consumptions only have a windfall effect. I use a 3SLS regression where I estimate the effect of short-time work consumption on firms' employment together with its effect on firms' financial constraints. I instrument STW take-up through spatial heterogeneity of access to STW. This method is based on empirical evidence of heterogeneity of management quality among local agencies in charge of giving STW authorization. I combine this exogenous variation with an exogenous measure of the exposure to the shock. Then, I show that the positive impact of STW policies on employment leads to a higher activity level afterward. This feature can explain, in part, the "German miracle" observed during the same period across the Rhine. I range the firm according to the shock perceived. This new measure combines the exposure to a shock and the vulnerability to it.

The literature on STW policy globally agrees on the benefits of STW programs on employment or aggregated utility (Hijzen and Ven, 2013 [1]; Tilly and Niedermayer, 2016 [2]; Gherke and Hochmuth, 2019 [3]), and has underlined the interactions of STW with other existent labor market institutions as well as the economic context as key determinants of STW policy success (Arico and Stein [4], 2012; Braun and Brügemann, 2014 [5]; Balleer et al., 2016 [6]; Cooper et al., 2017 [7]). Theoretical models of STW illustrate that, when an economy faces an exogenous productivity shock, this shock can end employer-employee matches if firms cannot adjust their working input around the intensive margin. Therefore, a crisis such as the 2008 subprime crisis can result in massive unemployment without STW stabilizers. In this perspective, STW schemes are relatively well-suited because they allow targeting matches that have been hit by the shock, which diminishes the windfall effect (Cahuc et al., 2018 [8]) and the utility loss for the workers (Borowczyk-Martins and Lalé, 2016 [9]). However, STW literature is mainly focused on the capacity of STW programs to preserve jobs during negative shocks. Therefore, theoretical works, to the best of my knowledge, does not explain the astonishing quick recovery of German's Gross Domestic Product (GDP) nor the difference in employment and production level between Germany and other European countries after the great recession (Rinne and Zimmermann, 2012 [10]). On the other hand, some authors conducting empirical works, such as Pavlopoulos and Chkalova (2019 [11]), have shed the light on the durable consequences of STW use. They find that during recoveries, workers employed by firms that have consumed STW tend to be less often unemployed than those who have been employed by non-STW consumer firms. This empirical evidence might be a lead for the potential dynamic benefits of STW policies.

Literature on hysteresis provides some insights into the mechanisms at stake behind the German miracle. I have counted two mechanisms. A first potential channel is that, following an exogenous shock, workers lose their jobs but also lose their skills. Unemployed workers, as they have stopped their learning-by-doing process and have lost contact with new practices and techniques introduced by firms, gradually deteriorate their existing skills over the unemployment period. As the economy recovers, and the unemployed are finally hired, their productivity is lower than the average productivity of incumbent workers (Stiglitz, 1994 [12]; Dosi et al., 2018 [13]). The decrease of employability and productivity of unemployed workers can explain, in part, the lower aggregate production and the slow recovery observed after the 2008 crisis. At first view, STW, by preserving a match between a worker and a firm, can moderate the negative impact of a shock on human capital. Workers who keep their jobs can preserve their firm-specific skills and can maintain their skill accumulation process through learning by doing. Second, as the match is preserved, the firm can get back to its pre-shock activity level without spending time on the labor market. A second potential channel is that, if we assume that wages are fixed by incumbents workers, then, during and after a drop in productivity those are fixed above their natural levels which prevent unemployed to find a job (Blanchard and Summer,

1986[14]; Gali, 2015[15]. Hence the lower input level (the lower employment) negatively impacted the output (the aggregate production). Finally, one can think that firms who have reduced their employment level during the crisis, once the economy recovers, might experience a searching period on the labor market before finding work which will slow down the take-up process. In this paper, I show that those hysteresis mechanisms can explain the higher activity level of firms who have consumed STW during the great recession.

STW literature usually ignores firms' financial constraints when assessing the impact of STW on employment. Empirical literature, to the best of my knowledge, does not analyze the role of financial constraint in their research and only uses it, at most, as a control variable. Theoretical literature usually assumes that firms decide to keep a worker hit by a negative productivity shock if their current loss will be outweighed by the future expected gain (Balleer et al., 2016 [6]; Cooper et al., 2017 [7]). In this case, STW policies, by sharing the labor cost between the State and the firm, diminish the loss during the negative shock and make the employee more likely to be preserved. Policymaker substitutes the role played by private insurance and guarantee help for firms during temporal difficulties (Braun and Brügemann, 2014 [5]). But this literature does not consider if firms, using STW or not, can afford this temporal loss. On the other hand, papers studying the behaviors of firms during the great recession have underlined the access to the financial market and the financial constraint as key determinants in the employment decision (Fougère, Golfier, Horny, Kremp, 2013 [16]; Gomis and Khatiwada, 2017 [17]; Giroud and Mueller, 2017 [18]). Firms with tight financial constraints and restricted access to loans tend to be less productive, to end matches with employees, and to die more often during the great recession. I use this empirical evidence to reconsider the effect of STW policies. Indeed, by reducing labor cost, STW consumption can relax the financial constraint which allows firms to adopt an employment strategy closer to the one described in the optimal decision of theoretical paper. In this perspective, rather than modifying the firm's optimal employment decision, STW programs allow them to make the actual employment decision closer to the optimal point and reduce the number of excessive layoffs. I consider the financial constraint as a measure of the vulnerability to a shock for a firm.

The paper is organized as follows. First, I introduce some background on the legal and historical context of STW consumption in France during the great recession. This section motivates the empirical method employed in the paper. This section must also be kept in mind when interpreting the results of my different computations. Then, I present the data, the method used and the results obtained.

Table 1: Evolution of the law relative to the STW scheme in France from 2008 to 2013

Effective date	Main changes	Legal reference
June 14^{th} 1996	Creation of the STW scheme	*Loi n° 96-502 du 11 juin 1996*
	(...)	
May 1^{st} 2008	Redesign of the STW system that will serve as a basis for all the next reforms until today with a fix rate of allocation and the eligibility conditions (including economic condition that I explore in this paper)	*Création Décret n°2008-244 du 7 mars 2008*
January 1^{st} 2009	Upgrade of STW allocation to workers up to 60% of the wage Raise of the maximum STW consecutive period allowed (up to 6 weeks) Raise of the maximum STW period allowed (up to 1 000 ours per year for some sectors) Increase the maximum wage threshold at which STW is free for the firm (up to 3.83 euros per hour)	*Avenant du 15 décembre 2008* *Décret du 22 décembre 2008* *Arrêté du 30 décembre 2008* *Décret n°2009-110 du 29 janvier 2009*
May 1^{st} 2009	Creation of long-time STW (*APLD*)	*Décret n°2009-478 du 29 avril 2009 et convention Etat-Unédic du 1er mai 2009*
January 1^{st} 2010	The maximum STW period allowed is generalized for all sectors and all workers	*Arrêté du 31 décembre 2009 et ANI du 8 juillet 2008*
March 1^{st} 2012	Firms do not need to ask for a pre-authorization to consume STW Upgrade of STW allocation by one euro Long-period STW is now financed by *unédic* The minimum time for a long-period STW take-up is lowered down to 2 months	*Décret n°2012-183 du 7 février 2012 et arrêté du 4 mai 2012* *Décret n°2012-275 du 28 février 2012*
November 1^{st} 2012	Firms need to ask for a pre-authorization to consume STW	*Décret n°2012-1271 du 19 novembre 2012*
July 1^{st} 2013	Merge of the classic STW program and the long-period STW program	*Loi n°2013-504 du 14 juin 2013 et décret n°2013-551 du 26 juin 2013*

Notes: This table does not display the directives sent by the government during the periods that played a major role in STW take-up. Also, this table does not present the evolution before 2008.

2 Background

Short-time work is a governmental unemployment insurance system. It has been introduced by labor market institutions as a tool to increase labor market flexibility. The idea is to prevent excessive layoffs – especially during a recession – by making adjustments in working hours more flexible. Indeed, short-time work allows firms to continuously adjust their production function along the hours margin. In other words, they can reduce the amount of working time below the legal minimum hours without firing any employees. This last feature differentiates short-time work from part-time work and, in a sense, makes short-time work close to temporary layoff. Indeed, in both programs, workers are expected to return to their full-time job after a period of reduction of working hours (where usually the state provides a grant for the hours the employee does not work). However, the main difference between temporary layoff and short-time work is that workers keep – most of the time – working for the firm during the program and their earnings are generally higher during STW than during temporary layoff which makes such programs, particularly pertinent during recession

periods. In France, during the great recession, the employee put in STW were paid 60 to 75 percent of their wage (depending on whether it has on a traditional STW or a long-term STW program, see table 1). Public institutions contributed from 60 up to 100% of this revenue, the rest remained in charge of the firm.

In late 2008 the subprime crisis heavily impacted all European economies and particularly the German economy that experienced a decline of 4.7% of its GDP in the first quarter of 2009. Nevertheless, this is also the German economy that experienced the fastest recovery with a GDP growth of 2.2% in the second quarter of 2010 while other European countries were stuck under the 0.5%. In addition, the share of unemployment never really fell off in Germany during the whole crisis. The astonishing quick recovery of the German economy was applauded by a broad range of press and academic articles that sometimes nicknamed it "The German miracle" about Germany's post-war economic boom. The press articles have particularly stressed the important role played by the German short-time work schemes (*kurzabeit*) in this second German miracle (see "Another economic miracle? The German labor market and the Great Recession" Rinne and Zimmermann, 2012 for more details [10]). In addition, Germany experienced one of the lowest increases in public debt after the recession. The obvious gap between Germany and other European countries has made it the new "economic superstar" of Europe (Dustman et al., 2014 [19]). This publicly acclaimed success of German STW policy has inspired a lot of other European policymakers during the following recession due to the covid-19 pandemic.

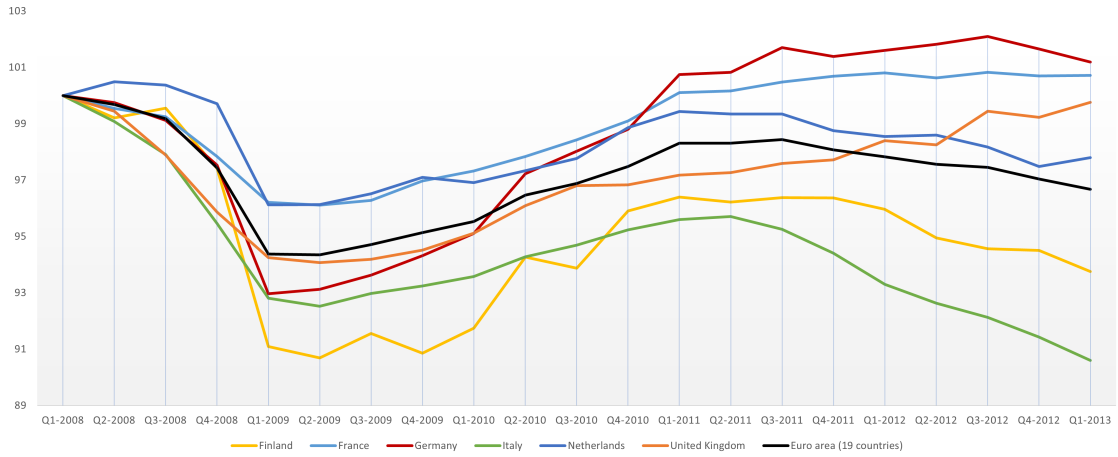

Figure 1: Quaterly GDP index

Source: OECD. **Notes:** The line represent the evolution of GDP compared to the base period $Q1 - 2008$, before european countries have entered into recession. **Definitions:** The index for a year t and a quarter q is computed as follows: $\frac{\text{GDP } Q_q\text{-}t}{\text{GDP } Q_1\text{-}2008} * 100$

This paper focuses on the use of STW in France during and after the great recession. The French use of STW programs is similar to most European countries during and after the great recession. Hence, this paper can be relevant beyond the scope of France. In France, as in most countries, STW consumption is conditioned to eligibility criteria. The purpose is to restrict STW programs to firms facing temporal and sometimes unpredictable difficulties. Eligible firms can submit a STW demand to their local public institution, once the authorization is given, the firm can decrease the number of hours worked below the legal minimum. For each hour not worked, the hourly taxes paid by the firm are lowered and the wage is substituted with a lower STW cost. The worker, on his side, keeps earning his wage for the hours worked and perceives a short-time compensation (STC) for the hours he does not work (usually fixed as a percentage of the actual wage). Short-time work policies usually rely on four channels. First, they relax the eligibility criteria. In 2008 for instance, french public decision-makers have released circulars to boost STW access (during the covid-19 crisis, french firms were allowed to use STW programs before the formal authorization). Second, STW maximal use and duration allowed are raised (in 2009 the maximum duration was raised from

4 to 6 consecutive weeks). Third, STW policy usually decreases the STW cost of the firm to increase the benefit of STW consumption for firms. In 2008-2009, for the majority of workers, STW cost has been lowered to 0, firms were only constraint to pay a STW cost for the high salaries. Finally, STCs are raised, during the recession the STC level was raised from 50 to 70% of the hourly gross wage. Those four channels of STW policies aim at making the STW program more attractive to preserve employment. The huge rise in STW consumption as well as the difference between the STW cost and the STC level comes with a significant public cost. Between 2008 and 2009, public STW expenses have increased from less than 20 million to near to 300 million euros. However, after the subprime crisis, the STW program was reformed and after more than 75 million hours of STW consumed in 2009, the STW consumption level went back beyond the 25 million threshold. As in most European countries, access to STW programs becomes more restricted after the great-recession (see figure 4 next page and figure 7 in the appendix).

My study focuses on the 2008-2011 period. It starts at the subprime crisis and focuses on the recovery period between 2009 and 2011 before the slowdown of the growth (see figure 3 next page) and the French short-time work subsequent reforms in 2012 (see table 1 above). Therefore, I begin by studying the short-term effect of STW policies for the years 2008 and 2009 (causal links 1 and 2 in figure 2 below). Then, I assess the mid/long-term effect of these policies for the years 2010 and 2011 (causal link 3 in figure 2 below).

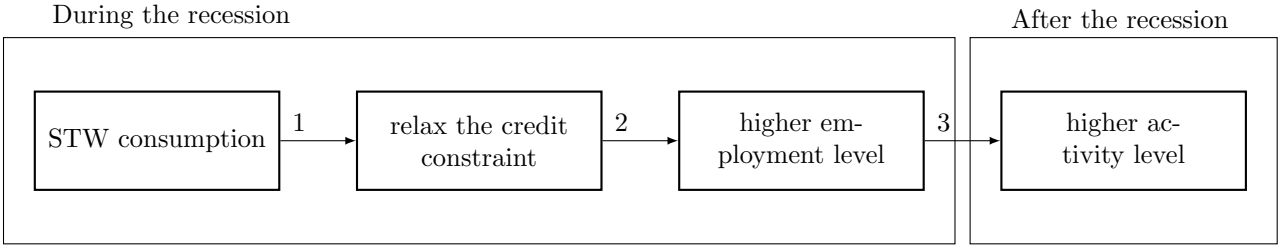

Figure 2: Causal links

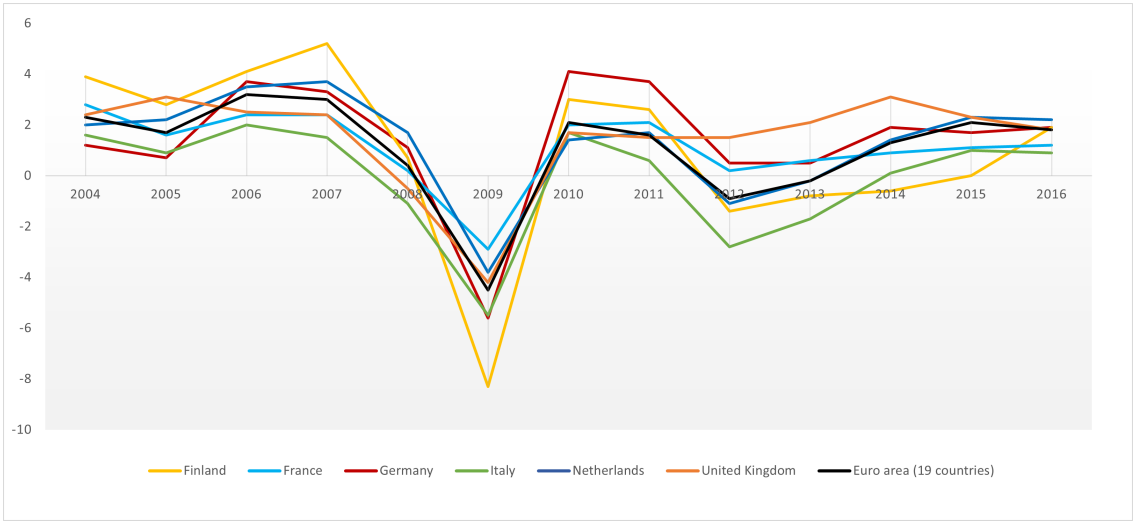

Figure 3: GDP growth

Source: Eurostat. **Definitions:** The GDP growth is computed as the percentage growth of the GDP from the year t to $t+1$

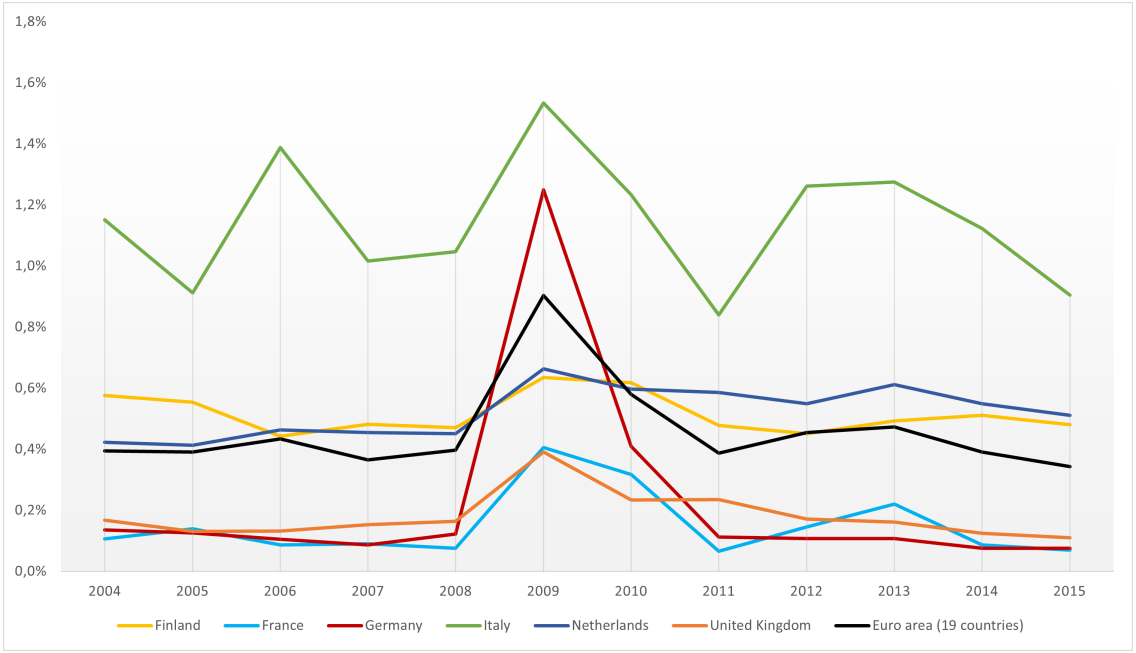

Figure 4: Number of STW worker per employee

Source: OECD. **Definitions:** The number of STW worker (for economic reasons) divided by the average number of employee GDP during the year considered.

3 Method

In this section, I first described the IV strategy to get rid of the endogeneity issue. Second, I present the 3SLS methodology in order to incorporate the effect of STW on the financial constraint in the estimation. Finally, the sorting method highlights the potential windfall effect of STW policies.

3.1 IV strategy

Short-time work schemes are usually restricted and used by firms experiencing a negative shock. Therefore, an OLS regression is not able to distinguish the impact of STW consumption from the economic context. That is why most of the empirical literature relies on an IV strategy (see for instance: Calavrezzo et al, 2009. [20]; Boeri and Bruecker, 2011 [21]; Giupponi and Landais, 2018 [22]). As I use the same dataset for the same period of the article "The Heterogeneous Impact of Short-Time Work: From Saved Jobs to Windfall Effects" by Cahuc, Nevoux and Kramarz (2021 [23]), I rely on the same IV strategy. In a few words, they exploit on one side an exogenous variation on the access to STW consumption, and on the other side, an exogenous measure of the need for STW. The exogenous variation in STW access is due to the French STW authorization process. In France, in order to consume STW, a firm has to send a demand to a local agency (called Dirrect in 2009). Cahuc, Nevoux and Kramar showed that the response, as well as the authorization rate, significantly differ from one local agency to another and that this difference comes from the exogenous and durable difference in management qualities. Second, they produce a leave-one-out growth rate so that they have an exogenous measure for the need of STW. Those two instruments should not be correlated to my outcome variables, here the financial constraint and the employment level (for an illustration of the IV strategy see figure 5). The model is the following:

$$\text{Labor}_{it} = \alpha_1 \text{STW}_{it} + \alpha_2 x_{it} + \eta_t + \varepsilon_{it} \tag{1}$$

With, "Labor_{it}" a labor measure of the firm i at time t, "STW_{it}" a measure of STW consumption, x_{it} the covariate variables, η_t fixed effects and ε_{it} the error terms. STW_{it} is instrumented as follows:

$$\text{STW}_{it} = \beta_1 (ap_{j(i)t-1} + \beta_2 g_{it} * ap_{j(i)t-1} + g_{it} * ap_{jit-1} + \beta_3 x_{it} + \eta_t + v_{it} \tag{2}$$

With: g_{it} the leave-one-out growth rate (by industry and community zone), $ap_{j(i)t-1}$ the approval rate in department j of the firm i in year $t-1$.

3.2 3SLS

I argue that STW consumption modifies the employment strategy chosen by the firms during the recession periods by relaxing their financial constraint. As shown by Giroud and Mueller (2016), financial constraint modifies the employment strategy of the firm, I believe that firms' layoff decisions during recessions are due to insufficient financial capacity to absorb a negative shock rather than the result of an intertemporal maximization. In other words, as firms suffer from financial constraints, they are forced to excessively end matches with employees and cannot follow the optimal path usually modeled by the theoretical literature.

In this perspective STW consumption, by lowering the labor cost during recession periods, relax the financial constraint and allows firms to be closer to the optimal employment decision during recessions at the same time. The model then becomes a simultaneous equations model:

$$\begin{aligned}
\text{Labor}_{it} &= \alpha_1^1 \text{STW}_{it} + \alpha_2^1 x_{it} + \eta_t + \alpha_3^1 \text{Financial}_{it} + u_{it} \\
\text{Financial}_{it} &= \alpha_1^2 \text{STW}_{it} + \alpha_2^2 x_{it} + \eta_t + \alpha_3^2 \text{Labor}_{it} + \varepsilon_{it} \\
\text{STW}_{it} &= \beta_1 ap_{j(i)t-1} + \beta_2 g_{it} * ap_{j(i)t-1} + \beta_3 x_{it} + \eta_t + v_{it}
\end{aligned} \tag{3}$$

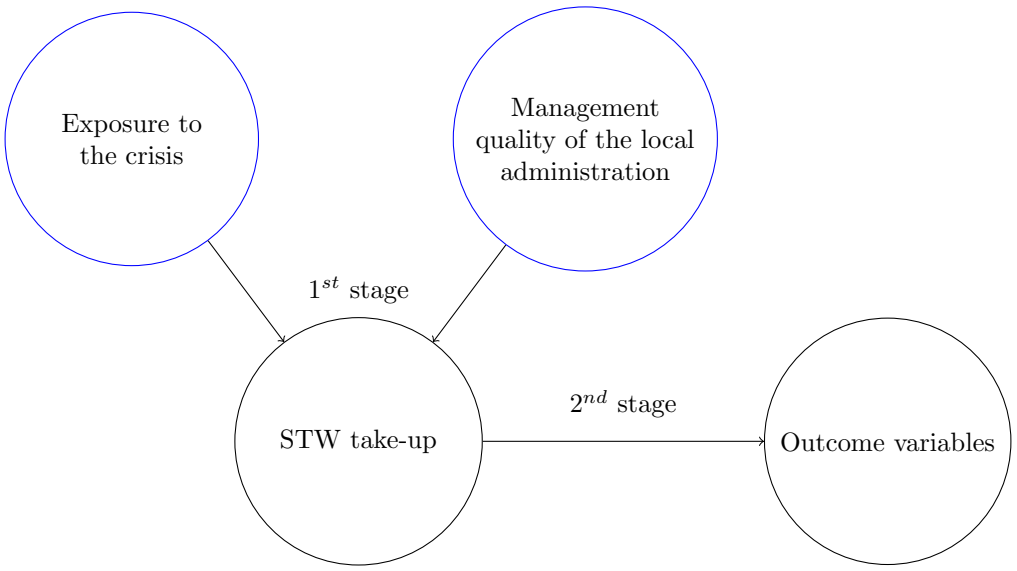

Figure 5: Illustration of the IV methodology

Where "Financial$_{it}$" is a measure of the financial constraint of the firm i at time t. To correctly estimate this system of the equation I have to check the order and the rank condition as well as the exclusion restriction. For the order condition, I need to have more exogenous variables than endogenous variables. Here I have three endogenous variables (Labor, Financial and STW) two exogenous variables from my instrument ($ap_{j(i)t-1}$ and g_{it}) so I need to have at least two other exogenous variables in my covariates. Second, the rank condition states that I need to have at least one common covariable between the first and the second line of the system and another common variable between the second and the third line of the system. Then, the exclusion restriction is already justified in Cahuc, Nevoux and Kramar's paper (2021). I use a traditional 3SLS method to estimate the system of equations. As Cahuc, Nevoux and Kramar, I use a first-difference operator for my variable. I am interested in the coefficient α_1^1 and α_1^2, if the assumption on the role played by the financial constraint is right, the 3SLS should lead to a more consistent estimation of both coefficients.

$$\begin{aligned}
\Delta\text{Labor}_{it} &= \alpha_1^1 \Delta\text{STW}_{it} + \alpha_2^1 \Delta x_{it} + \eta_t + \alpha_3^1 \Delta\text{Financial}_{it} + u_{it} \\
\Delta\text{Financial}_{it} &= \alpha_1^2 \Delta\text{STW}_{it} + \alpha_2^2 \Delta x_{it} + \eta_t + \alpha_3^2 \Delta\text{Labor}_{it} + \varepsilon_{it} \\
\Delta\text{STW}_{it} &= \beta_1 ap_{j(i)t-1} + \beta_2 g_{it} * ap_{j(i)t-1} + \beta_3 \Delta x_{it} + \eta_t + v_{it}
\end{aligned} \tag{4}$$

For the measure of STW consumption, employment and control variable I use the same measure as Cahuc, Kramar and Nevoux did. As I also use the same dataset, using the same variables allows me to directly compare my results with theirs. For STW consumption I use two different measures. First, ΔSTW_{it} denotes a dummy variable equal to 1 if the firm used short-time work for economic reasons in 2009 and to 0 otherwise. Second, ΔH_{STW} denotes the number of STW work hours of the firm divided by its total number of hours worked in the previous year. As control variables for the first line of the system (4), I use the LOO growth rate of sales, the LOO difference in the growth rate of sales, the growth rate of employment, the size of the firm, the leverage, the return on the asset on the age of the firm. For the second line, I add the previous financial constraint and the indebtment as two other control variables (those variables are not used by Cahuc, Kramar and Nevoux). For the last line, all control variables mentioned are used (then I run some tests with alternative specifications).

3.3 Heterogeneity

I show that considering financial vulnerability is crucial when trying to assess the result of a STW policy. In this section and in the rest of the paper I consider the financial constraint and the vulnerability to a shock as the same variable. I divide the sample of firms into quintiles. I test different sorting methods. First, I only consider the exposure to the shock, then I combine it with a measure of the vulnerability to a shock. Then, I run the 3SLS for each quintile of each sorting and show how considering the vulnerability to a shock leads to a most efficient sorting. The great recession has not impacted all firms equally, as the success of STW policies depends on the economic context, it is important to distinguish firms that are highly affected by the shock from those loosely affected when assessing the impact of STW consumption.

In this section, I propose to classify the firm according to the shock perceived rather than the shock experienced. The shock perceived is a measure of the change of behaviors due to a shock. For a small shock perceived, firms do not modify their activity while higher the shock is most likely they are to die. With respect to the shock experienced, the shock perceived adds a measure of vulnerability to the shock. The shock perceived measure adds a dimension to the exposure to the shock. This new dimension is due to empirical evidence from Giroud and Muller (2017 [18]) showing that firms that do not have the capacity to absorb a shock due to small reserve, already high indebtment level or restricted access to the financial market, are more likely to significantly modify their behaviors during a shock.

I need a measure of the exposure to the shock and a measure of the vulnerability to the shock in order to produce my shock perceived measure. For the exposure to the shock, I use the growth rate of sales. For the vulnerability to the shock, I produce an index based on the net working capital. But rather than the difference between the company's current assets—such as cash, accounts receivable/customers' unpaid bills, and inventories of raw materials and finished goods—and its current liabilities, such as accounts payable and debts, I compute the ratio between those two:

$$\text{vulnerability}_{i,t} = \frac{\text{liabilities}_{i,t}}{\text{assets}_{i,t}} \tag{5}$$

Higher (lower) the vulnerability index is larger (smaller) the current liabilities in comparison to current assets and therefore more vulnerable a firm is to a choc. I combine the measure of the vulnerability to a shock with a measure of the exposure to a shock in this way:

$$\text{shock perceived}_{it} = \text{vulnerability}_{it-1}^{\alpha} * \text{growth rate of sales}_{it}^{\beta} \tag{6}$$

Where α captures the importance of the vulnerability measure in comparison to the exposure measure. The fraction $\frac{\beta}{\alpha}$ captures the relative importance of one dimension to the other, the higher (lower) it is, the more (less) important the growth rate of sales is in comparison to the vulnerability in the way firms perceived shocks. Cahuc, Kramar and Nevoux use a prediction for the need of STW in order to sort the firm into quintiles, I reproduce their sorting for comparison purposes.

To derive the value of α and β, I need a proxy for the shock perceived. Fougère et al. (2013) have shown that the subprime crisis is mainly responsible for the huge increase in business failure and liquidation in 2009. In France, when a firm cannot pay the debt, it has to declare itself in an insolvency situation. Then a public institution examines its case and chooses a solution between different saving programs and firms' liquidation. This process can take up to 18 months. In my data, I distinguish firms that have been in an insolvency state in 2009 or have been liquidated in 2009 and 2010 from the other. This creates two pools, one that has been highly impacted by the shock and the other that have been less impacted. I then run a classification program and test the optimal value of α and β.

The optimization program consists in fixing values of α and β from 1 to 10 and ranging firms into quintiles. Then in each quintile, I count the number of firms that have been in an insolvency state in 2009 or have been

liquidated in 2009 and 2010. Then, I choose the value of α and β for which the first quintile contains the highest percentage while checking that this percentage is decreasing across quintiles.

Table 2: Number of firms liquidation by quintiles according to different sorting strategies

	Growth rate of sales_t	Growth rate of sales_t & $\text{vulnerability}_{t-1}$	LOO Growth rate of sales_t & $\text{vulnerability}_{t-1}$	Cahuc et al.'s sorting
Firms liquidiy				
1st quintile	9123	10009	9220	1921
2nd quintile	10701	10167	10469	872
3nd quintile	10909	8739	10469	843
4th quintile	2530	5510	3481	1016
5th quintile	11367	8981	10755	2746

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Notes:** This table displays the number of liquidation by quintiles. The first line describe the variables on which the quintiles are built. The vulnerability variable is describe in equation (5). The growth rate of sales & vulnerability measure is described in equation (6). In this table $|\frac{\beta}{\alpha}| = 1$. The growth rate LOO growth of sales of firm i is the average growth rate of the sector of the firm i in the same community zone without considering the firm i. The LOO Growth rate of sales_t & $\text{vulnerability}_{t-1}$ sorting is based on the same method as the Growth rate of sales_t & $\text{vulnerability}_{t-1}$ sorting. Cahuc et al.'s sorting is based on the predicted evolution of number of hours worked (see their article [23]). Yearly data, $t = 2009$.

I first note that, when $\frac{\beta}{\alpha} > 1$, it always gives more satisfying results meaning that the exposure to the shock is always more important than the vulnerability to it. Second, the proportion increase until $\frac{\beta}{\alpha} = 1$ and decrease afterward. I fix $\alpha = 1$, $\beta = 1$ when the growth rate of sales is negative and $\alpha = -1$ and $\beta = 1$ when the growth rate of sales is positive. The idea is that a small shock has a major impact on firms facing a high financial constraint. On the other hand, for firms facing huge financial constraints, the growth rate of sales has to be larger in order to move away from financial difficulties. I also test a similar sorting strategy by substituting the growth rate of sales by its LOO. This second measure aims at exogenously capturing the exposure to the shock of the firm. The sorting result is less satisfying but shows the same pattern, that is: considering the vulnerability together with the exposure to the shock leads to a more satisfying result (see figure 6 below and figure 8 in the appendix for an illustration of the shock perceived sorting). Nevertheless, I test all those sorting methods for my regressions and I find similar results. The only difference is between the magnitude and the repartition across quintile of the effect perceived. The sign of the effect remains the same which is reassuring.

3.4 Durable effect

Then, I use the effect measured in my 3SLS in each quintile in order to assess the effect of STW on firms' activity level during the recovery period. For each firm of each quintile, I produce an estimation of the variation in employment due to STW consumption:

$$\widehat{\text{Labor}}_{it} = \alpha_1^1 \Delta \text{STW}_{it} \tag{7}$$

Where α_1^1 comes from the 3SLS regression. Then I run an OLS regression to estimate the impact of those jobs preserved on economic activity (measure as the growth rate of sales) during the recovery period. I identify 2009-2011 as the recovery period (see figure 3 above). I run the following regression by quintiles:

$$\Delta \text{Activity}_{it+1} = \beta_1 \Delta \text{Labor}_{it} + \Delta x_{it} + \varepsilon_{it} \tag{8}$$

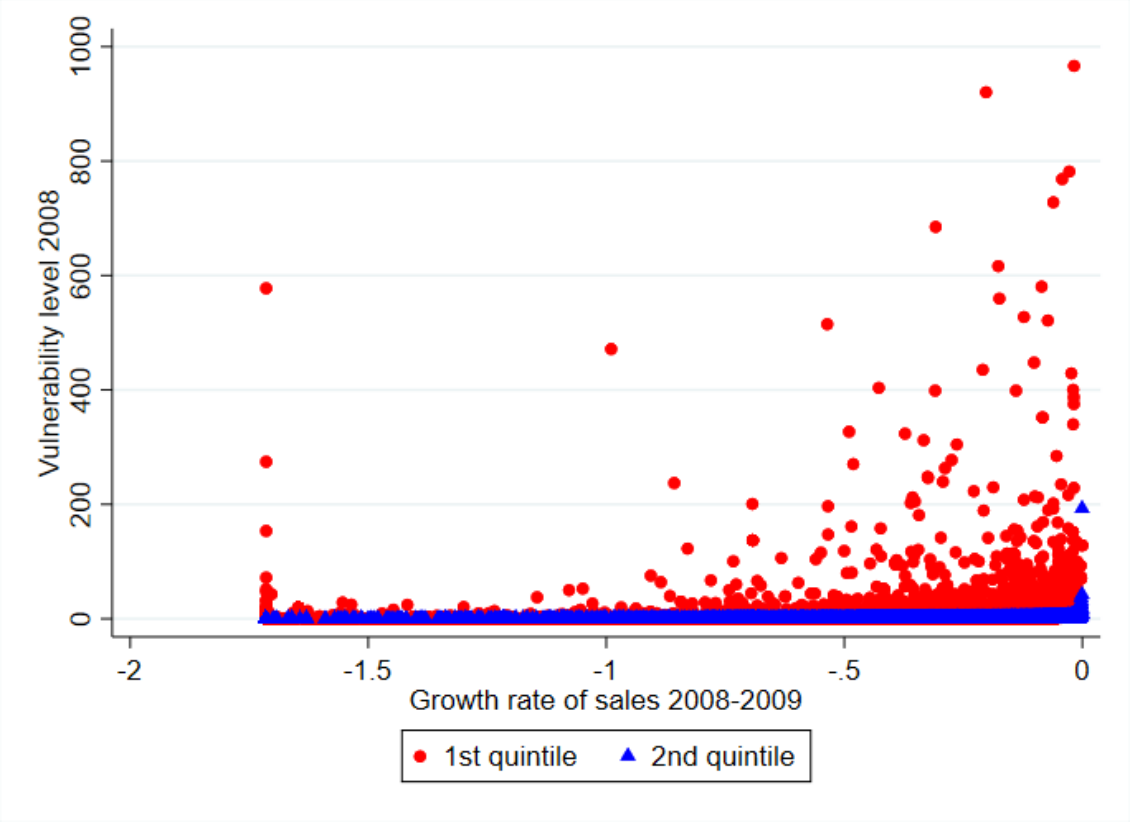

Figure 6: Vulnerability to the shock and growth rate of sales: repartition of the first and second quintile

Source: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Notes:** Repartition of a subset of firm according to vulnerability to the shock in 2008 and the growth rate of sate between 2008 and 2009. Firms are affected into a quintile according to their measure of the shock perceived. The growth rate of sales is winsorized at the 0.01 level.

Where β_1 is the coefficient of interest. According to hysteresis literature, it should be significantly higher than 0. Then its magnitude will capture the impact of STW on French recovery, and therefore a measure of STW contribution to the "German miracle".

4 Data

In order to understand the potential causes and effects of short-time work, I merge several data sources on French establishments. My data go from 2007 to 2013. I detail the component of my data by each source I use.

4.1 Sinapse-Chômage Partiel

To measure short-time work in all its components, administrative and economic, I use *Sinapse-Chômage Partiel*, a source produced by the *Statistical Department of the French Labor Ministry* (DARES) in collaboration with the Employment and Vocational Training Agency (DGEFP). Data were collected for the years 2007 to 2014 by the *DIRECCTE*. To accomplish this, a software called *Aglae-Chômage Partiel* creates a record for each short-time work application received from an establishment located in the *département*. The record allows information to be acquired at each step of the short-time work application process. Two data sets are then assembled out of these applications.

From those two data sets, all variables generated by the application process are included: the application identification number of the establishment, information on the applying establishment (identification number,

name, city, commuting zone (*zone d'emploi*), *département*, *région*, industry, weekly legal and collectively agreed work duration, number of employees); short-time work demand (reason, area, repeated use, hourly short-time work subsidy, the maximum number of short-time work hours per employee and per year, works council recommendation, labor inspection recommendation, application date); short-time work authorization (decision status, decision date, authorization period, number of authorized short-time work employees in total and by occupation and work duration, number of authorized short-time work hours and the associated number of subsidies). In the second data set, variables on monthly short-time work consumption are included: application identification number, short-time work consumption month and its sequential number relative to the first month of the authorization period, number of monthly employees effectively under short-time work, number of consumed short-time work hours and the associated number of subsidies.

4.2 DADS-Établissements

The Annual Declaration of Social Data (DADS) is produced by the French National Institute of Statistics and Economic Studies (INSEE). Each establishment reports the gross wage, inclusive of employer- and employee-paid payroll taxes, and net wage for each of its employees, to the tax authority. INSEE then processes these variables to yield various aggregates, at the individual, establishment, and firm levels. In what follows I use the establishment-level version which allows us to measure the industry, the city, employment, hours, and the wage bill for each establishment in our matched sample.

4.3 FICUS and FARE

The INSEE-Section "Production of Annual Firms' Statistics" (ESANE) produces the so-called FICUS (until 2007) and FARE (since 2008) data sets using the financial and fiscal accounts sent by all French firms to the fiscal authority. The variables are constructed using the annual tax returns and other administrative sources based on these accounts. The above data sets contain the firm identification, precise information about its balance sheet, its productivity or its activity level. These data sets contain most of the independent variables used in the regressions.

4.4 BODACC

The *Bulletin Officiel des Annonces Civiles et Commerciales* (BODACC) records information about all liquidations of firms and insolvency states. This administrative register allows us to identify firm destruction more precisely than with tax and social security registers, in which changes in firm identifier may be due to new owners, new addresses or mergers with other firms.

Table 3: Characteristics of firms with and without short-time work in 2009

	$STW = 1$	$STW = 0$
Revenue growth rate	-.17	.05
Leverage rate	.25	.27
Employment growth rate	-.14	-.25
Hourly gross wage	14.21	13.81
Hours worked per worker	1687.16	1617.36
Turnover rate	1.33	1.67
Share of temporary jobs	.11	.20
Number of employees	20.32	6.95
Age	18.5	13.49
Observations	11 313	757 030

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Notes:** $STW = 1$ stands for the firms using short-time work for economic reasons in 2009; $STW = 0$ stands for the firms not using short-time work in 2009.

5 Results

5.1 3SLS

I first present the result using the exposure to the shock for the sorting then the shock perceived measure in order to illustrate the variation induced by considering the vulnerability to the shock in the results. Using the growth rate of sales only for the sorting, I find, as expected, that STW has had a positive impact on the financial constraint. The negative signs signify that STW has had a positive impact on the financial constraint. The effect on the financial constraint increases when the exposure to the shock decreases. On the other hand, STW consumption has had an impact on employment only for the most exposed quintile. The coefficient linking STW consumption and employment steadily decrease through quintiles. It seems that, for the most exposed firm, STW has had a smaller positive impact on financial constraints but a larger impact on employment. This indicates that STW had a windfall effect for the less exposed firm. When a firm is less exposed to a shock, it uses STW in order to improve its financial situation rather than preserving a job. More preserved to the shock a firm is, higher is the windfall effect.

Table 4: Short-time work take-up, employment and vulnerability growth in 2008-2009 using three-stage least squared by quintile of growth rate of sales

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth					
STW	0.352***	0.126	0.010	0.194	-0.937*
	(4.05)	(0.72)	(0.03)	(0.34)	(-1.88)
Vulnerability growth	-0.006	0.011*	-0.002	0.011*	-0.001
	(-0.42)	(1.96)	(-0.39)	(1.94)	(-0.21)
Vulnerability growth					
STW	-5.127***	-20.086***	-32.710***	-67.719***	-55.564***
	(-12.29)	(-8.48)	(-5.81)	(-5.06)	(-5.49)
Employment growth	-0.729**	0.258	-0.485	-1.979***	-1.312
	(-2.25)	(0.64)	(-1.10)	(-2.97)	(-1.58)
N	49,724	50,381	50,405	50,389	50,144

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0 otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the α_1^1 and α_1^2 coefficient of the 3SLS estimation of equations (4) by quintile of growth rate of sales. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In the appendix, I run the two equations as two separate 2SLS and find similar results (table 7 and 8 in the appendix). The impact captured by the 3SLS of STW consumption on employment is similar to the one measured by Cahuc, Kramar and Nevoux (reproduced in table 9 in the appendix). They also find a significant result only in the first quintile and although their estimation is a bit higher, both coefficients are in the other's 95% confident interval (lower coefficient seems to be due to the transition from the 2SLS to the 3SLS (which might indicate that the impact captured in the 2SLS is overrated).

Using the perceived shock sorting leads to a different picture. First, the coefficient linking STW consumption and employment are higher for the first quintile. Second, this same coefficient for the second quintile is now significant. Third, the effect of STW on the financial constraint is now lower for the second and third quintile. The three features indicate that this sorting allows to better distinguish firm that needs STW in order to preserve employment from firms that use it for financial purposes. This also confirms the hypothesis stating that firms who less need STW in order to preserve employment are those who will take more advantage of it from a financial perspective. STW policies are, for them, a pure income transfer towards the less needy.

Table 5: Short-time work take-up, employment and vulnerability growth in 2008-2009 using three stage least squared by quintile of shock perceived

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth					
STW	0.510***	0.271***	-0.201	-0.576	-1.926**
	(0.076)	(0.095)	(0.193)	(0.383)	(0.777)
Vulnerability growth	-0.020	-0.027***	0.003	-0.010***	-0.016***
	(0.014)	(0.003)	(0.004)	(0.001)	(0.001)
Vulnerability growth					
STW	-3.647***	-5.278***	-26.515***	-31.595***	-36.442***
	(0.449)	(0.778)	(3.854)	(5.998)	(8.968)
Employment growth	0.596**	0.474**	1.920***	-0.069	0.265
	(0.280)	(0.219)	(0.414)	(0.444)	(0.474)
N	49,831	50,176	50,166	50,292	50,266

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0 otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the α_1^1 and α_1^2 coefficient of the 3SLS estimation of equations (4) by quintile of growth rate of sales multiply by the vulnerability to a shock in the previous period. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In table 5, with the new sorting, the magnitude of the effect of STW consumption is higher for the first quintile. In addition, the effect of STW consumption on employment is now also significant for the second quintile. Third, the impact of STW consumption on employment growth is now strictly decreasing through quintiles while the impact of STW consumption on financial constraint growth is strictly increasing through quintiles (recalling that a negative sign here means that the constraint is relaxing). Finally, the effect of employment growth for the three first quintiles (those for who the growth rate of sales is, on average, negative) is negative. In order to test the sorting, I run some tests on the first quintile regression (the most important one). I present the AIC, the BIC and the HQC criterion, they all displayed a better score for the "shock-perceived" sorting (table 13 in the appendix). This feature confirms that STW research, as well as STW policies, should consider the economic as well as the financial conjuncture of each firm when assessing the success of STW policies. I consider the results displayed in table 5 as my final results.

An increase in employment positively affects the financial constraint of the most impacted firms. Similarly, the financial constraint has a negative impact on employment for the most impacted firms. However, the impact is sometimes not significant and it is difficult to observe a clear pattern through the quintiles. Employment and financial constraint have a negative relationship, more employees mean more wages distributed and therefore higher cost to be supported by firms' finances. Both coefficients are of opposite signs for more. On the other hand, while STW consumption has more relaxed the financial constraint for the less affected firms, it has not had an effect on employment. It confirms that STW programs are used differently by the firm according to their economic and financial situation. This relation is robust to additional control variables (table 11 in the appendix) and a different measure of STW consumption (table 12 in the appendix).

STW increased employment growth by about 51% in the first quintile and 27% in the second quintile. Once taking into account the employment growth in this period, I find that STW policies have preserved 4.4 percent of jobs in the first two quintiles during the subprime crisis (5.3 percent for the first and 2.4 percent

for the second quintile). These figures show that STW policies can preserve employment during recessions. In the next section, I show how these jobs preserved have had a durable effect.

5.2 Durable effect

In this section, I show that preserving employment during a recession period leads to a quicker take-up during the recovery period. I use the effect measured in my 3SLS in each quintile in order to assess the effect of STW on firms' activity level during the recovery period. For each firm of each quintile, I produce an estimation of the variation in employment due to STW consumption. In order to be as precise as possible, I use the number of STW hours consumed divided by the total number of hours worked in the previous period, denoted by ΔH_{STW}, in order to estimate the increase in employment thanks to STW consumption. In order to check for the validity of the method, I use the same method for every quintile even though the relation between STW and employment growth is not significant for the third to the fifth quintile. As a dependent variable, I use the growth rate of sales during the recovery period (from 2009 to 2011). As control variables, I use the same as in the previous estimation.

Table 6: Job saved in 2008-2009 and activity level in 2009-2010 using ordinary least squared by quintile of shock perceived

	Q_1	Q_2	Q_3	Q_4	Q_5
Growth rate of sales$_{t+1}$					
Growth rate of employment$_t$	0.106***	0.167***	-0.021	0.047	0.008
	(4.27)	(4.49)	(-0.57)	(1.61)	(0.45)
N	49,724	50,381	50,405	50,389	50,144

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory variable is the share of growth rate of employment between 2008-2009 due to STW consumption as described in equation (7). Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the β_1 coefficient of the OLS estimation of equations (8) by quintile of growth rate of sales multiply by the vulnerability to a shock in the previous period. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

I find a positive relationship between jobs preserved during the negative shock and the growth rate of sales afterward. A one percent increase in the growth rate of employment during the 2008-2009 period has led to a 10 percent increase in the growth rate of sales for the first quintile and 16 percent for the second quintile in 2009-2011. This positive relationship decreases across quintiles and is non-significant for those where STW has impacted the employment level (which is reassuring for the method used). This effect is robust to different specifications for the activity level during the recovery period, for alternative control variables and by directly measuring the impact of STW consumption on activity during the recovery (see table 14, 15 and 16 in the appendix).

The hysteresis literature proposes two mechanisms that can explain this higher take-up due to employment protection during the recession. The first one is related to extensive growth. If we assume that wages are fixed by incumbents workers, then, during and after a drop in productivity those are fixed above their natural levels which prevent the unemployed to find a job (Blanchard and Summer, 1986; Gali, 2015). Hence, with a lower input level, the aggregate production level is lower. STW policy in this case can prevent a durable drop in the employment rate. The second mechanism is related to intensive growth. Unemployed workers, as they have stopped their learning-by-doing process and have lost contact with new practices and techniques introduced by firms, gradually deteriorate their existing skills over the unemployment period. As the economy recovers,

and the unemployed are finally hired, their productivity is lower than the average productivity of incumbent workers (Stiglitz, 1994; Dosi et al., 2018). By preserving an employer-employee match, STW policies can prevent the human capital depreciation process. In my results, the positive effect of employment protection during the crisis on activity during the take-up seems partly due to a difference in intensive growth. I find a positive correlation between jobs preserved and growth rate of sales per employee as well as the growth rate of added-value per employee (see table 7 below and table 18 in the appendix). However, my method does not allow me to determine which mechanism was prevalent during the great recession.

Table 7: Job saved in 2008-2009 and added-value per employee in 2009-2010 using ordinary least squared by quintile of shock perceived

	Q_1	Q_2	Q_3	Q_4	Q_5
Growth rate of sales$_{t+1}$					
Growth rate of employment$_t$	0.204***	0.360***	-0.077*	-0.059***	-0.015***
	(0.045)	(0.030)	(0.042)	(0.020)	(0.006)
N	40,584	41,717	42,989	43,970	42,900

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory variable is the share of growth rate of employment between 2008-2009 due to STW consumption as described in equation (7). Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement, pre-added-value per employee level and trend. **Notes:** This table displays the β_1 coefficient of the OLS estimation of equations (8) by quintile of growth rate of sales multiply by the vulnerability to a shock in the previous period. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Comparing the growth rate in different activity but also profitability variables, it appears that firms using STW in 2008-2009 perform better on average during the recovery period. This is also true for the number of hours worked o. Those firms also register higher returns on asset and added-value growth than their counterparts during the recovery period. This difference between STW and non-STW firms increases for the most affected firms (see table 8 below) which confirms that STW programs are more efficient during bad times.

Table 8: Difference between STW and non-STW consummer in growth rate of activity in 2009-2011 by quintile of shock perceived

	Growth rate of sales	Growth rate of sales per employee	Growth rate of roa	Growth rate of added value
1st quintile	0.102	0.131	0.383	0.151
2nd quintile	0.016	0.111	0.287	0.056
3rd quintile	-0.024	0.074	0.067	0.006
4th quintile	-0.062	0.001	0.142	-0.049
5th quintile	-0.195	0.017	0.260	-0.085
Total	0.095	0.168	0.428	0.111

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. **Notes:** This table displays the difference between firms that have consumed STW in in 2009 for economic reasons or not in the average growth rate of the different variables between 2009 and 2011.

6 Conclusion

In this paper, I first show the importance of considering financial constraints when assessing the impact of STW policies. Firms experiencing a difficult economic conjuncture can face it without modifying their employment policy if they have sufficient financial resources. However, those who do not might be constrained to excessive layoffs. STW policies, by sharing the labor cost between the public institutions and firms, can relax the financial constraints of firms and allow them to preserve their employment levels. However, if those policies are not well targeted, they might only have a windfall effect, lowering the cost and increasing the benefits of firms without impacting the aggregated employment level.

When a STW policy targets the right firms, it allows them to experience a greater take-up afterward. Their activity levels are significantly higher. I provide some proof of what can be considered a "human capital" mechanism. Preserving a job during the recession is correlated with higher productivity during the take-up. Still, this hysteresis mechanism remains to be more deeply explored. With my methodology, I provide empirical evidence of the positive durable effect of STW policies thanks to employment protection. However, I am unable to state among which channel proposed by the hysteresis literature this phenomenon is happening.

References

[1] Alexander Hijzen and Sebastien Martin. The role of short-time work schemes during the global financial crisis and early recovery: a cross-country analysis. *IZA Journal of Labor Policy*, 2(1):1–31, 2013.

[2] Jan Tilly and Kilian Niedermayer. Employment and welfare effects of short-time work. Technical report, Working paper, 2016.

[3] Britta Gehrke and Brigitte Hochmuth. Counteracting unemployment in crises: Non-linear effects of short-time work policy. *The Scandinavian Journal of Economics*, 2020.

[4] Fabio R Arico and Ulrike Stein. Was short-time work a miracle cure during the great recession? the case of germany and italy. *Comparative Economic Studies*, 54(2):275–297, 2012.

[5] Helge Braun and Björn Brügemann. Welfare effects of short-time compensation. 2017.

[6] Laurence Ball. Long-term damage from the great recession in oecd countries. *European Journal of Economics and Economic Policies: Intervention*, 11(2):149–160, 2014.

[7] Russell Cooper, Moritz Meyer, and Immo Schott. The employment and output effects of short-time work in germany. Technical report, National Bureau of Economic Research, 2017.

[8] Pierre Cahuc and Sandra Nevoux. Inefficient short-time work. 2018.

[9] Daniel Borowczyk-Martins and Etienne Lalé. How bad is involuntary part-time work? *Available at SSRN 2644179*, 2016.

[10] Ulf Rinne and Klaus F Zimmermann. Another economic miracle? the german labor market and the great recession. *IZA journal of labor policy*, 1(1):1–21, 2012.

[11] Dimitris Pavlopoulos and Katja Chkalova. Short-time work: a bridge to employment security or a springboard to unemployment? *Economic and Industrial Democracy*, page 0143831X19890674, 2019.

[12] Joseph E Stiglitz. Endogenous growth and cycles. *Innovation in technology, industries, and institutions*, pages 121–156, 1994.

[13] Giovanni Dosi, Marcelo C Pereira, Andrea Roventini, and Maria Enrica Virgillito. The effects of labour market reforms upon unemployment and income inequalities: an agent-based model. *Socio-Economic Review*, 16(4):687–720, 2018.

[14] Olivier J Blanchard and Lawrence H Summers. Hysteresis in unemployment, 1986.

[15] Jordi Galí. Hysteresis and the european unemployment problem revisited. Technical report, National Bureau of Economic Research, 2015.

[16] Denis Fougère, Cécile Golfier, Guillaume Horny, and Élizabeth Kremp. Quel a été l'impact de la crise de 2008 sur la défaillance des entreprises? *Economie et statistique*, 462(1):69–97, 2013.

[17] Roger M Gomis and Sameer Khatiwada. Debt and productivity: Evidence from firm-level data. Technical report, Graduate Institute of International and Development Studies Working Paper, 2017.

[18] Xavier Giroud and Holger M Mueller. Firm leverage, consumer demand, and employment losses during the great recession. *The Quarterly Journal of Economics*, 132(1):271–316, 2017.

[19] Christian Dustmann, Bernd Fitzenberger, Uta Schönberg, and Alexandra Spitz-Oener. From sick man of europe to economic superstar: Germany's resurgent economy. *Journal of Economic Perspectives*, 28(1):167–88, 2014.

[20] Oana Calavrezo, Richard Duhautois, Emmanuelle Walkowiak, et al. *The Short-Time Compensation Program in France: An Efficient Measure against Redundancies?* Centre d'Etudes de l'Emploi, 2009.

[21] Tito Boeri and Herbert Bruecker. Short-time work benefits revisited: some lessons from the great recession. *Economic Policy*, 26(68):697–765, 2011.

[22] Giulia Giupponi and Camille Landais. Subsidizing labor hoarding in recessions: The employment & welfare effects of short time work. 2018.

[23] Pierre Cahuc, Sandra Nevoux, et al. The heterogeneous impact of short-time work: From saved jobs to windfall effects. 2021.

Appendix

Back to text

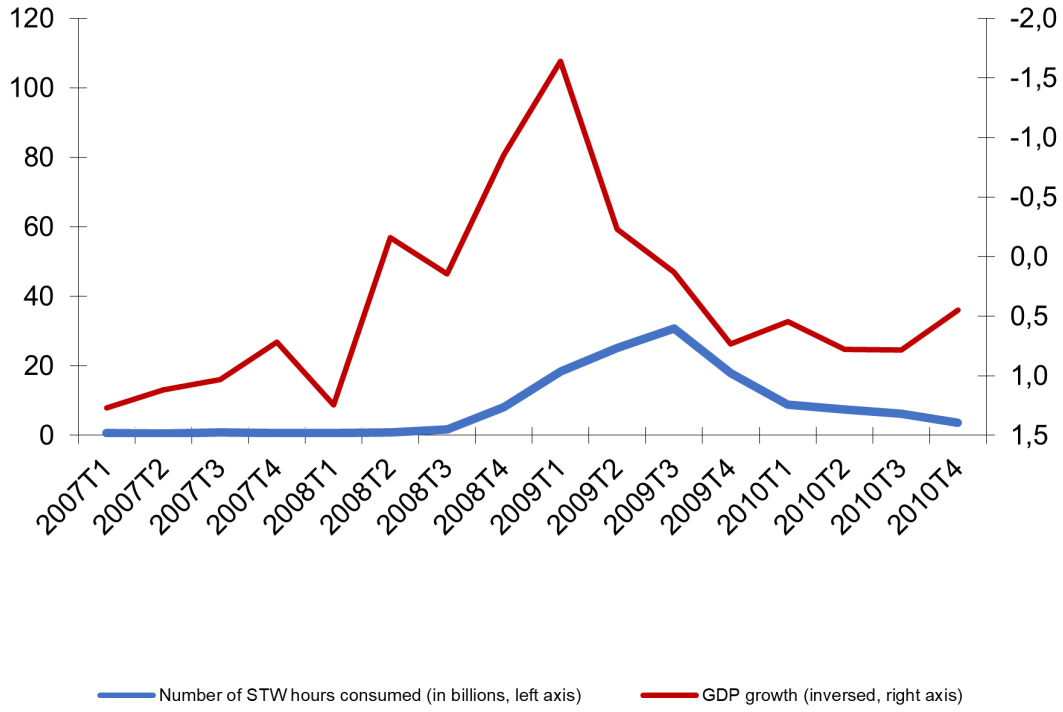

Figure 7: STW consumption and GDP growth in France

Source: Dares.

Back to text

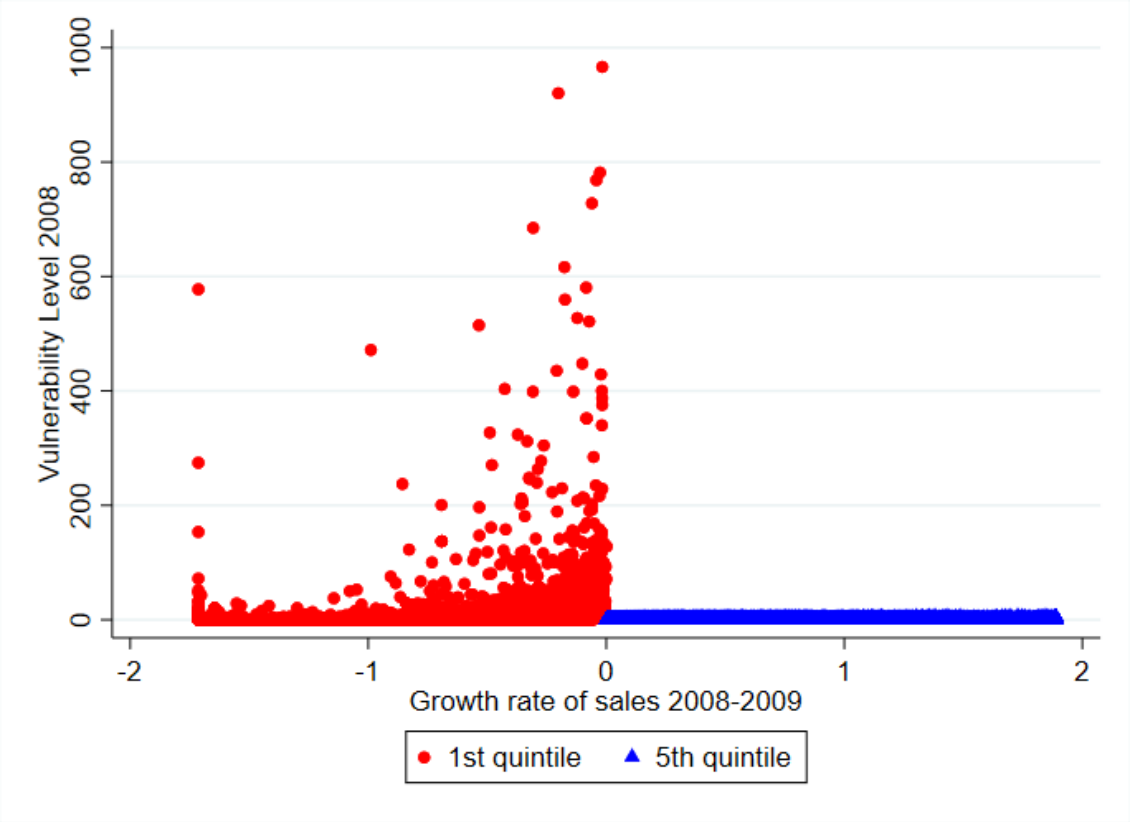

Figure 8: Vulnerability to the shock and growth rate of sales: repartition of the first and fifth quintile

Source: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Notes:** Repartition of a subset of firm according to vulnerability to the shock in 2008 and the growth rate of sate between 2008 and 2009. Firms are affected to a quintile according to their measure of the shock perceived.

Back to text

Table 9: Short-time work take-up and employment growth in 2008-2009 using two stage least squares by quintile of exposure to the shock

Employment growth	Q_1	Q_2	Q_3	Q_4	Q_5
STW	0.383***	-0.094	0.066	-0.495	-0.862*
	(0.065)	(0.218)	(0.273)	(0.323)	(0.469)
N	50,543	50,542	50,542	50,542	50,542

Definitions: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0 otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm. **Notes:** This table displays the α_1^1 coefficient of the 3SLS estimation of equations (4) but with a 2SLS method (therefore ignoring the second line of the equation) by quintile of growth rate of sales. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Short-time work take-up and vulnerability growth in 2008-2009 using two stage least squares by quintile of growth rate of sales

Vulnerability growth	Q_1	Q_2	Q_3	Q_4	Q_5
STW	-5.438***	-20.054***	-33.013***	-68.350***	-54.997***
	(0.877)	(4.814)	(11.939)	(23.198)	(14.604)
N	49,724	50,381	50,405	50,389	50,144

Definitions: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0 otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms previous level of vulnerability to the shock; indebtment. **Notes:** This table displays the α_1^2 coefficient of the 3SLS estimation of equations (4) but with a 2SLS method (therefore ignoring the first line of the equation) by quintile of growth rate of sales. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Back to text

Table 11: short-time work take-up, employment and hours of work in 2008-2009 using two-stage least by quintile of the predicted growth rate of hours of work squares

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth	0.423***	0.096	-0.060	-0.077	-0.032
	(0.160)	(0.068)	(0.117)	(0.107)	(0.160)
N	32,362	26,575	40,589 58,040	99,758	

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0 otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms previous level of vulnerability to the shock; indebtment. **Notes:** This table displays the α_1^2 coefficient of the 3SLS estimation of equations (4) but with a 2SLS method (therefore ignoring the first line of the equation). Firms are sorted according to Cahuc et al.'s prediction of growth rate of hours of work. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Back to text

Table 12: Short-time work take-up, employment and vulnerability growth in 2008-2009 using three stage least squared by quintile of shock perceived using additional control

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth					
STW		0.080***	0.056***	-0.094*	-0.162
-0.466					
	(6.06)	(2.91)	(-1.81)	(-1.57)	(-1.33)
Vulnerability growth	-0.020	-0.029***	0.001	-0.010***	-0.018***
	(-1.32)	(-10.20)	(0.18)	(-7.15)	(-6.12)
Vulnerability growth					
STW	-3.022***	-6.191***	-30.568***	-31.934***	-52.649***
	(-6.78)	(-6.70)	(-5.74)	(-4.74)	(-4.10)
Employment growth	-0.564***	-1.121***	-6.318***	-8.658***	-8.730*
	(-7.04)	(-5.77)	(-5.12)	(-4.08)	(-1.68)
N	50,225	50,344	50,381	50,142	50,346

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable h_{STW} is the number of STW hours consumed divided by the total number of hours worked in the previous period. Covariates include: firm size in previous year; the past leverage level and trend of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement level; average employment level in 2007; past rate of sale level and trend, past added-value level and trend . **Notes:** This table displays the α_1^1 and α_1^2 coefficient of the 3SLS estimation of equations (4) by quintile of the LOO growth rate of sales multiply by the vulnerability to a shock in the previous period. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 13: Short-time work take-up, employment and vulnerability growth in 2008-2009 using three stage least squared by quintile of shock perceived

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth					
H_{STW}	0.080***	0.056***	-0.116**	-0.179	-0.261*
	(0.013)	(0.019)	(0.051)	(0.141)	(0.158)
Vulnerability growth	-0.021	-0.028***	0.001	0.007***	0.008
	(0.015)	(0.003)	(0.003)	(0.001)	(0.008)
Vulnerability growth					
H_{STW}	-0.561***	-1.146***	-4.847***	-15.387***	-11.314**
	(0.080)	(0.198)	(1.000)	(4.114)	(4.443)
Employment growth	0.553*	0.653**	-0.215	-3.441***	-3.082*
	(0.316)	(0.277)	(0.493)	(0.770)	(1.783)
N	49,926	50,269	50,117	50,386	50,345

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable h_{STW} is the number of STW hours consumed divided by the total number of hours worked in the previous period. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the α_1^1 and α_1^2 coefficient of the 3SLS estimation of equations (4) by quintile of growth rate of sales multiply by the vulnerability to a shock in the previous period. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Back to text

Table 14: Quality test on the sorting strategies (first quintile)

	Growth of sales$_t$ & vulnerability$_{t-1}$	Growth of sales$_t$	LOO Growth of sales$_t$ * vulnerability$_{t-1}$	Cahuc et al.'s sorting
AIC	0.0747	0.1286	0.0826	0.1066
BIC	0.0751	0.1291	0.0830	0.1073
HQC	0.0747	0.1288	0.0826	0.1068
N	2552	2537	2542	1544

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Notes:** This table displays the result of different quality tests run on the first quintile of the 2SLS according to different sorting strategies. Covariates are (for every sorting): firm size in previous year; the past leverage of the firm; age of the firm. The first line describe the variables on which the quintiles are built. LOO growth of sales of firm i is the average growth rate of the sector of the firm i in the same community zone without considering the firm i. The vulnerability variable is describe in equation (5). Cahuc et al.'s sorting is based on the predicted evolution of number of hours worked (see their article [23]). For computational motive I take a random 50% sample of my dataset.

Back to text

Table 15: Job saved in 2008-2009 and number of hours worked in 2009-2010 using ordinary least squared by quintile of shock perceived

	Q_1	Q_2	Q_3	Q_4	Q_5
Growth rate of number of hours worked$_{t+1}$					
Growth rate of employment$_t$	0.126***	0.193***	-0.117***	0.012	-0.001
	(4.62)	(6.36)	(-4.54)	(0.45)	(-0.19)
N	49,724	50,381	50,405	50,389	50,144

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory variable is the share of growth rate of employment between 2008-2009 due to STW consumption as described in equation (7). Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the β_1 coefficient of the OLS estimation of equations (8) by quintile of growth rate of sales multiply by the vulnerability to a shock in the previous period. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 16: Short-time work take-up and employment growth in 2008-2009 using ordinary stage least squares by quintile of shock perceived with additional controls

	Q_1	Q_2	Q_3	Q_4	Q_5
Growth rate of sales$_{t+1}$					
STW	0.056***	0.095***	-0.017	0.047	-0.003
	(0.019)	(0.034)	(0.037)	(0.029)	(0.019)
N	46,273	46,497	46,775	48,493	47,863

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is the growth rate of sales and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory variable is the share of growth rate of employment between 2008-2009 due to STW consumption as described in equation (7). Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement, firms previous growth rate and level of sales per employee. **Notes:** This table displays the β^1 coefficient of the OLS estimation of equations (8) but with the 2SLS method. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 17: Short-time work take-up and employment growth in 2008-2009 using two stage least squares by quintile of shock perceived

	Q_1	Q_2	Q_3	Q_4	Q_5
Growth rate of sales$_{t+1}$					
STW	0.829***	0.725***	0.090	-1.462**	-1.585
	(9.69)	(4.40)	(0.14)	(-2.51)	(-1.31)
N	46,273	46,497	46,775	48,493	47,863

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is the growth rate of sales and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory variable is the share of growth rate of employment between 2008-2009 due to STW consumption as described in equation (7). Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the β^1 coefficient of the OLS estimation of equations (8) but with a 2SLS method. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Back to text

Table 18: Job saved in 2008-2009 and growth rate of sales per employee in 2009-2010 using ordinary least squared by quintile of shock perceived with additional controls

	Q_1	Q_2	Q_3	Q_4	Q_5
Growth rate of sales$_{t+1}$					
Growth rate of employment$_t$	0.076***	0.194***	-0.043	-0.035**	-0.008***
	(3.88)	(8.27)	(-1.18)	(-2.18)	(-3.72)
N	41,805	42,632	43,882	45,600	42,641

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory variable is the share of the growth rate of employment between 2008-2009 due to STW consumption as described in equation (7). Covariates include: firm size in the previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, firms' previous level of debt, firms previous growth rate and level of sales per employee. **Notes:** This table displays the β_1 coefficient of the OLS estimation of equations (8) by quintile of growth rate of sales multiplied by the vulnerability to a shock in the previous period. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Additional tables and figure

Table 19: Short-time work take-up and employment growth in 2008-2009 using two stage least squares by quintile of shock perceived

Employment growth	Q_1	Q_2	Q_3	Q_4	Q_5
STW	0.577***	0.448***	-0.422	-0.250	-1.117**
	(0.082)	(0.113)	(0.316)	(0.349)	(0.513)
N	50,388	50,388	50,388	50,388	50,388

Definitions: The dependent variable is employment growth growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0

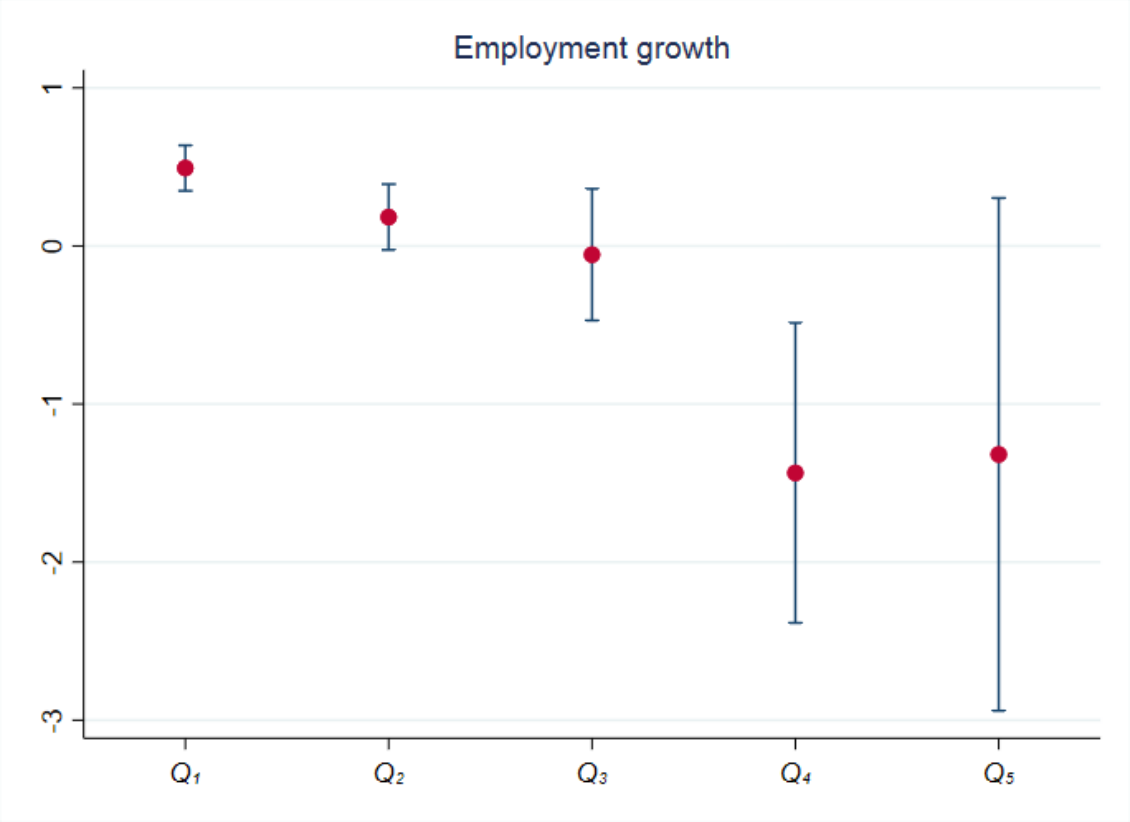

Figure 9: Coefficient plot of the results of table 5

Source: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Notes:** The graph displayed the coefficients and their confidence interval found in table 5 for the effect of STW consumption on employment growth.

otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm. **Notes:** This table displays the α_1^1 coefficient of the 3SLS estimation of equations (4) but with a 2SLS method (therefore ignoring the second line of the equation) by quintile of shock perceived as described in equation (6). Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 20: Short-time work take-up and vulnerability growth in 2008-2009 using two stage least squares by quintile of shock perceived

Employment growth	Q_1	Q_2	Q_3	Q_4	Q_5
STW	-3.289***	-5.049***	-26.358***	-31.665***	-35.981***
	(0.633)	(1.250)	(7.964)	(11.869)	(9.805)
N	49,831	50,176	50,166	50,292	50,266

Definitions: The dependent variable is vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable *STW* is equal to 1 if the firm uses short-time work for economic reasons in 2009 and to 0 otherwise. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm. **Notes:** This table displays the α_1^1 coefficient of the 3SLS estimation of equations (4) but with a 2SLS method (therefore ignoring the second line of the equation) by quintile of shock perceived as described in equation (6). Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 21: Short-time work take-up, employment and vulnerability growth in 2008-2009 using three-stage least squared by quintile of shock perceived using LOO growth rate of sales

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth					
STW	0.310***	0.428**	0.228	-0.231	-0.357**
	(0.079)	(0.175)	(0.244)	(0.214)	(0.167)
Vulnerability growth	-0.001	0.009***	0.006***	0.000	-0.002
	(0.011)	(0.004)	(0.002)	(0.001)	(0.005)
Vulnerability growth					
STW	-4.746***	1.368	12.885***	20.261***	4.352***
	(0.565)	(1.008)	(2.530)	(3.221)	(1.312)
N	50,225	50,344	50,381	50,142	50,346

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable H_{STW} is the number of STW hours consumed divided by the total number of hours worked in the previous period. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the α_1^1 and α_1^2 coefficient of the 3SLS estimation of equations (4) by quintile of the LOO growth rate of sales multiply by the vulnerability to a shock in the previous period. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 22: Short-time work take-up, employment and vulnerability growth in 2008-2009 using three stage least squared by quintile of schock perceived with $|\frac{\beta}{\alpha} = 2|$

	Q_1	Q_2	Q_3	Q_4	Q_5
Employment growth					
STW	0.497***	0.228**	-0.246	-0.574	-1.657**
	(6.20)	(2.25)	(-0.83)	(-1.42)	(-2.42)
Vulnerability growth	-0.016	-0.013***	0.004	-0.009***	-0.010***
	(-1.19)	(-5.09)	(0.92)	(-3.79)	(-6.71)
Vulnerability growth					
STW	-4.549***	-8.970***	-34.762***	-47.349***	-44.263***
	(-9.61)	(-7.75)	(-6.17)	(-5.30)	(-4.24)
Employment growth	0.631*	0.407	1.031**	-0.100	3.308***
	(1.86)	(1.61)	(2.28)	(-0.18)	(4.96)
N	50,225	50,344	50,381	50,142	50,346

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. **Definitions**: The dependent variable is employment growth and vulnerability growth defined as the log-difference between 2009 and 2008. The explanatory endogenous variable H_{STW} is the number of STW hours consumed divided by the total number of hours worked in the previous period. Covariates include: firm size in previous year; the past leverage of the firm; age of the firm; firms' previous level of vulnerability to the shock, indebtement. **Notes:** This table displays the α_1^1 and α_1^2 coefficient of the 3SLS estimation of equations (4) by quintile of the growth rate of sales squared multiply by the vulnerability to a shock in the previous period. Δgl_{it-1}, Δgh_{it-1} and $\Delta ghtete_{it-1}$ are winsorized at the 0.01 level. Robust standard errors are clustered at the *département* level. p-values: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 23: Characteristics of firms in 2009 by quintile of shock perceived

	Number of employees	Number of hours worked	Value added per employee	Short-time work subsidy	ROA
1st quintile	20.270	33140.010	47.225	4722.435	-.027
	(.201)	(326.452)	(2.223)	(153.139)	(.004)
2nd quintile	19.374	32679.860	51.94337	2000.502	.0430162
	(.196)	(324.774)	(.807)	(107.520)	(.001)
3rd quintile	17.909	30190.430	52.525	680.481	.069
	(.346)	(573.445)	(.604)	(133.227)	(.001)
4th quintile	17.107	29275.210	57.140	163.324	.099
	(.186)	(334.364)	(2.546)	(35.567)	(.010)
5th quintile	17.719	31132.400	60.04838	291.6156	.1089927
	(.173)	(301.999)	(.594)	(33.628)	(.001)

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. Firms not using short-time work at all in 2009 or using it in 2009 for economic reasons only. Standard error in parenthesis.

Table 24: Characteristics of firms in 2009 by quintile of shock perceived

	STW	H_{STW}	Employment growth	Vulnerability growth	Growth rate of sale
1st quintile	.079	.473	-.125	-1.302	-.292
	(.001)	(.010)	(.001)	(.006)	(.001)
2nd quintile	.029	.149	-.075	.046	-.128
	(.001)	(.005)	(.001)	(.007)	(.001)
3rd quintile	.011	.046	-.049	1.253	-.039
	(.001)	(.003)	(.001)	(.013)	(.000)
4th quintile	.006	.020	.007	-.356	.104
	(.000)	(.002)	(.001)	(.008)	(.001)
5th quintile	.004	.024	.020	2.206	.227
	(.000)	(.005)	(.001)	(.012)	(.002)

Sources: *DADS*, *FICUS* and *FARE* (*INSEE*) and *Sinapse* (*DGEFP*). **Scope**: Mainland France excluding Corsica. Market sectors excluding agriculture. Single-establishment firms with employment in 2008 greater than 4. STW=1 if the firm has consumed STW for economical reasons. H_{STW} is the number of STW hours consumed divided by the total number of hours worked in the previous period. Growth is defined as the log log difference between 2008 and 2009. Standard error in parenthesis.