Firing Costs, Employment and Misallocation
Evidence from Randomly–Assigned Judges

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Why should we care about firing costs?

- Firing costs make it more costly for firms to reallocate labor in response to exogenous shocks.
- Misallocation of resources over time and across firms, potentially inefficient.
- Both job creation and job destruction are reduced, ambiguous effect on average employment level.

This paper

Using a quasi–experiment:

1. quantify the magnitude to which firing costs reduce labor reallocation over time;
2. test the effect of firing costs on average employment level.

Literature

Very large literature,

1. cross–countries comparisons:
   - Lazear 1990
   - Haltiwanger, Scarpetta, and Schweiger 2008, 2014
   - Bassanini and Garnero 2013
2. within–country comparisons:
   - David, Kerr, and Kugler 2007;
   - Kugler and Pica 2008;

but no true source of exogenous variation of firing costs:

- unobservable factors differing between countries;
- firms sorting into the low firing costs regime within countries.

Ideal Experiment vs Court Experiment

- **Ideal experiment:** randomly and credibly allocate firing costs to firms.
- **My experiment:**
  - Setting in which longer trials imply higher firing costs (Italy).
  - Consider one large Italian labor court.
  - Within this court, firms are randomly allocated to judges.
  - There are fast and slow judges.
- Random allocation of firms to judges $\Rightarrow$
  $\Rightarrow$ Exogenous variation of **experienced trials length** $\Rightarrow$
  $\Rightarrow$ Exogenous variation of **future expected firing costs** $\Rightarrow$
  $\Rightarrow$ Employment changes
  $\Rightarrow$ Employment levels

Results

Employment inaction

A 10% increase in expected firing costs reduces the hazard of employment changes by 3.6%.

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Employment levels

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Employment levels

A 10% increase in expected firing costs increases by 3% average employment levels.

- Potentially inefficient high level of employment due to lower labor reallocation

Expected Firing Costs

A long trial ending today implies:

1. A large (sunk)cost to be paid today by the firm.
2. Expectations of future firing costs revised upwards.

- Trial cost does not matter **directly** for future optimal decisions because it is sunk.
- It matters **indirectly** by changing future expectations on firing costs.

Liquidity constraints do not matter

The effects estimated do not depend on how much the firm is liquidity constrained.

Firms learn trials length (firing costs)

- Firms might have incomplete information on trials length in the area where they operate.
- Firms have priors on the trial length.
- Firms' experienced trials lengths are signals of the true trial length.
- These signals are used to update priors.
- Firms assigned to slow judges and experiencing long trials updated their priors differently than firms assigned to fast judges and experiencing short trials.

Younger firms have more to learn

The effects estimated is larger in size for younger firms, given less experience, imprecise priors, they are more likely to revise their expectations

Longer trials imply higher firing costs

$$\text{Firing costs} = \text{Transfer} + \text{Tax}$$

1. legal costs, **Tax**
2. organizational costs, longer period of uncertainty (Bloom 2009), **Tax**
3. foregone wages $\times$ prob. worker wins the case, **large firms only, Transfer**
4. penalty delayed payment of forgone social security contributions $\times$ prob. worker wins the case, **large firms only, Tax**

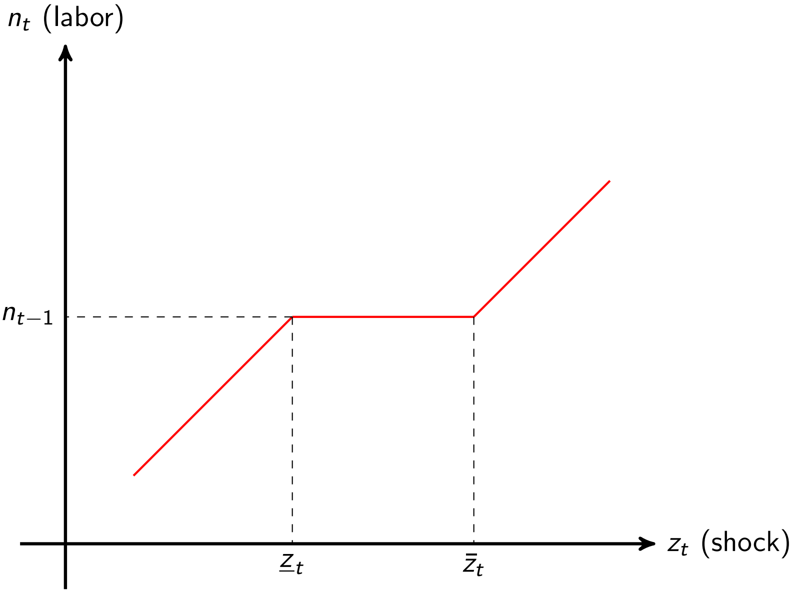
A partial equilibrium model of firing costs

- Bentolila and Bertola 1990

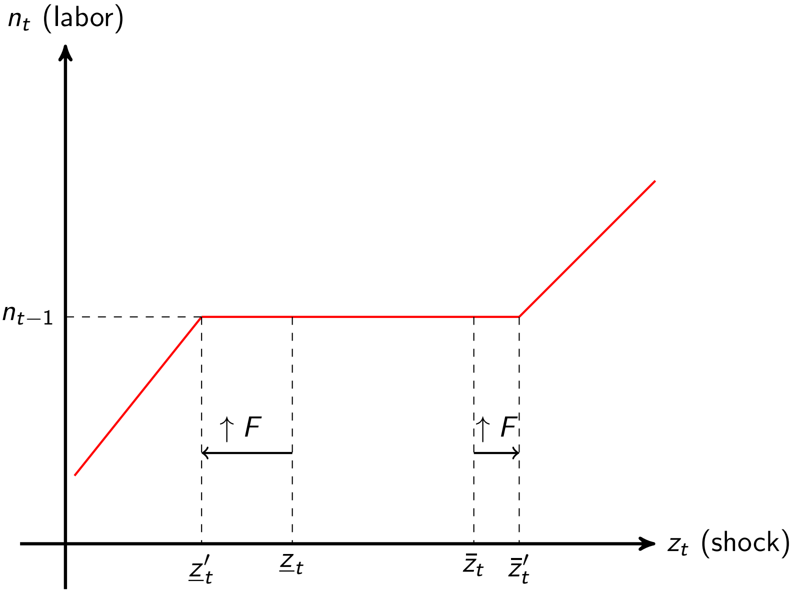
$$\max_{\{n_t\}_{t=1}^{\infty}} \sum_{t=1}^{\infty} \delta^t E\{[z_t f(n_t) - w n_t - F \max\{0, n_{t-1} - n_t\}]\} \quad s.t. \quad n_t \geq 0$$

- employment n_t as the only input
- shock z_t identically distributed over time with cumulative density function G
- exogenous wage w
- firing cost F
- firing costs raise firms' (downward) adjustment costs.

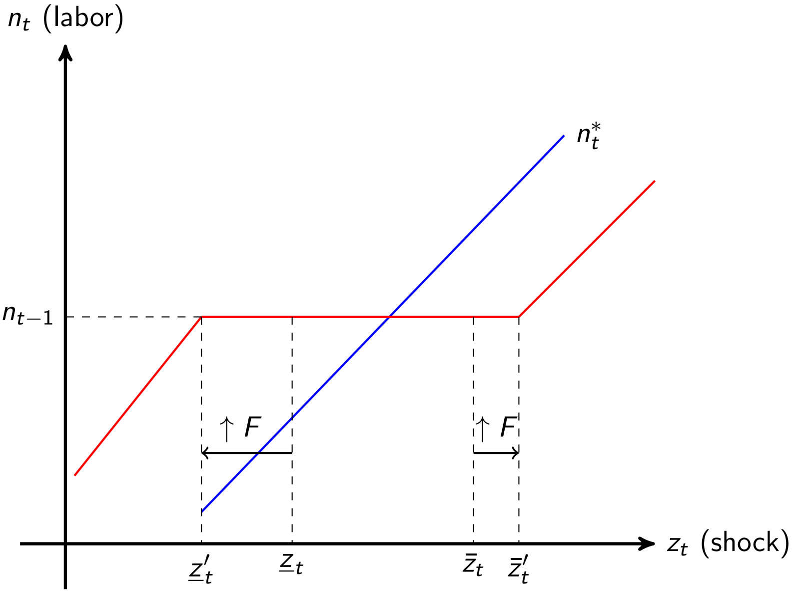
model solution



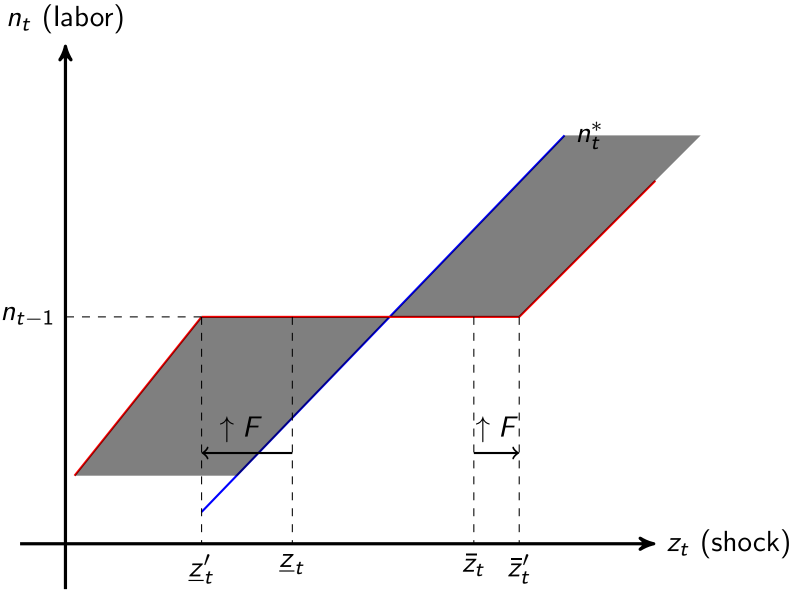
Simulation employment levels



Simulation employment levels



Simulation employment levels



Simulation employment levels

Theory summary

Firing costs:

- reduce employment changes,
- have an ambiguous effect on employment levels,
- lead to misallocation of resources over time: underemployment in good times and overemployment in bad times.

Data

Court data from one large Italian labor court: descriptive

- 320,191 trials filed between 2001 and 2012 (trials end between 2001 and 2014);
- 82 judges;
- 82,518 trials involving 25,906 firms

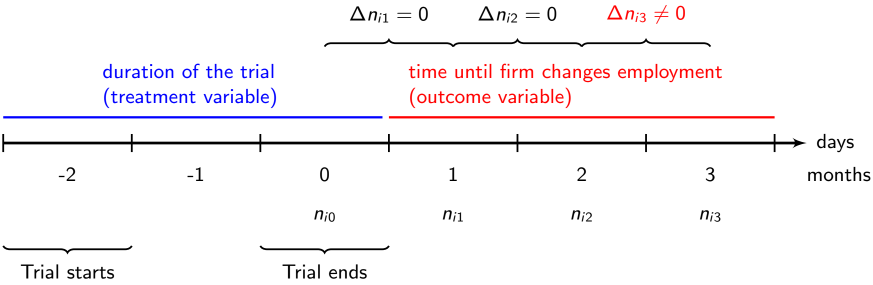
Firms data: descriptive

- universe of firms (220,341) operating in the geographical area for which the labor court has jurisdiction;
- monthly employment from 1990 to 2013, (National Social Security (INPS) agency data).
- annual balance sheet data from 1993 to 2014, (CERVED data).

Linkage:

- 7617 firms matched between the two data sets
- No significant difference in the observable characteristics of the trials of firms linked and not linked table

Figure: Time line: empirical strategy



- n_{it} monthly employment in month t at firm i.
- Δn_{it} employment change in month t with respect to month $t-1$.

Table: Firms for which no monthly employment change is observed (censored)

Year end of trial	Number of firms	Number of firms censored	Percentage of firms censored (%)
2001	29	0	0
2002	394	0	0
2003	512	2	0.39
2004	589	3	0.51
2005	689	5	0.73
2006	649	6	0.92
2007	607	5	0.82
2008	551	7	1.27
2009	508	10	1.97
2010	600	16	2.67
2011	712	43	6.04
2012	981	86	8.77
2013	796	325	40.83
Overall	7617	508	6.67

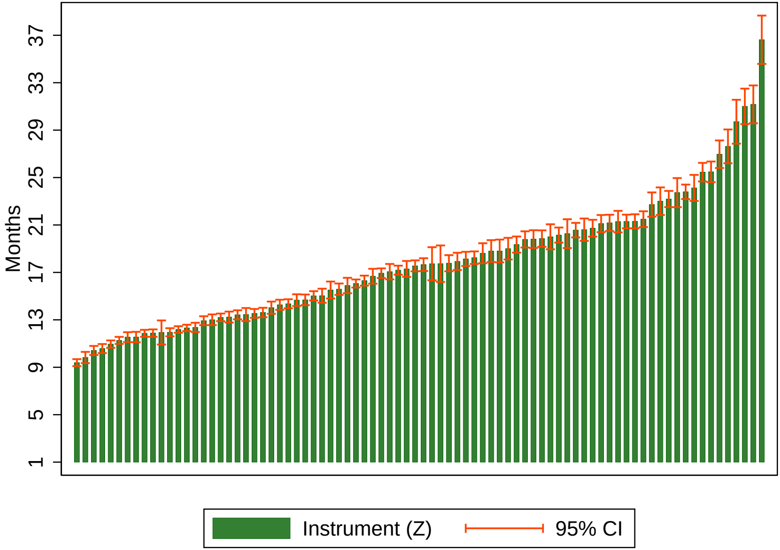
Instrumental variable calculation

The instrument, which is defined for each firm i assigned to judge $j(i)$ is simply a mean:

$$Z_{j(i)} = \left(\frac{1}{n_{j(i)}}\right)\left(\sum_{k=1}^{n_{j(i)}} \ell_k\right).$$

- ℓ_k is the length of the k–case seen by judge j.
- $n_{j(i)}$ is the total number of cases seen by judge j, excluding cases used as treatments.
- Total number of trials: 320191
- Trials used as treatments: 7617
- Trials used to construct $Z_{j(i)}$: 312574

Figure: Instrument: average length of trials assigned to each judge. first stage



Cox model – Control function

- First stage:

$$\ell_i = \delta_0 + \delta_1 Z_{j(i)} + \delta_2 D_i + v_i$$

- Second stage:

$$h_{it} = h_0(t)\exp(\beta_1 \ell_i + \beta_2 D_i + g(v_i))$$

- ℓ_i: length of the trial of firm i
- $Z_{j(i)}$: average length of judge $j(i)$ assigned to firm i
- h_{it}: hazard that firm i changes employment t months after the end of its trial
- $h_0(t)$: baseline hazard
- D_i: calendar monthly and yearly dummies for start of trial
- $g(v_i)$: polynomial in the estimated residual

Table: The effect of trial length on the hazard of employment change

Dependent variable	Trial's length	$h(t\|X)$
Estimation method	OLS	ML
Stage	First	Second
	(1)	(2)
Trial length		-0.0370***
		(0.0059)
		[0.0059]
Judge's avg. length	0.4110***	
	(0.0257)	
Cragg–Donald Wald F statistic		256
Observations	7617	7617

Note: Standard errors in parentheses are clustered at the judge level in column (1). * significant at 10%, ** significant at 5%, *** significant at 1%.

Economic significance

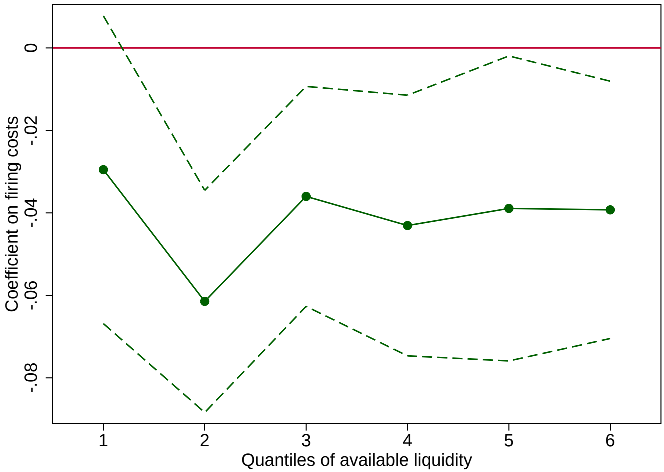
- β_1 is the effect of one unit increase in trial length on the natural logarithm of the hazard ratio.

Result

- At the median length of trials of 11 months, 10% increase in trials length **reduces the hazard** of employment changes by 3.6%. descriptive
- This represents* an **increases in the duration** of the number of months until employment change of 3.7%.
- At the median duration of 4 months until employment change, a 7 months longer trial increases the time until employment change by 1 month.

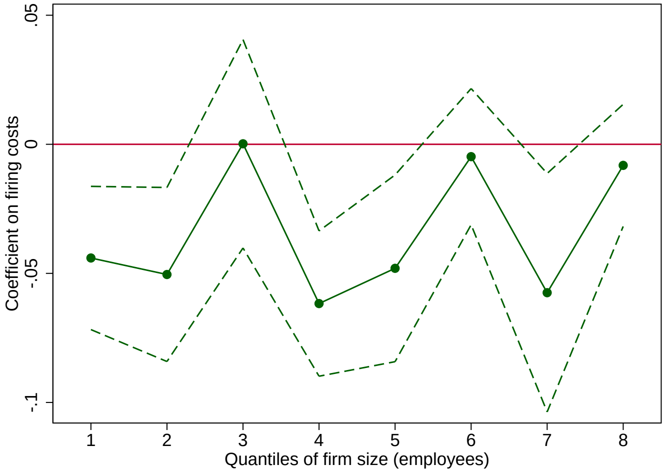
*: Assumptions, β_1 is also the effect of one unit increase of the length of trials on the natural logarithm of the time until employment change.

Figure: No heterogeneous effects by financial constraints. standardized by firm size



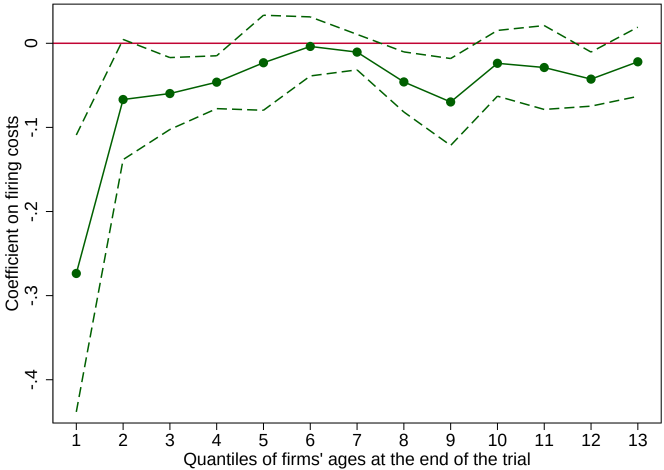
Note: Each quantile corresponds to a separate estimation and the dashed lines show 95% confidence intervals. Quantiles of firms' available liquidity before going to court.

Figure: No heterogeneous effects by firm size



Note: Each quantile corresponds to a separate estimation and the dashed lines show 95% confidence intervals. Quantiles of firms' size (number of employees) before going to court.

Figure: Heterogeneity by firm age



Note: Each quantile corresponds to a separate estimation and the dashed lines show 95% confidence intervals. Firm age: years from incorporation of the firm to trial.

Employment Levels

$$\ell_i = \delta_0 + \delta_1 Z_{j(i)} + \delta_2 D_i + v_i \qquad \text{first–stage}$$

$$\log(\bar{n}_i) = \gamma + \alpha \hat{\ell}_i + \phi D_i + \varepsilon_i \qquad \text{second–stage}$$

- $\bar{n}_i$ is the average employment level at firm i in all M months after the end of the trial.
- Trials end between 2001-2013: concern of composition bias.
- $M = 48$ hold sample fixed with firms which trials ended between January 2001 and January 2010. (Results robust to different choices of M). Robustness samples

Table: Firing costs increase average employment levels

Dependent variable	Trial length	ln(Employment)
Estimation method	OLS	IV
Stage	First	Second
	(1)	(2)
Trial length		0.0319**
		(0.0134)
Judge avg. length	0.4054***	
	(0.0427)	
Cragg–Donald Wald F statistic		96
Observations	3094	3094
Number of firms	3094	3094

Note: Standard errors in parentheses are clustered at the judge level in column (1) and at the firm level in column (2). * significant at 10%, ** significant at 5%, *** significant at 1%.

Robustness checks

1. Inclusion of firms controls does not change the estimates.
2. Linear model IV instead of Cox model Control Function for time until employment change, same results.
3. Using variance of employment instead of duration model gives the same result.
4. The effect is the same for firms experiencing firing and non–firing trials.
5. The effect is bigger for firms born after 2001. Cleaner identification because it guarantees the use of the first trial ever experienced by firms.
6. Results do not change if the duration analysis begins from the start of the trial.

Conclusions

- Random allocation of firms to judges creates an exogenous variation of the length of trials experienced by firms which creates an exogenous variation of expected firing costs.
- Firing costs reduce employment adjustments over time.
- Both Job Creation and Job Destruction are reduced, theory cannot unambiguously say the net effect of firing costs on employment levels. Reduced form estimates suggest that higher firing costs increase employment levels.
- Higher employment level potentially inefficient.

APPENDIX SLIDES

Dynamic problem

The firm chooses employment after the current shock realization z_t is observed

$$V(n_{t-1}, z_t) = \max_{n_t \geqslant 0} \; z_t f(n_t) - w n_t - F \max\{0, n_{t-1} - n_t\} + \delta E_t\{V(n_t, z_{t+1})\}$$

back to model

Increase labor

$$\overbrace{z_t f'(n_{t-1}) + \delta E_{t-1}\left(\frac{\partial V(n_{t-1}, z_{t+1})}{\partial n_{t-1}}\right)}^{\text{MB of increasing labor at } t} > \overbrace{w}^{\text{MC of increasing labor at } t}$$

then it is optimal to increase labor in period t relatively to period $t-1$,

$$n_t > n_{t-1}$$

$$z_t > \frac{w - \delta E_{t-1}\left(\frac{\partial V(n_{t-1}, z_{t+1})}{\partial n_{t-1}}\right)}{f'(n_{t-1})} \equiv \bar{z}_t$$

Optimal labor satisfies the following first order condition:

$$z_t f'(n_t) = w - \delta E_t\left(\frac{\partial V(n_t, z_{t+1})}{\partial n_t}\right)$$

back to model

Decrease labor

$$\overbrace{w}^{\text{MB of decreasing labor at } t} > \overbrace{z_t f'(n_{t-1}) + \delta E_{t-1}\left(\frac{\partial V(n_{t-1}, z_{t+1})}{\partial n_{t-1}}\right) + F}^{\text{MC of decreasing labor at } t}$$

then it is optimal to decrease labor in period t relatively to period $t-1$,

$$n_t < n_{t-1}$$

$$z_t < \frac{w - F - \delta E_{t-1}\left(\frac{\partial V(n_{t-1}, z_{t+1})}{\partial n_{t-1}}\right)}{f'(n_{t-1})} \equiv \underline{z}_t$$

Optimal labor satisfies the following first order condition:

$$z_t f'(n_t) = w - F - \delta E_t\left(\frac{\partial V(n_t, z_{t+1})}{\partial n_t}\right)$$

back to model

Inaction

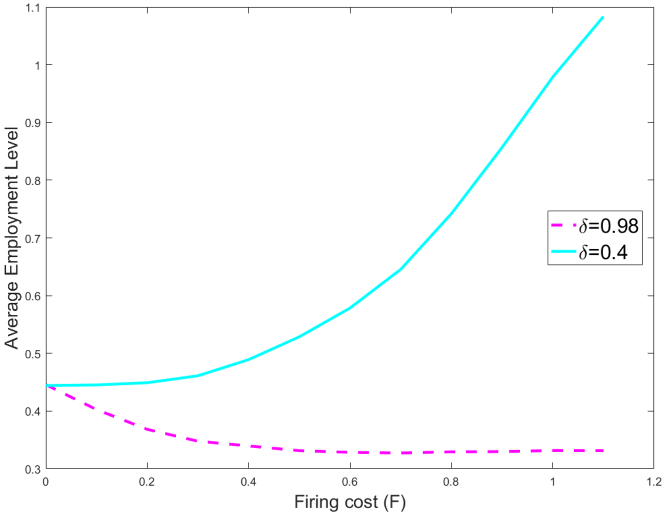
$$w - F < z_t f'(n_{t-1}) + \delta E_{t-1}\left(\frac{\partial V(n_{t-1}, z_{t+1})}{\partial n_{t-1}}\right) < w$$

then it is optimal for the firm not to change employment in this period relatively to the previous period.

$$n_t = n_{t-1}$$

$$\underline{z}_t < z_t < \bar{z}_t$$

back to model


Average Employment Level
Firing cost (F)
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
0
0.2
0.4
0.6
0.8
1
1.2
δ=0.98
δ=0.4

back

Table: Distribution of trial length and judges average trial length

Percentiles	Judges average length (months). All trials.	Trial length (months). Only firms trials.
1st	9	0.33
5th	11	2
10th	12	4
25th	13	7
50th	**18**	**11**
75th	21	19
90th	24	28
95th	28	35
99th	37	47
Mean	18	14
Standard deviation	5	10
Number of judges	82	82
Number of trials	320191	7617

back data

back results

Table: Distribution of firms average employment levels and inaction

Percentiles	Firms average employment (number of employees)	Firms duration employment inaction (months)
1st	1	2
5th	1	2
10th	1	2
25th	2	2
50th	**6**	**4**
75th	14	8
90th	55	14
95th	139	23
99th	830	52
Mean	74	7
Standard deviation	1041	10
Number of firms	7617	7617

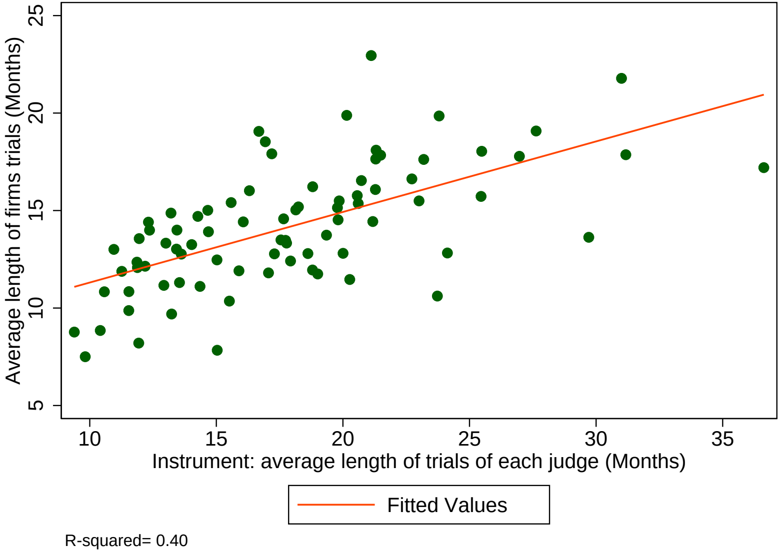
back

Table: Comparison of trials of firms linked and not linked between databases

back

Variables	Averages: Firms not linked	Averages: Firms linked	p–value for H_0: equal means
Object of controversy: *Overall % of trials with given object*			
Compensantion	0.2842	0.2965	.000
29%	(0.4510)	(0.4567)	
Attendance allowance	0.0004	0.0004	.942
0.04%	(0.0189)	(0.0192)	
Other hypothesis	0.1976	0.2078	.000
20%	(0.3982)	(0.4057)	
Other controversies	0.0338	0.0329	.469
3%	(0.1807)	(0.1783)	
Disability living allowance	0.0002	0.0001	.236
0.02%	(0.0157)	(0.0115)	
Pension	0.0002	0.0002	.813
0.02%	(0.0134)	(0.0126)	
Temporary work contract	0.0506	0.0464	.005
5%	(0.2192)	(0.2103)	
Termination of employment	0.1809	0.2039	.000
19%	(0.3849)	(0.4029)	
Type of employment relationship	0.0575	0.0454	.000
5%	(0.2328)	(0.2082)	
Other types of cases	0.1947	0.1665	.000
18%	(0.3960)	(0.3726)	
Number of parties involved in trials	2.41	2.41	.893
Overall average: 2.41	(2.50)	(2.36)	
Number of trials	44,552	37,966	
Number of firms	17,859	7617	

Figure: First stage. back



Cox proportional hazard model as a linear regression

- The Cox proportional hazard model can be written as

$$\ln(\Lambda(T_i)) = -\beta_1 \ell_{i0} + \eta_i$$

where $\Lambda(T_i) = \int_0^{T_i} u du$ of the underlying employment inaction duration T_i of firm i.

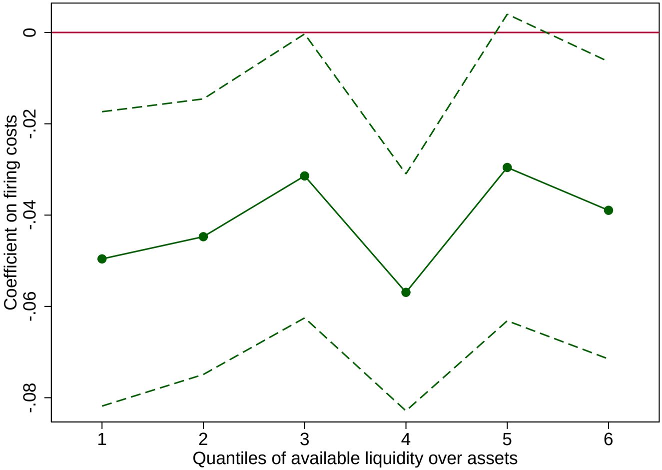
- If η_i has an extreme value distribution independent of the regressors and the baseline hazard $h_0(t) = 1$.

$$\ln(T_i) = -\beta_1 \ell_{i0} + \eta_i$$

- The estimated coefficients of the Cox Proportional model can be interpreted as the effect of a one unit increase of the average length of trials on the logarithm of the duration of the spell of employment inaction.

back.

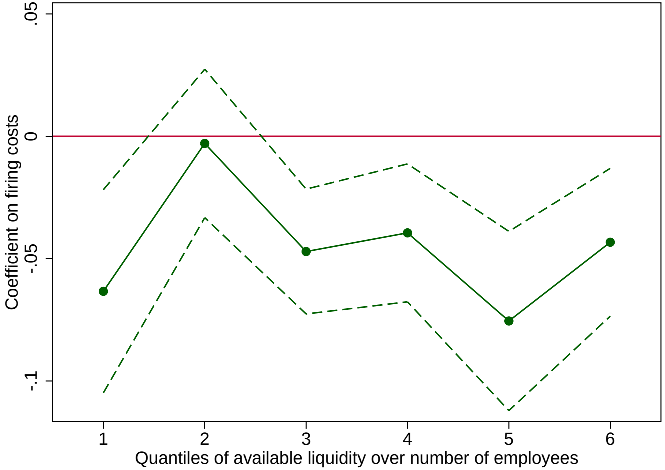
Figure: Heterogeneity by financial constraints, available liquidity over assets



Note: Each quantile corresponds to a separate estimation and the dashed lines show 95% confidence intervals.

back

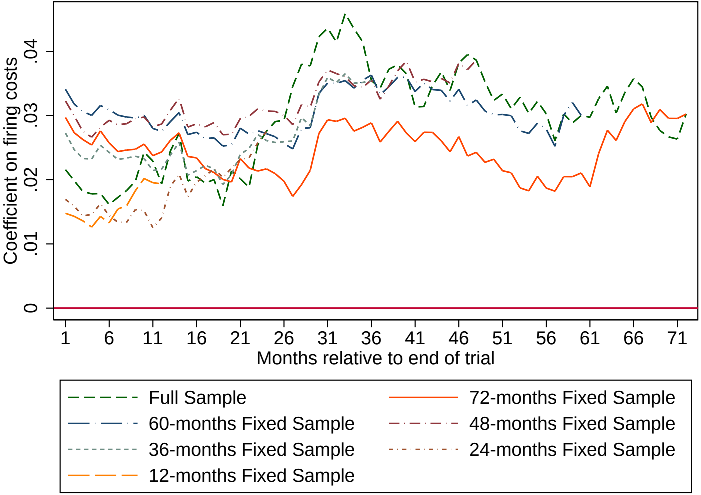
Figure: Heterogeneity by financial constraints, available liquidity over employees



Note: Each quantile corresponds to a separate estimation and the dashed lines show 95% confidence intervals.

back

Figure: Effect of firing costs on employment levels with fixed samples



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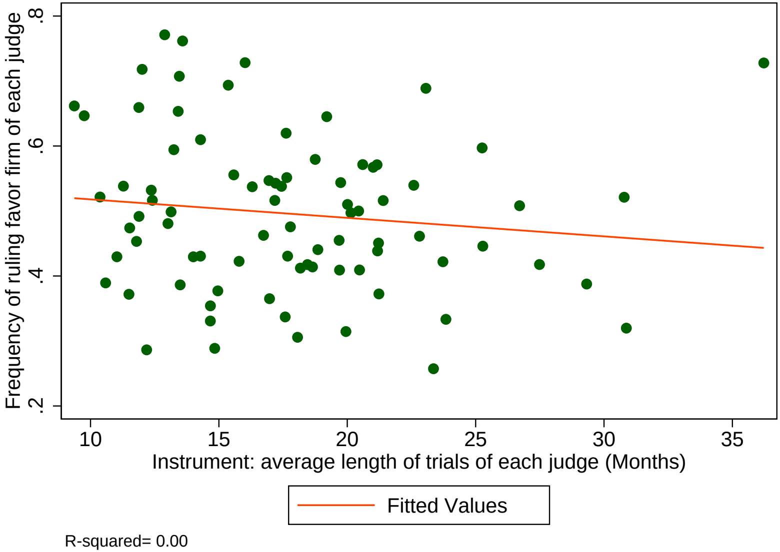
Exclusion restriction: outcome and length of the trial



back

Exclusion restriction: outcome and length of the trial

Table: Outcome and length of the trial are independent

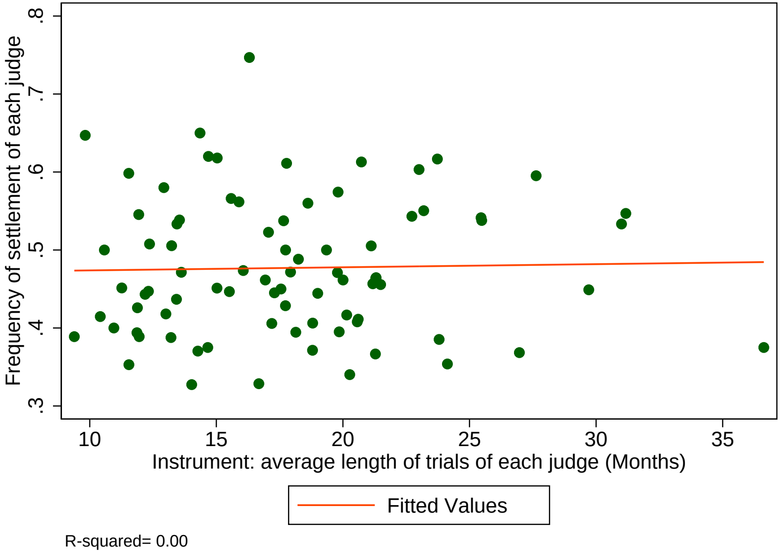
Sample	Only firms match emp. data	All firms
Stage	Second	Second
	(1)	(2)
ℓ_i	-0.0085	-0.0050
	(0.0062)	(0.0060)
Observations	3,865	41,742

$$\ell_i = \delta_0 + \delta_1 Z_{j(i)} + v_i$$
$$y_i = \alpha_0 + \alpha_1 \ell_i + u_i$$

$$y_i = \begin{cases} 1 & \text{if judge } j \text{ in trial } i \text{ ruled in favor of the firm} \\ 0 & \text{otherwise} \end{cases}$$

Note: Linear probability model. Subset of trials that ended with a decision by the judge. Standard errors in parentheses are clustered at the judge level. back

Exclusion restriction, settlements



back

Exclusion restriction, settlements

Table: Fast judges are not more likely to induce a settlemnt

Sample	Only trials of firms match emp. data	Universe of trials
	(1)	(2)
Judge average length $Z_{j(i)}$	0.00093 (0.00195)	-0.00080 (0.00049)
Observations	8007	320191

$$y_i = \alpha_0 + \alpha_1 Z_{j(i)} + u_i$$

$$y_i = \begin{cases} 1 & \text{if trial } i \text{ ended with a settlement} \\ 0 & \text{otherwise} \end{cases}$$

Note: Linear probability model. Standard errors in parentheses are clustered at the judge level.

back