Short-time Work and Employment in the Great Recession in France

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December 2017

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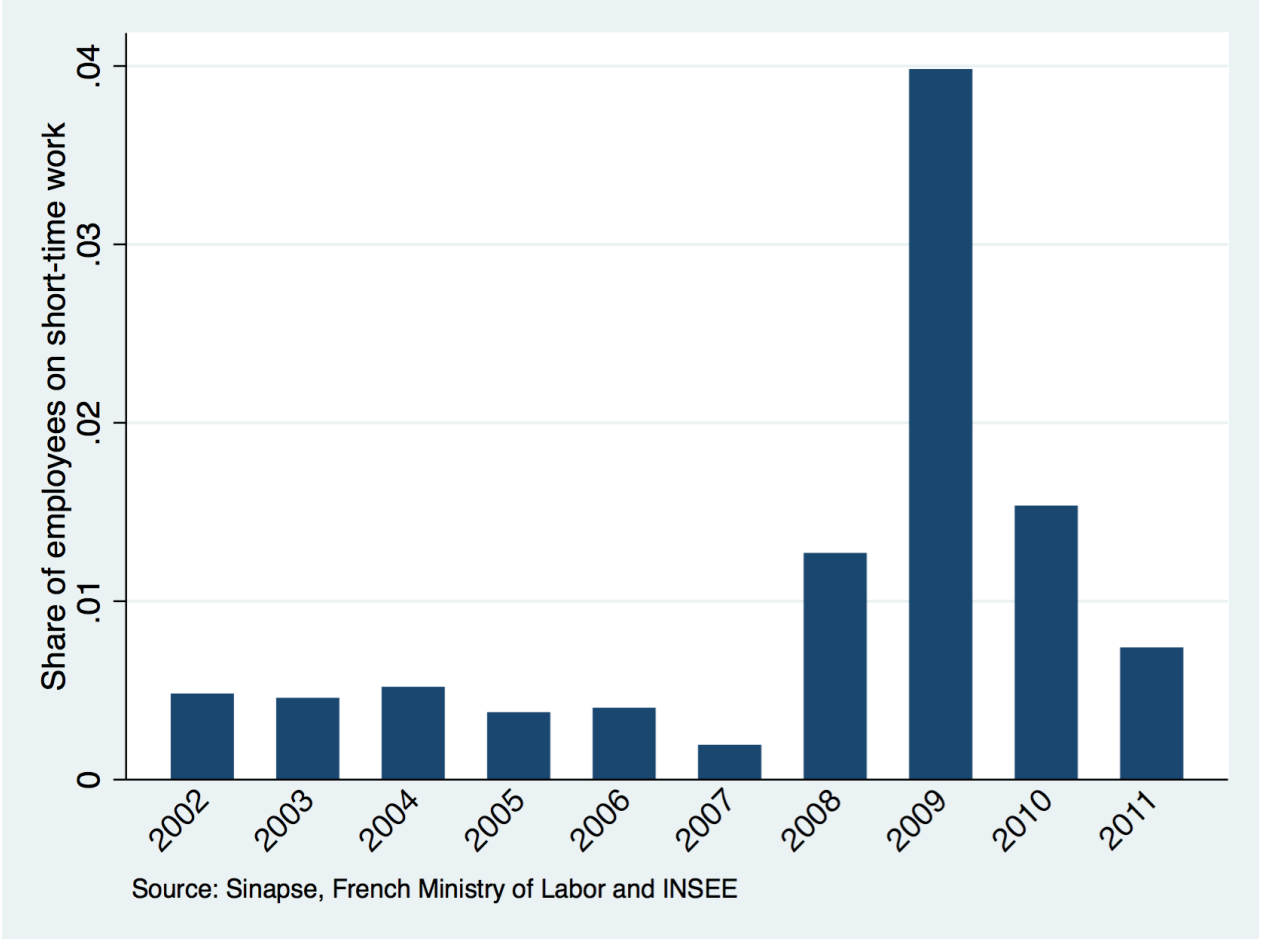
Introduction

- Short-time work enables establishments, under adverse economic circumstances and specific conditions:
  - to decrease the number of hours worked of their employees
  - to maintain a payment for these unworked hours while keeping workers in the firm
  - to receive subsidies for these hours
- In 2008 and 2009 France was severely hit by the economic crisis
- In response to the Great Recession, short-time work has dramatically expanded

Introduction



Share of employees on short-time work in the market non agricultural sectors

Introduction

- Investigate the impact of short-time work on employment and survival of single establishment firms in 2009
- Theoretical model:
  - short-time work saves jobs if the drop in the revenue of the firm is large
  - short-time work decreases hours of work without saving jobs if the drop in the revenue of the firm is moderate
  - short-time work more effective at saving jobs than wage subsidies or hiring subsidies (lower cost per job saved)

Deep reason: short-time work allows the government to target subsidies toward jobs hit by negative shocks
$\longrightarrow$ small windfall effects

Introduction

- Empirical part:
  - short-time work reduced job losses **only** in firms for which the drop in revenue was large
  - short-time work reduced hours of work with not significant impact on employment in about 50% of firms which used short-time work
  - Nevertheless, the cost per job saved is low compared with wage subsidies or hiring subsidies

$\longrightarrow$ Short-time work was an effective policy to save jobs at low cost during the great recession
$\longrightarrow$ But the scheme could have been more effective

Introduction

- Novelty
  - heterogeneous effects depending on the size of the drop in revenue
  - create jobs at low cost because targets jobs hit by negative shocks
  - data cover all the universe of establishments
  - identification strategy

Presentation plan

1. What is short-time work?
2. Model
3. Data
4. Empirical strategy
5. Results

1. What is short-time work?

- Rules prevailing from 2009 to 2011
- All private establishments and all their employees, located in France, are eligible to short-time work.
- An establishment can apply to short-time work for 6 motives: (i) economic situation; (ii) modernization, restructuring and transformation; (iii) problems in the provision of raw materials; (iv) accident; (v) exceptionally adverse weather conditions; (vi) other exceptional circumstances.
- Our paper is focused on the first only (80% of short-time work)
- When using short-time work, an establishment must specify its domain of application, which can be either a part or the totality of the establishment or a temporary suspension of activity

1. What is short-time work?

- Short-time work applies only to the unworked hours below the weekly legal duration of 35 hours or below the weekly collectively-agreed or contractual duration if it is below 35 hours.
- The yearly number of subsidized hours per employee per year cannot exceed 1000 hours and 12 months
- Under short-time work, each hour worked is still paid at the previous gross hourly wage and each subsidized hour is paid at 60% of the previous gross hourly wage, with a lower limit of 6.84€ (75% min wage).
- The establishment is then reimbursed by the state 3.84€ for establishments belonging to firms with 250 employees or less and 3.33€ for establishments belonging to firms with 251 employees or more

1. What is short-time work?

- The procedure
  1. Applications from the establishment to the departmental labor relations directions (consultation of staff representatives, documents proving its economic difficulties)
  2. Reply of the departmental directions of work
  3. In case of authorization, the establishment can use short-time work within the limits set by the local authority.
- Refusal rates are low (below 5% in 2009)

2. The model

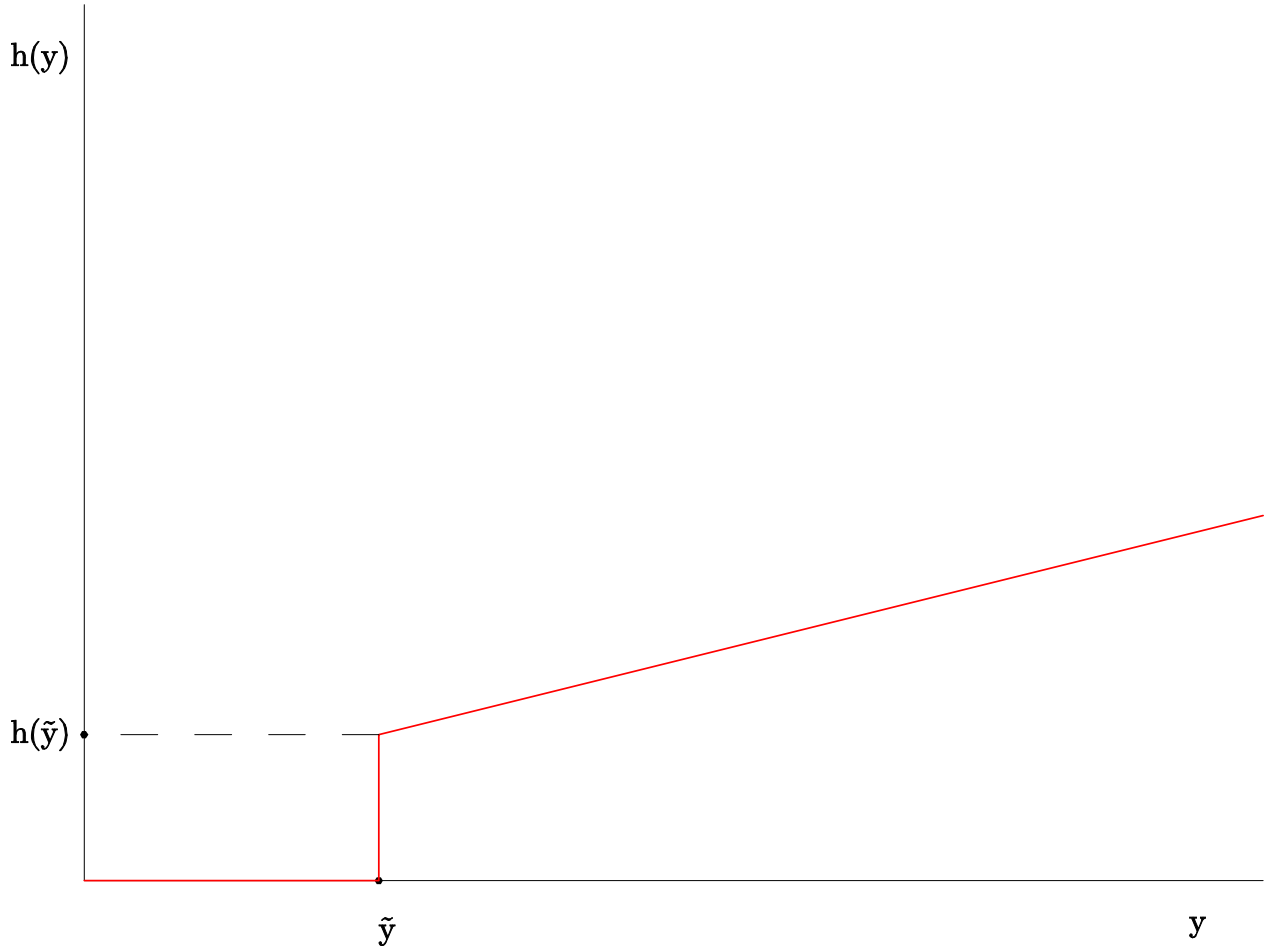
- Explains the features of contingent labor contracts when there is short-time work
- The production per hour worked on each job y, is only revealed to the firm and to the worker once the worker has been hired
- Realizations of y are independent and identically distributed across jobs
- Firms offer labor contracts on competitive labor markets to risk averse workers:
  - Wage $w(y)$
  - Hours $h(y)$
  - Productivity threshold below which jobs are destroyed $\tilde{y}$

2. The model

- Agency provides
  - insurance benefits to unemployed workers
  - short-time compensation to employees if the number of hours worked falls below the threshold $\bar{h}$.
- Short-time compensation $= \sigma \max(\bar{h} - h, 0)$

2. The model

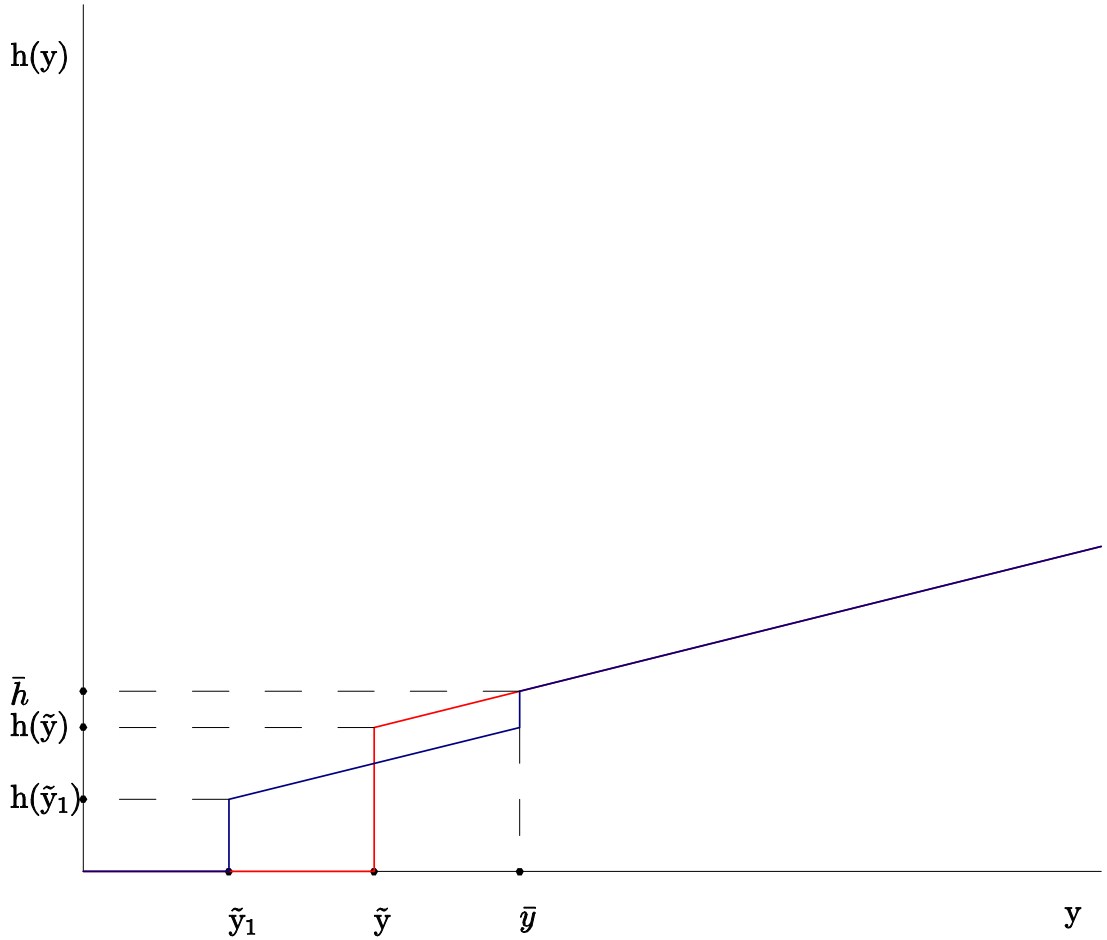
Optimal labor contract without short-time work



Productivity y and hours worked $h(y)$ absent short-time work. $\tilde{y}$ is the threshold value of productivity below which jobs are destroyed.

2. The model

Optimal labor contract with short-time work



Productivity y and hours worked $h(y)$ with short-time work (blue line)

2. The model

- Short-time work is more effective than wage subsidies to reduce job destruction if the agency does not observe productivity y:
  - short-time work is a means to induce firms to credibly reveal their low productivity

$\longrightarrow$ allows the agency to target low productivity jobs

- Nevertheless
  - short-time work implies drops in hours of work and no employment effects in firms hit by moderate drop in revenue
  - positive employment effect in firms hit by large drop in revenue only
- The rest of the paper evaluates this prediction empirically

3. Data

- Short-time work for each establishment: *Sinapse-Chômage Partiel* (number of hours, amount of subsidy, date of demand, acceptance, refusal, consumption...)
- The Annual Declaration of Social Data (*DADS*, administrative data), establishment identification number, sector, municipality, commuting zone, the total number of employees over the year, on 1st January, on 31 December, the number of employees disaggregated by contract type, the net and gross wage, the number of paid hours and the level of turnover
- *FICUS* and *FARE* (annual tax returns and surveys), financial information on firms levels of turnover and debt

$\longrightarrow$ Focus on firms with single establishment **which did not use short-time work in 2007-2008**

3. Data

Firm	Short-time work	No short-time work
Nb employees	24.31	6.84
	(80.33)	(27.92)
Employment growth rate	−.14	−.08
	(.30)	(.46)
Revenue growth rate	−.17	.04
	(.39)	(.52)
Hourly wage	14.27	13.79
	(5.17)	(62.83)
Hours worked per employee/year	1570.97	1591.22
	(320.33)	(411.52)
Worker turnover	1.32	1.60
	(0.62)	(1.14)
Share of temporary jobs	.04	.09
	(0.12)	(0.21)
Firm leverage	.22	.22
	(0.24)	(0.26)
Nb. of obs.	13,826	869,274

Characteristics of firms in 2009

4. Empirical strategy

- Estimate the relation for year 2009:

$$L_i = \alpha_0 + STW_i\alpha_1 + Y_i\alpha_2 + X_i\alpha_3 + \varepsilon_i$$

  - L_i : employment growth rate in the benchmark specification.
  - STW_i : indicator variable equal to one if the firm uses short-time work
  - Y_i : revenue growth rate
  - X_i : control variables, past share of temporary jobs, past mean hourly wage, past number of hours worked per employee, past labor turnover, (728) sector fixed effects, past size of the firm (10, 50, 250 and 1000 employees), past firm leverage, firm age
  - ε_i : error term

4. Empirical strategy

$$L_i = \alpha_0 + STW_i\alpha_1 + Y_i\alpha_2 + X_i\alpha_3 + \varepsilon_i$$

- Short-time work use is potentially correlated with the error term ε_i even if the revenue growth rate is controlled for
  - Firms have more incentives to use short-time work if it is more costly to store production or to find productive activities to incumbent workers when the demand drops
  - Correlation between the revenue growth rate and the total hours of work growth rate is weak ($r = 0.139$ in 2009)
  - At industry level ($N = 728$) positive correlation between
    - short-time work use in 2009 and
    - the correlation between revenue and hours of work in 2008

4. Empirical strategy

- Firms with more intensive short-time work use are also those which are more likely to adjust hours of work and employment downwards when their revenue drops
- Technological factors, quality of management, of labor relations, distribution of jobs tenure within the firm may influence the adjustment costs of employment and short-time work use for a given drop in revenue

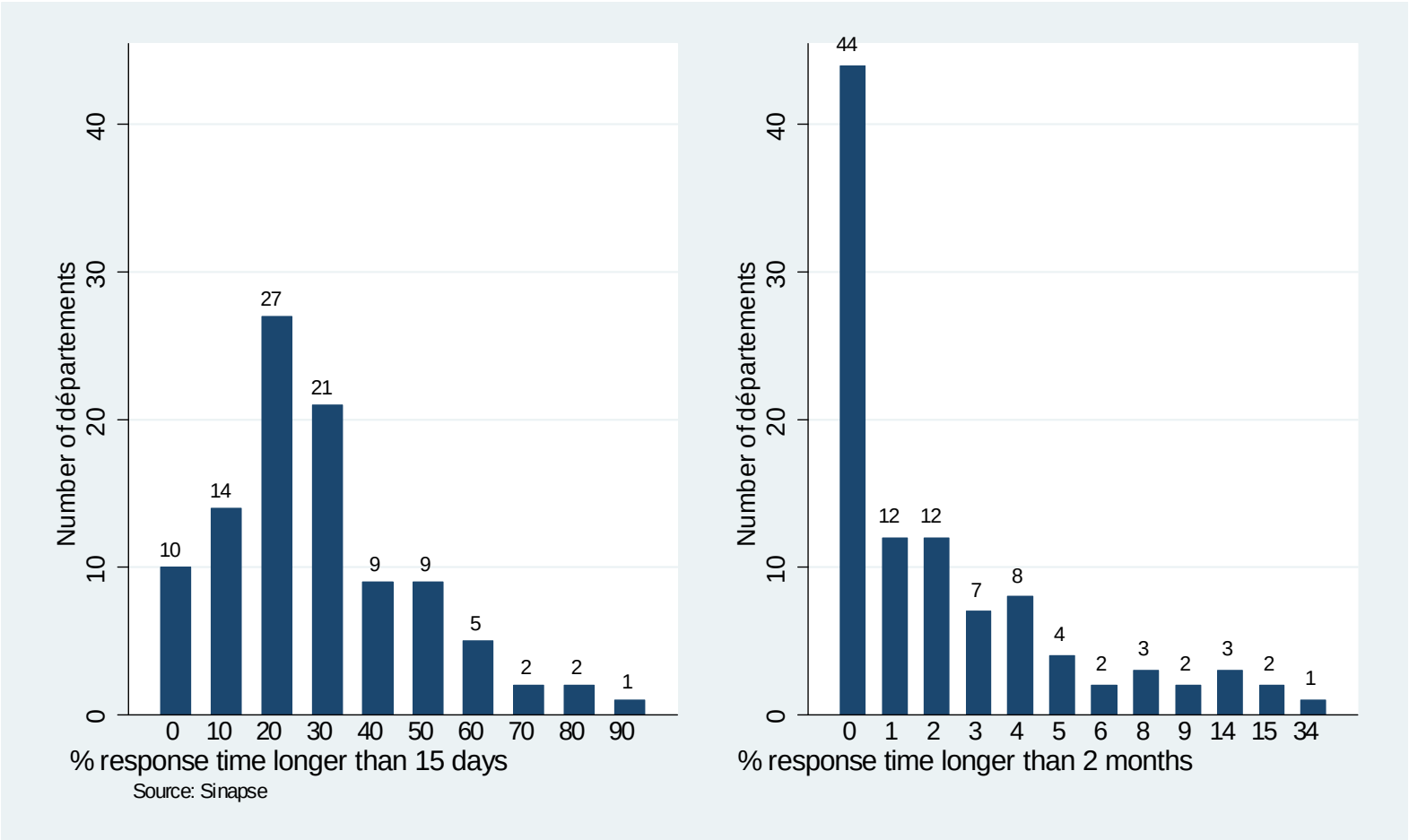
$\longrightarrow$ OLS short-time work estimate biased downwards

4. Empirical strategy

- Instrumental variable for short-time work take-up
- Departmental directions of labor relations play a key role in the implementation of short-time work

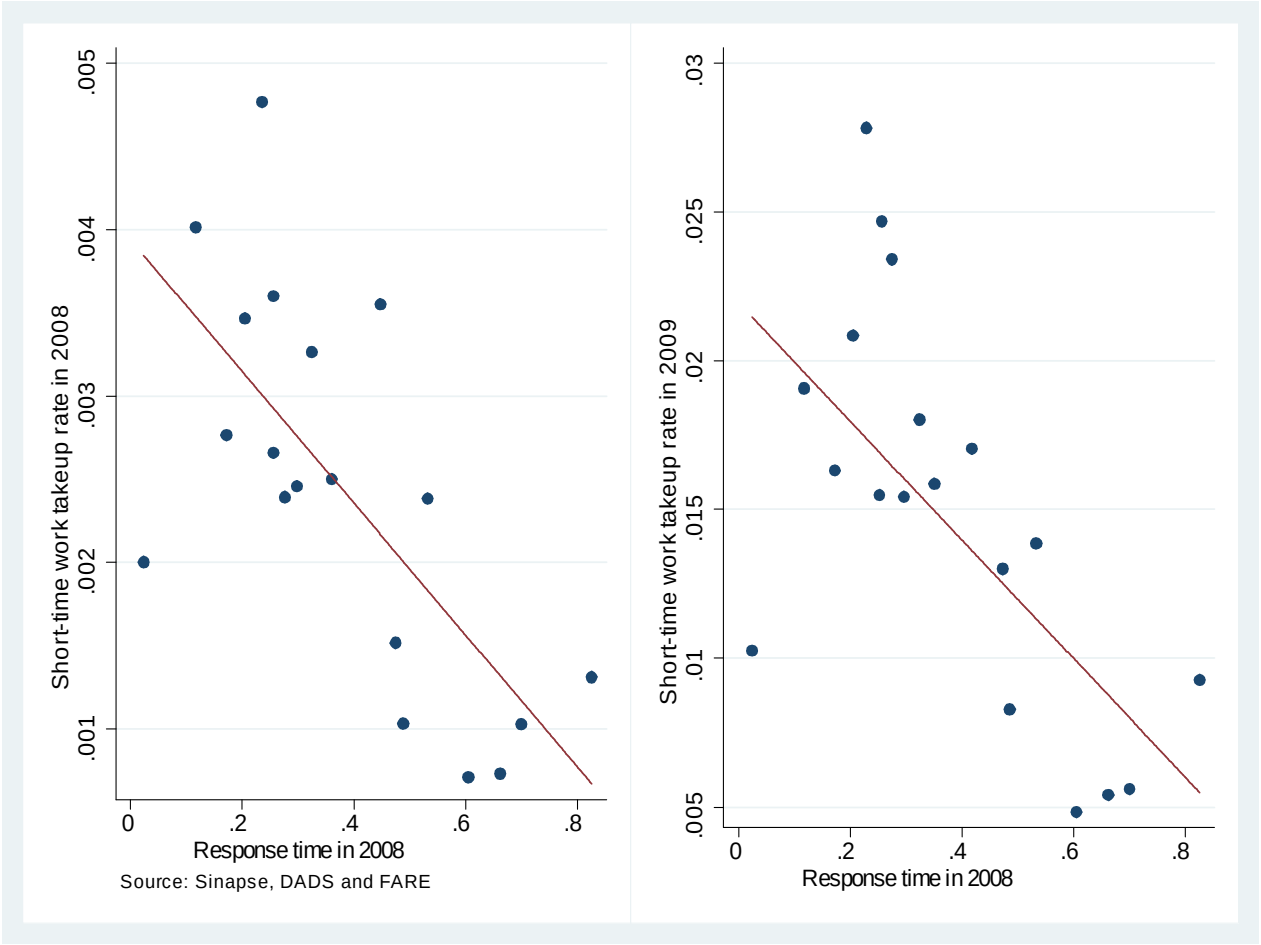
$\longrightarrow$ response time to short-time work applications across départements

4. Empirical strategy



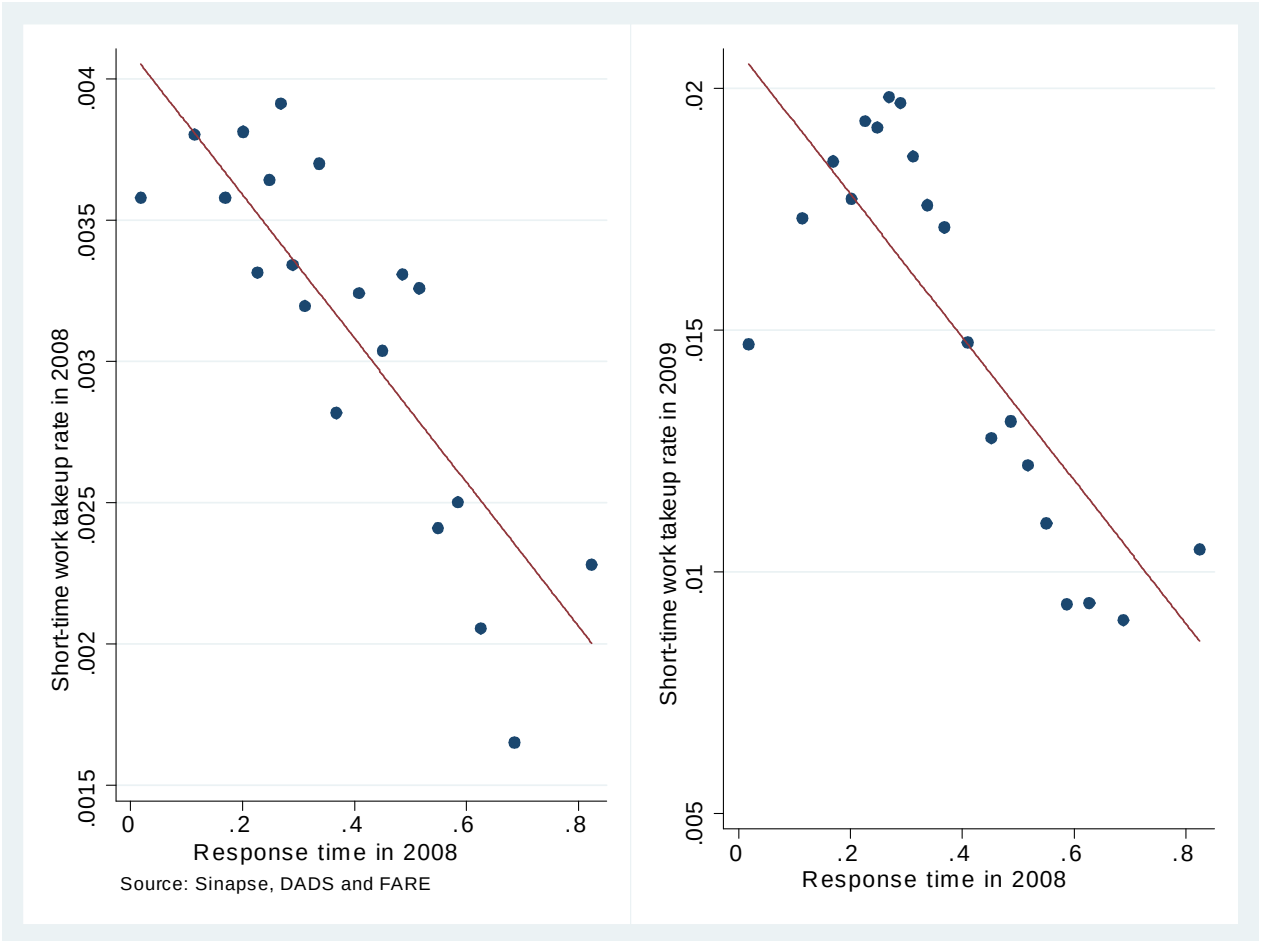
Percentage of response time to short-time work applications longer than 15 days (left-hand side) and longer than 2 months (right-hand side), by département in 2008.

4. Empirical strategy



Departmental share of response time $>$ 15 days in 2008 and short-time work take-up rate in 2008 (left) and in 2009 (right). Binscatters without covariate

4. Empirical strategy



Departmental share of response time $>$ 15 days in 2008 and short-time work take-up rate in 2008 (left) and in 2009 (right). Binscatters with covariates

4. Empirical strategy

- The response time of the departmental administration is also related to the choice of multi-establishment firms.
- Multi-establishment firms used short-time work more frequently in 2008, before the recession, in their establishments located in the départements where the response time was shorter in 2008

4. Empirical strategy: multi-establishment firms

	Dep variable: STW take-up in 2008
Share of reponse time $>$ 15 days	$-.222^{***}$
	$(.048)$
Ctg Zone revenue growth rate	-3.34^{***}
	$(.810)$
Hours worked per employee/year	.000
	$(.000)$
Hourly wage	$-.001$
	$(.001)$
Share of temporary jobs	$-.07^{***}$
	$(.003)$
Sector fixed effect for establishment	yes
Firm fixed effect	yes
Nb observations	$322,517$

4. Empirical strategy

- The behavior of single establishment firms in 2009 is influenced
  - by the past response time of the administration,
  - but also by the proximity, in previous year, of short-time work establishments belonging to multi-establishment firms

4. Empirical strategy: Single establishment firms

	Dep variable: STW take-up
Dept time response to STW applications	$-.917^{***}$
	(0.113)
Distance to STW user in previous year	$-.007^{***}$
	(.001)
Adj-R^2	.090
Prob $F > 0$	.000
Nb observations	768, 343

4. Empirical strategy

- Short-time work use in firm i in 2009 explained by:

$$STW_i = a_0 + RP_i a_1 + DM_i a_2 + Y_i a_3 + X_i a_4 + \varepsilon_{1i}$$

  - RP_i share of response time to STW applications > 15 days in the département of firm i in 2008;
  - DM_i distance to the closest establishment, belonging to a multi-establishment firm, which used STW in 2008

4. Empirical strategy

- The revenue growth rate Y_i may be impacted by short-time work use:

$$Y_i = b_0 + STW_i b_1 + \bar{Y}_i b_2 + X_i b_3 + \varepsilon_i$$

  - $\bar{Y}_i$: leave one out mean revenue growth rate of the (88) industries interacted with the revenue growth rate of the (328) commuting zone of firm i.

4. Empirical strategy

- Finally, we estimate

$$L_i = \alpha_0 + STW_i\alpha_1 + Y_i\alpha_2 + X_i\alpha_3 + \varepsilon_i$$

where:

$$\begin{aligned} STW_i &= \beta_0 + RP_i\beta_1 + DM_i\beta_2 + \bar{Y}_i\beta_3 + X_i\beta_4 + \eta_i \\ Y_i &= \gamma_0 + RP_i\gamma_1 + DM_i\gamma_2 + \bar{Y}_i\gamma_3 + X_i\gamma_4 + \xi_i \end{aligned}$$

- Assuming: $\mathbb{E}\left(\varepsilon_i \middle| RP_i\right) = \mathbb{E}\left(\varepsilon_i \middle| DM_i\right) = \mathbb{E}\left(\varepsilon_i \middle| \overline{Y_i}\right) = 0$
  - RP_i share of response time to STW applications > 15 days in the département of firm i in 2008;
  - DM_i distance to the closest establishment, belonging to a multi-establishment firm, which used STW in 2008

5. Empirical results

Global effects of short-time work in 2009

For all firms	OLS	IV
Employment growth	$-.028^{***}$	.051
	(.003)	(.069)
Share of perm jobs	0.025^{***}	$.098^{**}$
	(.002)	(.047)
Relative growth of perm jobs	$-.003$	.086
	(.003)	(.077)
Relative growth of temp jobs	-0.017^{***}	$-.038$
	(.002)	(.058)
Death rate	-0.030^{***}	$-.0216$
	(.002)	(0.0432)
Nb. Observations	768, 343	768, 343

Note: Death = zero employee on 31 December 2009; Robust standard errors, clustered at industry $\times$ département level

5. Empirical results

Heterogeneous effects

- Model $\Rightarrow$ Heterogeneous effects of short-time work
  - reduction in job losses when large negative drop in revenue
  - no impact on job losses otherwise
- Stratification of firms according to their predicted revenue growth (first stage of the IV strategy)

5. Empirical results

Heterogeneous effects

Quintile	Nb firms	STW rate (%)	g_y STW=1	g_y STW=0
1	153,669	3.92	−.26	−.12
			(.26)	(.23)
2	153,669	1.27	−.17	−.04
			(.29)	(.30)
3	153,668	0.9	−.14	− .01
			(.32)	(.29)
4	153,669	0.7	.09	.04
			(.38)	(.41)
5	153,668	0.6	.31	.38
			(.96)	(.88)

STW take-up and revenue growth rate (g_Y) by quintile of firms stratified by predicted revenue growth rate in 2009

5. Empirical results

Heterogeneous effects in 2009: First stage IV estimation

Quintile	1	2	3	4	5
R. time	-1.854^{***}	$-.968^{***}$	$-.832^{***}$	$-.552^{***}$	$-.412^{***}$
	(0.348)	(.178)	(.0149)	(.0124)	(.0117)
D. STW	$-.020^{***}$	$-.001$	$-.007^{***}$	$-.006^{***}$	$-.001$
	(.004)	(.002)	(.002)	(.002)	(.002)
Pr $F > 0$	.000	.000	.000	.000	.000
Nb obs	153,669	153,669	153,668	153,669	153,668

R. time: response time of départmental administration; D. STW: Distance to multi-etablishment STW user in previous year

5. Empirical results

Heterogeneous effects in 2009: Second stage IV estimation

Quintile	1	2	3	4	5
Emp growth	$.158^{***}$	.108	.058	$-.129$	$-.309$
	(.051)	(.140)	(.167)	(.201)	(.273)
Share perm jobs	$.068^{**}$	.145	$.199^{*}$	$-.013$	.235
	(.032)	.090)	(.167)	(.149)	(.173)
Gr perm jobs	$.176^{***}$	$-.221$	.193	$-.237$	$-.187$
	(.053)	(.137)	(.164)	(.207)	(.280)
Gr temp jobs	.007	$-.082$	.145	.001	$-.154$
	(.039)	(.110)	(.144)	(.176)	(.228)
Death rate	$-.0876^{***}$	$-.040$	.029	$.237^{*}$	.226
	(.033)	(.087)	(.096)	(.127)	(.155)
Nb. Obs	153, 669	153, 669	153, 668	153, 669	153, 668

IV estimations. Robust standard errors, clustered at industry $\times$ département level

5. Empirical results

Heterogeneous effects in 2009: stratification by tercile

Tercile	1	2	3
Emp growth	.125**	−.135	−.173
	(.054)	(.158)	(.247)
Share perm jobs	.084**	.139	.225
	(.033)	(.118)	(.158)
Gr perm jobs	.176***	−.197	.001
	(.056)	(.166)	(.271)
Gr temp jobs	−.018	−.154	−.238
	(.041)	(.141)	(.202)
Death rate	−.057	.009	.218
	(.035)	(.096)	(.141)
Nb. Obs	256, 115	256, 114	256, 114

IV estimations. Robust standard errors, clustered at industry × département level

5. Empirical results

Lasting heterogeneous effects in 2010

Quintile	1	2	3	4	5
Emp growth	.146**	−.134	−.246	−.028	−.215
	(.066)	(.171)	(.203)	(.240)	(.255)
Death	−.045	.131	−.124	−.046	−.073
	(.039)	(.112)	(.120)	(.141)	(.163)
Nb. Obs	130, 331	133, 147	131, 899	126, 307	116, 822

Impact of STW in 2009 on employment growth and firms survival in 2010

IV estimations. Robust standard errors, clustered at industry × département level

5. Empirical results

Cost per job saved in 2009

- On average, each worker on short-time work in 2009 reduced her/his working time by 123 hours
- Employers got 3.7 euros per subsidized non-worked hour, or 460 euros per worker on short-time work.
- This amount is small compared to the average annual labor cost in the firms which used short-time work, which is equal to 38,600 euros.
- Cost per job created: Number of jobs saved/total cost $= 2,995$ euros
- Equal to 6.5% of the average annual labor costs in our set of firms, 95% confidence interval $[4\%, 17\%]$.

5. Empirical results

Cost per job saved in 2009

- Very small compared with
  - hiring subsidies (25% of annual labor cost)
  - wage subsidies (100% to 200% of annual labor cost)
- Explanation: short-time work targets workers who are at risk of losing their job because their marginal productivity falls below the marginal labor cost, whereas
  - wage subsidies are usually given to all workers
  - hiring subsidies are usually given to all hires

5. Empirical results

Cost per job saved in 2009

- Cost per job saved in first quintile: $1,725$ euros$<= 2,995$ euros,
- Windfall effects are relatively small because firms above the fifth quintile, which represent about 50% of all firms with positive short-time work take-up in 2009, only used 17% of the total number of subsidized hours in 2009 and received 17% of the total amount of subsidies

5. Empirical results

Effect on global amount of hours of work

- Workers on short-time work in 2009 reduced their hours of work by 8% of the average annual number of hours of work per job.
- A worker on short-time work saves 0.2 job, 95% confidence interval $[0.08, 0.33]$
- Every worker on short-time work in 2009 induced an increase in the total volume of hours of work equal to 12.5% of the average number of hours per job – 95% confidence interval $[0\%, 25\%]$
- All in all, short-time work did not only save jobs, also limited the drop in the total number of hours

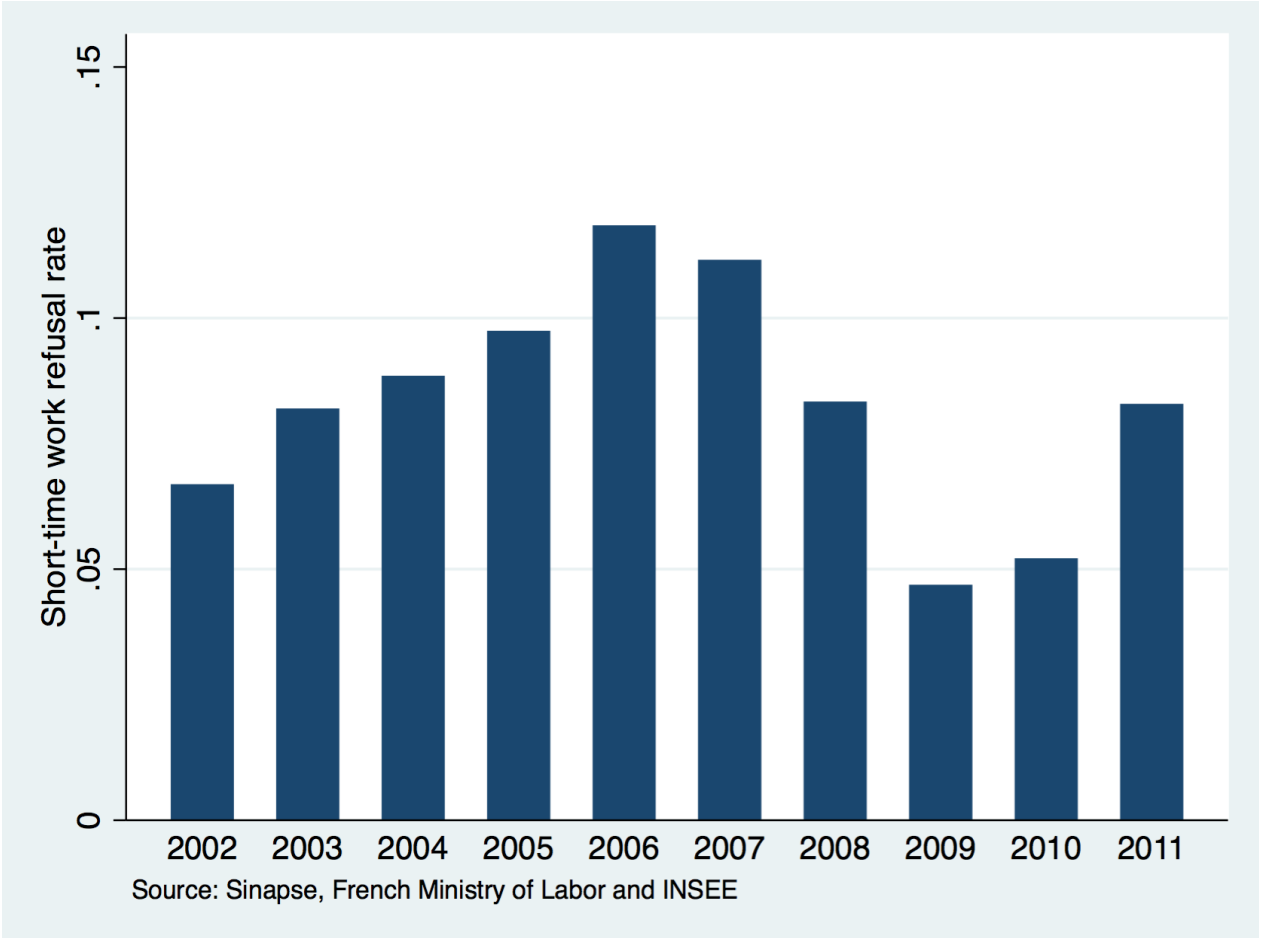
Conclusion

- Short-time work in 2009 has been an effective policy to save jobs: low cost compared with other policies (employment subsidies, creation of public jobs)
- Short-time work induces windfalls for firms and workers
- Possible to reduce these windfalls
  - target at firms with large drop in revenue
  - lower the threshold of hours below which unworked hours are subsidized
- Important to introduce experience rating
  - Justification of short-time work: imperfect financial markets
  - Recurrent short-time work is inefficient (Cahuc, Nevoux, 2017)

A.1. Hike in short-time work

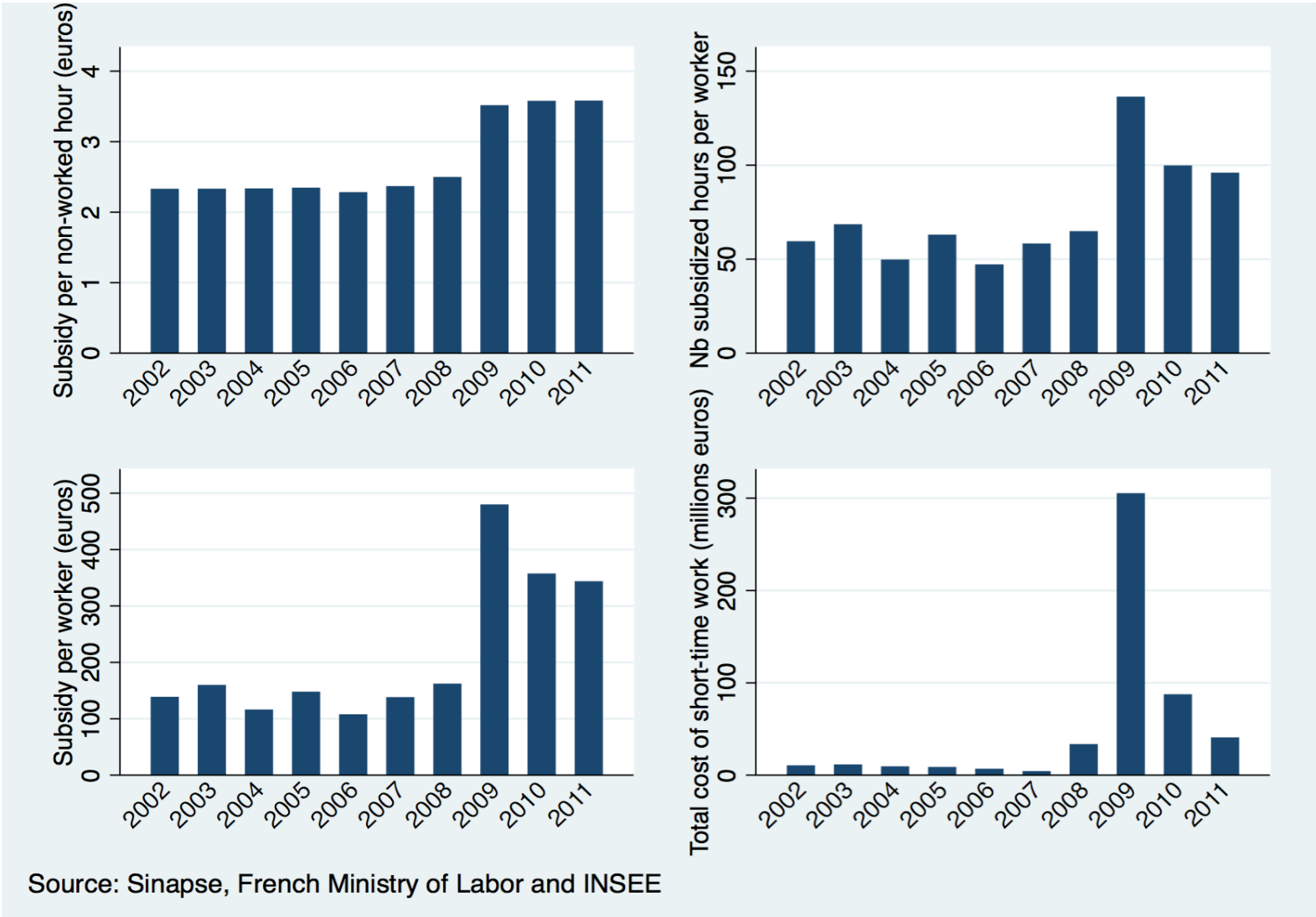
- The strong hike in short-time work has been boosted by the public authorities:
  - December 2008: compensated short time hours increased from a maximum of 600 to 800 with a duration increasing from 4 to 6 weeks
  - January 2009: the allocation increased from 50 to 60% of the previous gross hourly wage and the subsidy received by the establishment has been expanded
  - May 2009: creation of long-term short-time work which can be implemented during a period of at least 3 months up to 12 months. The allocation is set to 75% of the previous gross hourly wage. The establishment receives an additional subsidy.
  - Furthermore, several ministerial circulars and directives have been sent to the local authorities in charge of short-time work, calling for an easier access to this scheme.

A.1. Hike in short-time work



Short-time work refusal rate

A.1. Hike in short-time work



Source: Sinapse, French Ministry of Labor and INSEE

A.2. Short-time work use (1)

	Dep variable: STW take-up
STW in dept × sector cell (2008)	83.85^{***}
	(3.28)
Ctg zone revenue growth rate	-10.10^{***}
	(1.08)
Ctg zone × sector revenue growth rate	127.2^{***}
	(22.38)
Past workers turnover rate	$-.10^{***}$
	(.01)
Past hours worked per employee/year	$-.01^{***}$
	(.00)
Past hourly wage	$-.29^{***}$
	(.03)
Past share of temporary jobs	$-.40^{***}$
	(.04)
Nb observations	779,367

A.2. Short-time work use (2)

	Dep variable: STW take-up
Past firm size (ref: 1 to 9 employees)	
from 10 to 49 employees	11.60^{***}
	(.10)
from 50 to 249	14.88^{***}
	(.32)
from 250 to 999	18.01^{***}
	(.95)
1000 and more	18.26^{***}
	(4.23)
Past leverage	10.15^{***}
	(.03)
Adj-R^2	0.10
Nb observations	779,367

A.3. Related literature

- Theoretical literature
  - Burdett and Wright, 1989, Van Audenrode, 1994 $\longrightarrow$ short-time work is favorable to employment but distorts downwards the number of hours worked per employee
  - Braun and Brügemann, 2012 $\longrightarrow$ short-time work can be welfare improving if firms have limited access to financial markets.
  - Our paper $\longrightarrow$ short-time work can save jobs in firms that face large drop in revenue, but reduces hours worked without saving any job in firms which face moderated drop in revenue

A.3. Related literature

- Empirical literature
  - Macro data: Abraham and Houseman, 1994, 2014, Boeri and Bruecker, 2012, Brey and Hertweck, 2015, Cahuc and Carcillo, 2011, Hijzen and Venn, 2011, Hijzen and Martin, 2012, van Audenrode, 1994 $\longrightarrow$ positive employment effects
  - Micro data: Balleer, Gehrke, Lechthaler, and Merkl, 2016, Bellman, Gerner, Upward, 2012, Boeri and Bruecker, 2011, Kruppe and Scholz, 2014, Niedermayer and Tilly, 2015, Calavrezo, Duhautois and Walkowiak (2010) $\longrightarrow$ mixed effects
  - Our paper $\longrightarrow$ rich information on all firms, allow us to implement IV strategy, show heterogeneous effects, compute cost per job saved

A.4. The model

- Explains the feature of contingent labor contracts when there is short-time work
- Static framework (but can be thought as intertemporal)
- Continuum of identical workers of measure one
- Continuum of mass of measure at least one of risk neutral entrepreneurs
- Entrepreneurs pay a fixed cost $k > 0$ per job created
- Jobs produce a numeraire good
- Labor is the sole factor of production

A.4. The model

- The production per hour worked, y, is only revealed to the firm and to the worker once the worker has been hired
- $G(y)$, cdf of y defined on $[0, +\infty)$
- Realizations of y are independent and identically distributed across jobs

A.4. The model

- $U(c, 1-h)$, consumption $c \geq 0$, working hours $0 \leq h \leq 1$
- U, concave utility function, leisure is a normal good, $\lim_{c \to 0} U_1(c, 1-h) = \infty$.
- Employee: $U(w, 1-h)$, w : wage
- Unemployed worker: $U(b, 1)$, b : unemployment benefit

A.4. The model

- The market is competitive.
- Entrepreneurs create jobs and compete to offer contracts which stipulate contingent wages, $w(y)$, and hours worked, $h(y)$, if the worker is not laid off.
- Firms face ex-post profit constraints because they have shallow pockets and the financial market is imperfect.
- This implies that firms have limited resources in case of layoffs: severance payments and layoff taxes are upward bounded
  - firms are small: 1 job firms
  - ex-post profit must be strictly non-negative on each job.

$\Rightarrow$ firms cannot pay layoff taxes and cannot provide severance payments to laid-off workers

A.4. The model

- Agency provides
  - insurance benefits to unemployed workers
  - short-time compensation to employees if the number of hours worked falls below the threshold $\bar{h}$.
- Short-time compensation $= \sigma \max(\bar{h} - h, 0)$.
- Unemployment benefits and short-time compensation are financed with a lump sum tax t which has to be paid at the instant a labor contract is signed.

A.4. The model

At competitive equilibrium, workers get contracts which stipulate contingent wages $w(y)$, hours worked $h(y)$, and the threshold value of productivity below which jobs are destroyed $\tilde{y}$, solution to the following program:

$$\max_{\{w(y),h(y),\tilde{y})\}} \int_{\tilde{y}}^{\infty} U\left[w(y), 1-h(y)\right] \mathrm{d}G(y) + G(\tilde{y})U\left(b,1\right)$$

s.t.

$$\mathbb{E}(\Pi) = \int_{\tilde{y}}^{\infty} yh(y) - w(y) + \sigma \max\left[\bar{h} - h(y), 0\right] \mathrm{d}G(y) - t - k = 0,$$

$$yh(y) - w(y) + \sigma \max\left[\bar{h} - h(y), 0\right] \geq 0, \forall y.$$