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

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September 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
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
  → 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 40% of firms which used short-time work
- Nevertheless, the cost per job saved is low compared with wage subsidies or hiring subsidies

→ Short-time work was an effective policy to save jobs at low cost during the great recession
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

→ 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

→ Focus on firms with single establishment **which did not use short-time work in 2007-2008**
## 3. Data

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

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
- \( \varepsilon_i \): error term
4. Empirical strategy

\[ L_i = \alpha_0 + STW_i \alpha_1 + Y_i \alpha_2 + X_i \alpha_3 + \epsilon_i \]

- Short-time work use is potentially correlated with the error term \( \epsilon_i \) 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 \((r = 0.139 \text{ in } 2009)\)
  - 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

→ OLS short-time work estimate biased downwards
→ Instrumental variable for short-time work take-up: short-time work take-up rate in the (88) sector × (95) department in 2007-2008
4. Empirical strategy

- 4 main channels can explain the relation between short-time work take-up rate in 2009 and past short-time work take-up:
  
  1. Departmental directions of labor relations play a key role in the implementation of short-time work.
  2. Chambers of commerce, whose geographical areas coincide with those of the department to a large extent, play also an active role in promoting short-time work.
  3. Firms surrounded by firms having already used short-time work in the past makes are more likely to be aware of this scheme and familiar with its procedure.
  4. Using short-time work represents a negative signal for the firm’s employees, its trading partners and its creditors as it highlights the financial difficulties it is facing. Hence, belonging to a pool of former short-time work firms might undermine this stigmatization effect and encourage short-time work use.
4. Empirical strategy

\[ \Delta STW_i = 0.02 + 0.73 \times STW_i, \text{Adj}R^2 = 0.10, N = 5726 \]

4. Empirical strategy

\[ \Delta STW_i = 0.02 + 0.55 \times STW_i, \text{Adj}R^2 = 0.07, N = 5726 \]

(0.00) (0.03)

Fixed effects of regression of STW firms take-up rate; controls: revenue growth, labor turnover, firm size, leverage
4. Empirical strategy

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

$$STW_i = a_0 + STW_{i}a_1 + Y_{i}a_2 + X_{i}a_3 + \varepsilon_{1i}$$

  - $STW_{i}$: leave one out mean short-time work take-up rate in 2008 in industry $\times$ département of firm $i$.

- 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:

\[ STW_i = \beta_0 + STW_i \beta_1 + \bar{Y}_i \beta_2 + X_i \beta_3 + \eta_i \]

\[ Y_i = \gamma_0 + STW_i \gamma_1 + \bar{Y}_i \gamma_2 + X_i \gamma_3 + \zeta_i \]

Assuming

\[ E(\varepsilon_i|STW_i) = 0 \]

\[ E(\varepsilon_i|Y_i) = 0 \]
5. Empirical results
Short-time work take-up (first stage regression)

<table>
<thead>
<tr>
<th></th>
<th>Dep variable: STW take-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>STW in dept × sector cell (2008)</td>
<td>83.85*** (3.28)</td>
</tr>
<tr>
<td>Ctg zone revenue growth rate</td>
<td>−10.10*** (1.08)</td>
</tr>
<tr>
<td>Adj-$R^2$</td>
<td>0.10</td>
</tr>
<tr>
<td>Nb observations</td>
<td>779,367</td>
</tr>
</tbody>
</table>

5. Empirical results

Global effects of short-time work in 2009

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>−.021***</td>
<td>.135**</td>
</tr>
<tr>
<td></td>
<td>(.003)</td>
<td>(.064)</td>
</tr>
<tr>
<td>Survival</td>
<td>.029***</td>
<td>.505***</td>
</tr>
<tr>
<td></td>
<td>(.004)</td>
<td>(.080)</td>
</tr>
<tr>
<td>Nb. Observations</td>
<td>779,357</td>
<td>779,357</td>
</tr>
</tbody>
</table>

Robust standard errors, clustered at industry × département level

Note: Survival = positive number of employees on 31 December 2009
5. Empirical results

Long lasting global effects of short-time work in 2010 and 2011

<table>
<thead>
<tr>
<th></th>
<th>2009-2010</th>
<th>2009-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>0.009</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>(0.104)</td>
<td>(0.126)</td>
</tr>
<tr>
<td>Survival</td>
<td>-0.044</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>Nb. Observations</td>
<td>779,345</td>
<td>779,345</td>
</tr>
</tbody>
</table>

Robust standard errors, clustered at industry × 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

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Nb firms</th>
<th>STW rate (%)</th>
<th>$g_Y$ STW=1</th>
<th>$g_Y$ STW=0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>194,842</td>
<td>3.66</td>
<td>-.26 (.26)</td>
<td>-.11 (.32)</td>
</tr>
<tr>
<td>2</td>
<td>194,843</td>
<td>1.12</td>
<td>-.16 (.33)</td>
<td>-.02 (.37)</td>
</tr>
<tr>
<td>3</td>
<td>194,841</td>
<td>0.78</td>
<td>-.09 (.42)</td>
<td>.03 (.42)</td>
</tr>
<tr>
<td>4</td>
<td>194,841</td>
<td>0.50</td>
<td>.23 (.85)</td>
<td>.24 (.78)</td>
</tr>
</tbody>
</table>

STW take-up and revenue growth rate ($g_Y$) by quartiles of firms stratified by predicted revenue growth rate in 2009
## 5. Empirical results

### Heterogeneous effects in 2009

<table>
<thead>
<tr>
<th>Quartile</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emp growth: 2008-2009</td>
<td><strong>.146</strong>* (0.052)</td>
<td>.151 (0.160)</td>
<td><strong>−.092</strong> (0.213)</td>
<td><strong>−.379</strong> (0.301)</td>
</tr>
<tr>
<td>Survival: 2008-2009</td>
<td><strong>.416</strong>* (0.068)</td>
<td><strong>.388</strong> (0.170)</td>
<td>.316 (0.208)</td>
<td><strong>.385</strong> (0.272)</td>
</tr>
<tr>
<td>Nb. Observations</td>
<td>194,842</td>
<td>194,843</td>
<td>194,841</td>
<td>194,841</td>
</tr>
</tbody>
</table>

IV estimations. Robust standard errors, clustered at industry × département level
5. Empirical results
Heterogeneous effects in 2009

<table>
<thead>
<tr>
<th>Quartile</th>
<th>1 &amp; 2</th>
<th>3 &amp; 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emp growth: 2008-2009</td>
<td>.134**</td>
<td>.023</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.244)</td>
</tr>
<tr>
<td>Survival: 2008-2009</td>
<td>.102***</td>
<td>.092</td>
</tr>
<tr>
<td></td>
<td>(.035)</td>
<td>(.168)</td>
</tr>
<tr>
<td>Nb. Observations</td>
<td>389,683</td>
<td>389,683</td>
</tr>
</tbody>
</table>

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

Long lasting heterogeneous effects in 2010 and 2011

<table>
<thead>
<tr>
<th>Quartile</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emp growth: 2009-2010</td>
<td>0.354*</td>
<td>-0.196</td>
<td>-0.116</td>
<td>-0.062</td>
</tr>
<tr>
<td></td>
<td>(0.201)</td>
<td>(0.185)</td>
<td>(0.257)</td>
<td>(0.332)</td>
</tr>
<tr>
<td>Survival: 2009-2010</td>
<td>0.026</td>
<td>-0.068</td>
<td>-0.252*</td>
<td>0.115</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.111)</td>
<td>(0.148)</td>
<td>(0.179)</td>
</tr>
<tr>
<td>Emp growth: 2009-2011</td>
<td>0.570**</td>
<td>0.196</td>
<td>-0.366</td>
<td>-0.054</td>
</tr>
<tr>
<td></td>
<td>(0.250)</td>
<td>(0.235)</td>
<td>(0.344)</td>
<td>(0.414)</td>
</tr>
<tr>
<td>Survival: 2009-2010</td>
<td>0.055</td>
<td>0.007</td>
<td>0.187</td>
<td>-0.039</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.115)</td>
<td>(0.132)</td>
<td>(0.159)</td>
</tr>
<tr>
<td>Nb. Observations</td>
<td>182,763</td>
<td>184,045</td>
<td>181,668</td>
<td>171,444</td>
</tr>
</tbody>
</table>

Impact of STW in 2009 on employment growth and firms survival in 2010 and 2011

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 122 hours.
- Employers got 3.7 euros per subsidized non-worked hour, or 454 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 38,500 euros.
- Cost per job created: Number of jobs saved/total cost = 2,662 euros
- Equal to 7% of the annual labor cost in our set of firms.
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 quartile: 1,685 euros < 2,662 euros
- Windfall effects are relatively small because these firms, which represent about 40% of all firms with positive short-time work take-up in 2009, only used 15% of the total number of subsidized hours in 2009 and received 15% 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 7% of the average annual number of hours of work per job.
- A worker on short-time work saves 0.15 job
- Every worker on short-time work in 2009 induced an increase in the total volume of hours of work equal to 8% of its usual annual number of hours of work.
- All in all, short-time work did not only save jobs, it 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

Source: Sinapse, French Ministry of Labor and INSEE
A.1. Hike in short-time work

Source: Sinapse, French Ministry of Labor and INSEE
## A.2. Short-time work use (1)

<table>
<thead>
<tr>
<th>Dep variable: STW take-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>STW in dept × sector cell (2008)</td>
</tr>
<tr>
<td>Ctg zone revenue growth rate</td>
</tr>
<tr>
<td>Ctg zone × sector revenue growth rate</td>
</tr>
<tr>
<td>Past workers turnover rate</td>
</tr>
<tr>
<td>Past hours worked per employee/year</td>
</tr>
<tr>
<td>Past hourly wage</td>
</tr>
<tr>
<td>Past share of temporary jobs</td>
</tr>
<tr>
<td>Nb observations</td>
</tr>
</tbody>
</table>
A.2. Short-time work use (2)

<table>
<thead>
<tr>
<th>Past firm size (ref: 1 to 9 employees)</th>
<th>Dep variable: STW take-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 10 to 49 employees</td>
<td>11.60***</td>
</tr>
<tr>
<td></td>
<td>(.10)</td>
</tr>
<tr>
<td>from 50 to 249</td>
<td>14.88***</td>
</tr>
<tr>
<td></td>
<td>(.32)</td>
</tr>
<tr>
<td>from 250 to 999</td>
<td>18.01***</td>
</tr>
<tr>
<td></td>
<td>(.95)</td>
</tr>
<tr>
<td>1000 and more</td>
<td>18.26***</td>
</tr>
<tr>
<td></td>
<td>(4.23)</td>
</tr>
<tr>
<td>Past leverage</td>
<td>10.15***</td>
</tr>
<tr>
<td></td>
<td>(.03)</td>
</tr>
<tr>
<td>Adj-$R^2$</td>
<td>0.10</td>
</tr>
<tr>
<td>Nb observations</td>
<td>779,367</td>
</tr>
</tbody>
</table>
A.3. Related literature

- Theoretical literature
  - Burdett and Wright, 1989, Van Audenrode, 1994 → short-time work is favorable to employment but distorts downwards the number of hours worked per employee
  - Braun and Brügemann, 2012 → short-time work can be welfare improving if firms have limited access to financial markets.
  - Our paper → 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**
  - **Our paper**: 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:

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

s.t.

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

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