





















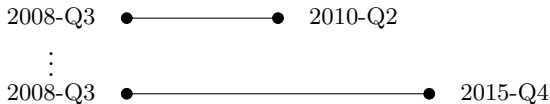




# Local Projection DID Matching Approach

- Estimation: Average treatment effect on the treated (ATT)
- Bias-corrected Abadie and Imbens (2006) matching estimator

$$\hat{\tau}_{ATT}^h = \frac{1}{N_T} \sum_{i:T_i=1} [\Delta^h Y_i - \Delta^h \tilde{Y}_i(0)] \quad \forall h = 1, \dots, 23$$



- ⇒ Disentangle short-run from long-run effects
- ⇒ Trace out a *treatment effect curve over time*



















# The Big Picture

- Global Financial Crisis of 2008-09 followed by the Great Recession
- Slow recovery in the United States and many other advanced economies (Reinhart and Rogoff, 2014)
- Heterogeneity in recovery paths across firms (and countries)

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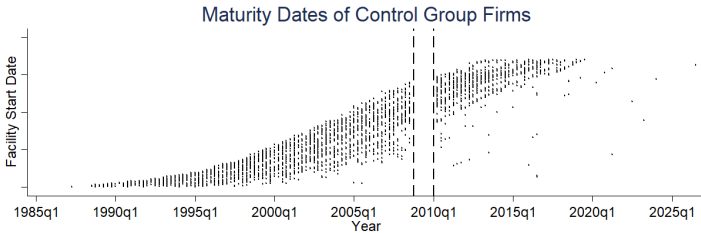
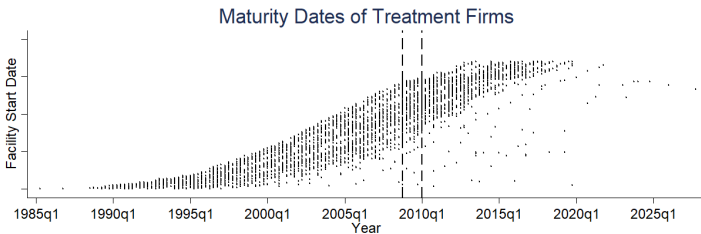






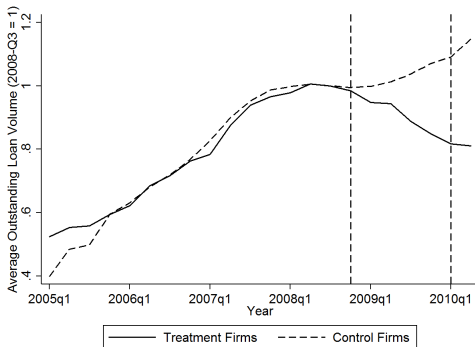


# Maturity Structure



# Were Treatment Firms Able to Refinance?

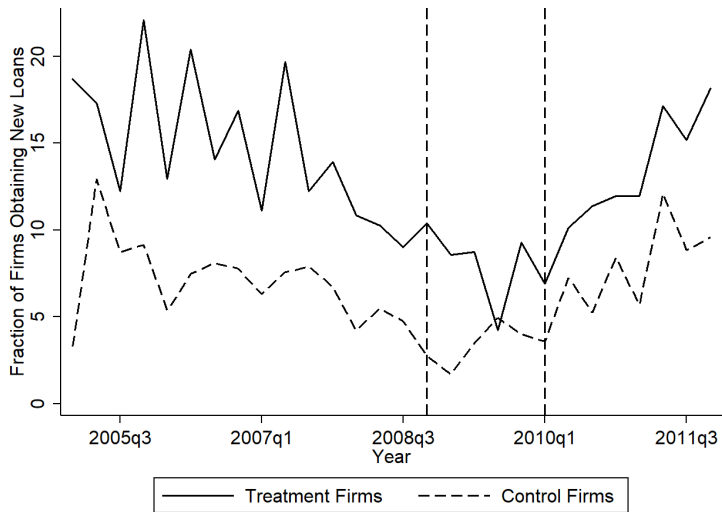
Outstanding Loan Volume (2008-Q3 = 1)



⇒ Treatment firms were unable to (fully) refinance.

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# Who Got Credit?



# Wage Data and Payroll Calculation

- Source: Quarterly Workforce Indicators (QWI)
- Level of observation: State  $\times$  4-Digit NAICS  $\times$  Firm Size
- Merging QWI and Compustat based on:
  - Headquarter State
  - 4-digit NAICS industry
  - Firm Size Bucket $\Rightarrow$  Similar to Tuzel and Zhang (2017) and Kuehn, Simutin, and Wang (2017)
- Calculating the payroll of firm  $i$

$$\text{Payroll}_{i,t} = \text{Employment}_{i,t}^{\text{CS}} \times \text{Wage}_{i,t}^{\text{QWI}}$$

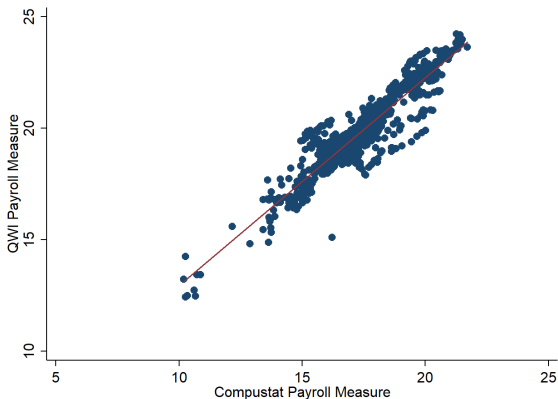
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# Use of Wage Data: Caveat

- **Caveat:** QWI data is at the establishment level
  - ⇒ Measurement error if production outside headquarter state
- **But:** Headquarters are a good proxy for firm location
  - Chaney, Sraer, and Thesmar (2012)
  - Tuzel and Zhang (2017)
- **Also:** QWI-Compustat payroll  $\approx$  Compustat's staff expenses

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# Payroll Measure versus Compustat Staff Expenses

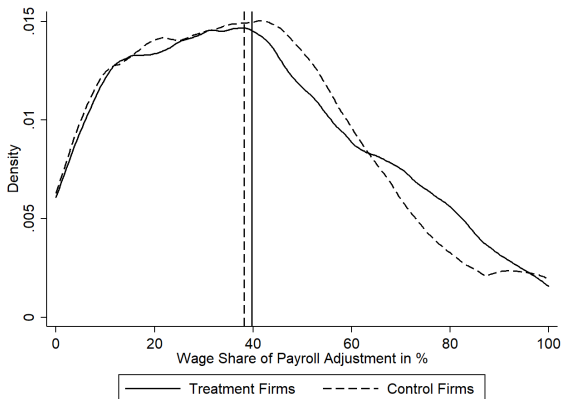


- $\beta = 0.93$
- Adjusted  $R^2 = 0.88$



# Wage Share of Payroll Adjustment

$$\theta_i = \frac{1}{T} \sum_{t=1}^T \frac{\Delta \text{Log}(\overline{\text{Wage}}_{i,t})}{\Delta \text{Log}(\text{Payroll}_{i,t})}$$



# Local Projection DID Matching Approach: Variables

## Outcome Variables:

- $\Delta \text{ Investment} = \text{Investment}_{\text{After}} - \text{Investment}_{\text{Before}}$
- $\Delta \text{ Log PPE} = \text{Log PPE}_{\text{After}} - \text{Log PPE}_{\text{Before}}$

## Matching Covariates (as of 2008-Q3):

- Size, Investment Ratio, Cash Holdings, Tobin's Q, Cash Flow, Return on Assets, Leverage
- 1-digit SIC industry code

## Time Horizon:

- Before Period = 2008-Q3
- After Period = {2010-Q2, ..., 2015-Q4}

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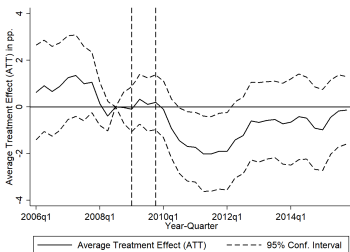
# Matching Results: Investment and Firm Growth

Dependent Variable	Δ Investment		Δ Log PPE Assets	
	ATT	S.E.	ATT	S.E.
2010-Q2	-1.2 *	0.7	-2.9 **	1.5
2010-Q3	-1.5 **	0.7	-3.6 **	1.6
2010-Q4	-1.6 **	0.8	-4.1 **	1.8
2011-Q1	-1.5 *	0.8	-4.6 **	2.0
2011-Q2	-1.6 *	0.9	-6.3 ***	2.1
2011-Q3	-1.6 *	0.8	-7.2 ***	2.3
2011-Q4	-1.7 **	0.9	-7.9 ***	2.5
2012-Q1	-1.7 **	0.9	-8.1 ***	2.6
2012-Q2	-1.5 *	0.9	-7.9 ***	2.7
2012-Q3	-1.6 *	0.9	-8.1 ***	2.8
2012-Q4	-1.1	0.9	-7.5 **	3.0
2013-Q1	-1.1	0.9	-8.6 ***	3.1
2013-Q2	-1.0	0.9	-9.5 ***	3.3
2013-Q3	-0.3	0.9	-9.4 ***	3.3
2013-Q4	-0.5	0.9	-7.8 **	3.5
2014-Q1	-0.2	0.9	-8.4 **	3.6
2014-Q2	0.3	0.9	-9.0 **	3.7
2014-Q3	-0.1	0.9	-9.6 **	3.7
2014-Q4	-0.4	0.9	-8.7 **	3.9
2015-Q1	-0.5	0.9	-9.6 **	3.9
2015-Q2	-0.3	0.8	-9.8 **	4.0
2015-Q3	-0.4	0.8	-8.0 *	4.1
2015-Q4	-0.4	0.8	-8.7 **	4.4
Observations	736		736	

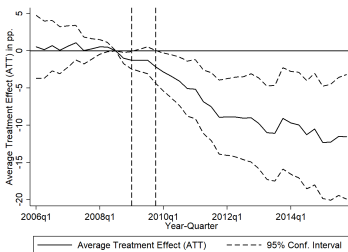
# Robustness Check 1: Alternative Treatment Period

- Baseline treatment period: 2008-Q4 - 2010-Q1
- Syndicated loan market bottomed out in 2009
- Alternative treatment period now: 2009-Q1 - 2009-Q4

### Investment



### Firm Growth

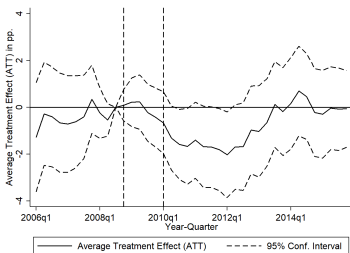


# Robustness Check 2: Alternative Treatment Definition

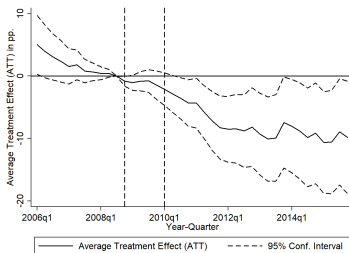
- Baseline treatment definition: Firms with at least one syndicated loan facility maturing during the period crisis.
- **Problem:** Might contain firms for which syndicated loans are only a small part of their overall funding.

$$\frac{\text{Maturing Loans}}{\text{Total Assets}} > 5\%$$

### Investment



### Firm Growth

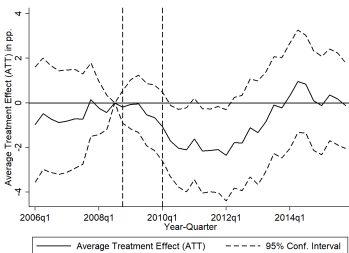


# Robustness Check 2: Alternative Treatment Definition

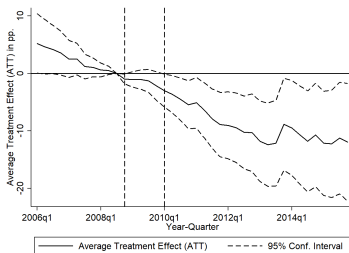
- Baseline treatment definition: Firms with at least one syndicated loan facility maturing during the period crisis.
- **Problem:** Might contain firms for which syndicated loans are only a small part of their overall funding.

$$\text{Maturing Loans} / \text{Total Assets} > 10\%$$

### Investment

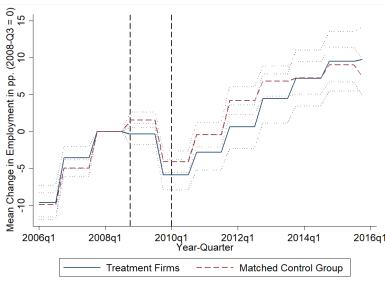


### Firm Growth

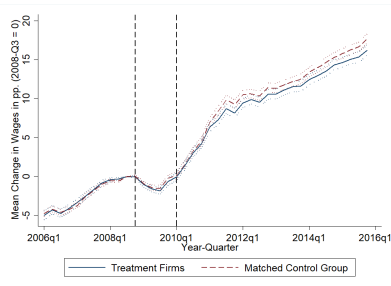


# Parallel Trends: Employment and Wages

## Employment



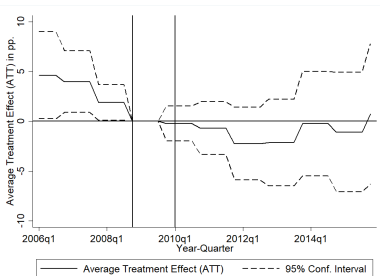
## Wages



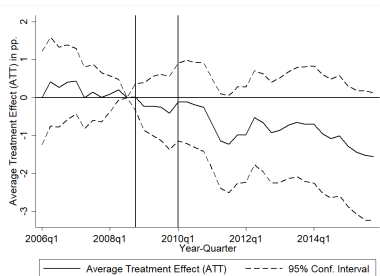
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# Treatment Effect Curves: Employment and Wages

## Employment



## Wages



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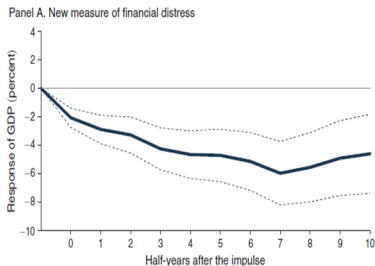
# Matching Results: Employment and Wages

Dependent Variable	Δ Log Employment		Δ Log Wages	
	(1) ATT	(2) S.E.	(3) ATT	(4) S.E.
Post Period				
2010-Q2	-0.2	0.9	-0.1	0.6
2010-Q3	-0.2	0.9	-0.2	0.6
2010-Q4	-0.7	1.4	-0.2	0.6
2011-Q1	-0.7	1.4	-0.7	0.6
2011-Q2	-0.7	1.4	-1.1	0.6
2011-Q3	-0.7	1.4	-1.2	0.7
2011-Q4	-2.2	1.9	-1.0	0.6
2012-Q1	-2.2	1.9	-1.0	0.6
2012-Q2	-2.2	1.9	-0.5	0.6
2012-Q3	-2.2	1.9	-0.7	0.7
2012-Q4	-2.1	2.2	-0.9	0.7
2013-Q1	-2.1	2.2	-0.9	0.7
2013-Q2	-2.1	2.2	-0.7	0.7
2013-Q3	-2.1	2.2	-0.6	0.7
2013-Q4	-0.2	2.7	-0.7	0.8
2014-Q1	-0.2	2.7	-0.7	0.8
2014-Q2	-0.2	2.7	-1.0	0.8
2014-Q3	-0.2	2.7	-1.1	0.8
2014-Q4	-1.1	3.1	-1.0	0.8
2015-Q1	-1.1	3.1	-1.3	0.8
2015-Q2	-1.1	3.1	-1.4	0.8
2015-Q3	-1.1	3.1	-1.5	0.9
2015-Q4	0.7	3.6	-1.6	0.9
Observations	736		736	

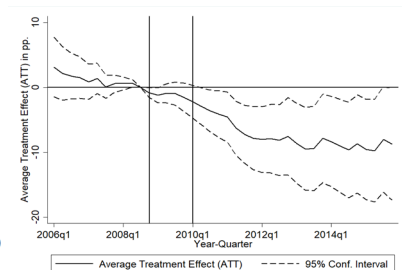
# Romer and Romer (2017) vs. Wix (2023)

- Romer and Romer (2017) suggest that: “the most fruitful approach to establishing causation [of financial crises] may lie in combining natural experiments with detailed cross-section evidence”.

### Romer and Romer (2017)



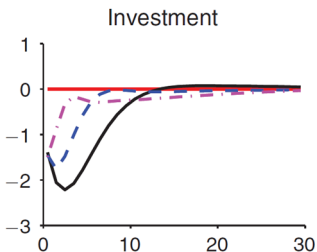
### Wix (2017)



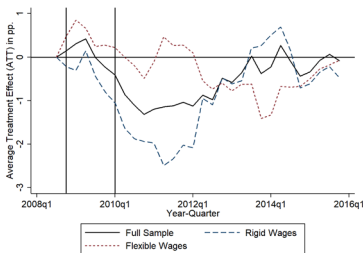
# Ajello (2016) vs. Wix (2017)

- Ajello (2016) finds that: “wage rigidities are a necessary feature [...] to create amplification of financial shocks”.

Ajello (2016)



Wix (2017)



# Matching Quality

*Panel A: Affected Firms with Rigid Wages vs. Affected Firms with Flexible Wages (Unmatched Sample)*

Matching Covariate	Rigid	Flexible	%Bias	t-Stat
Size	21.39	21.99	-37.95	-4.87***
Investment	6.27	5.20	25.49	3.25***
Cash Holdings	8.28	7.21	10.85	1.39
Q	1.52	1.55	-4.72	-0.58
Cash Flow	-2.17	10.31	-24.37	-2.32**
Return on Assets	3.21	3.58	-13.57	-1.69*
Long-Term Leverage	28.35	25.31	15.84	2.03**
Number of Firms	334	325		

*Panel B: Affected Firms with Rigid Wages vs. Affected Firms with Flexible Wages (Matched Sample)*

Matching Covariate	Rigid	Flexible	%Bias	t-Stat
Size	21.39	21.59	-12.47	-1.61
Investment	6.27	5.65	14.99	1.93*
Cash Holdings	8.28	8.39	-1.10	-0.14
Q	1.52	1.52	0.03	0.00
Cash Flow	-2.17	1.49	-4.34	-0.55
Return on Assets	3.21	3.78	-20.16	-2.55**
Long-Term Leverage	28.35	24.31	18.76	2.42**
Number of Firms	334	334		

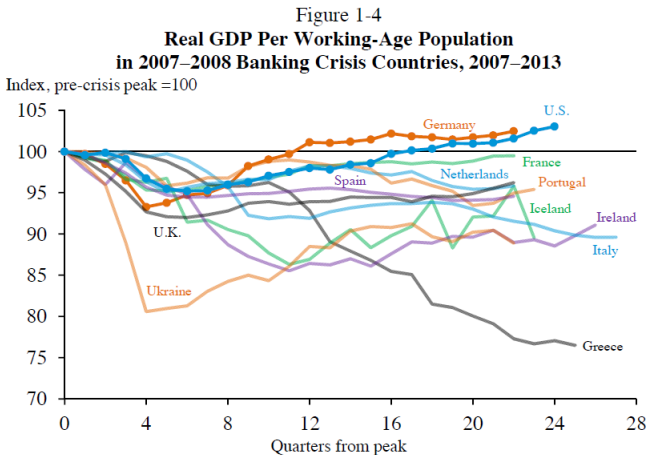


# Digression: The German “Labor Market Miracle”

- Germany’s “Labor Market Miracle”
    - Steep drop in GDP, but little rise in unemployment.
  - Short-time work (“Kurzarbeit”) programs in Germany
    - Government short-time work support for firms in “unavoidable” financial difficulties
    - Firms refrain from layoffs, but reduce employees’ hours and pay them 60-67% for the hours not demanded (“Kurzarbeitergeld”).
    - Firms are reimbursed for this “Kurzarbeitergeld” by the BA
  - Expansion of short-time work programs during the crisis.
- ⇒ Injection of wage flexibility into the German labor market.

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# GDP Recovery from the 2008 Banking Crisis



Source: U.S. Council of Economic Advisors, Statistical Office of the European Communities