

# Financing Constraints and Unemployment: Evidence from the Great Recession

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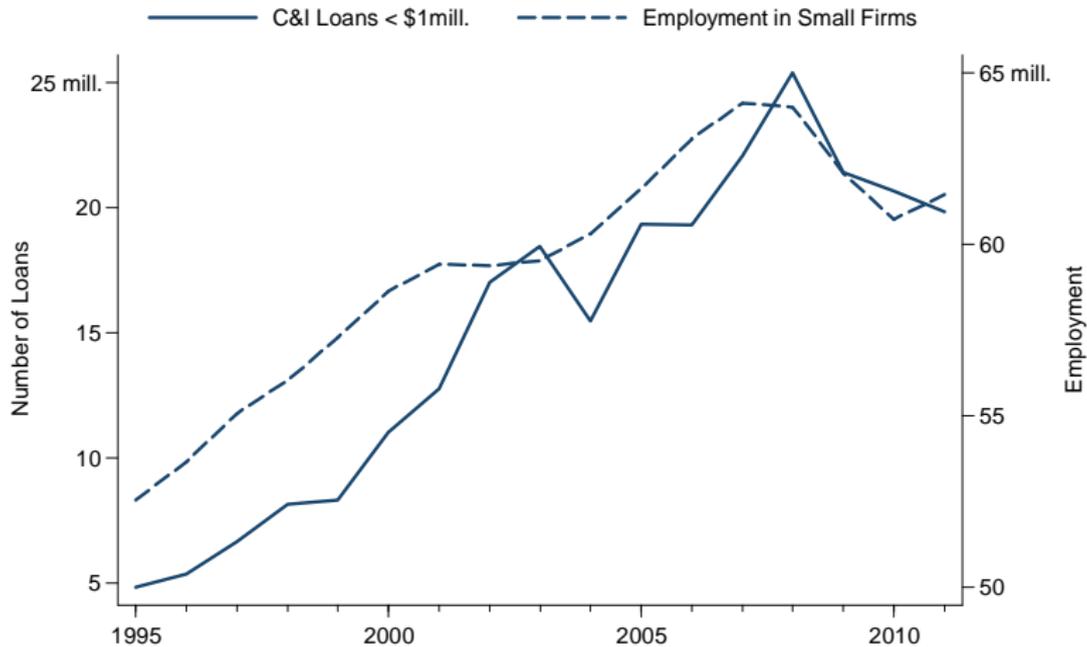
## disclaimer

The views expressed here are solely those of the authors and do not necessarily reflect official positions of the Federal Reserve Bank of Boston or the Federal Reserve System.

## motivation

- Lending to small businesses declined from **\$710bil.** to **\$670bil.** (Q2:2008 - Q1:2010).
- 80% of all firms in the economy have  $< 9$  employees.
- Small firms employ about 50% of all non-farm private sector workers.
- What are the macroeconomic implications of a reduction in small business lending?
  - Is there an impact on **unemployment**?

## Number of Small-Business Loans and Employment in Small Firms



Source: Federal Deposit Insurance Corporation and Quarterly Census of Employment and Wages.

## challenges

- ① Lending and unemployment can be related through,
  - changes in the supply of credit,
  - changes in the demand for credit,
  - or, something unobserved.
- ② We have no data that link borrowers and lenders.

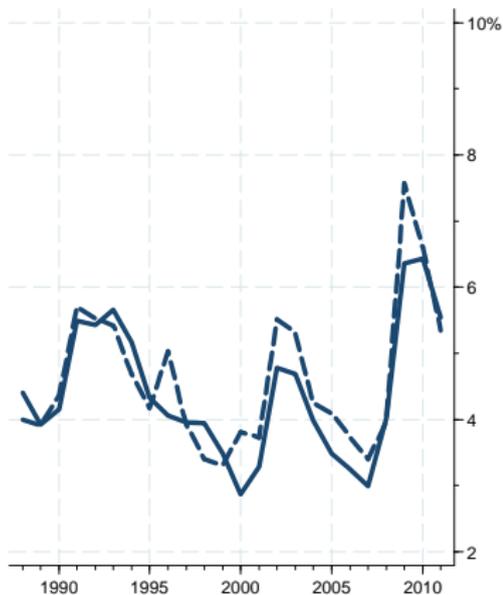
## this paper

- We estimate the impact of changes in lending on unemployment, using a quadruple difference approach.
- Exploit variation across:
  - **time**: we look before and after the 2007-09 recession to capture the period of declining lending to small businesses.
  - **firm size**: if changes in lending to small firms affect unemployment, we expect a more pronounced effect on small firms.
  - **external financial dependence**: only firms that need to raise external finance should be affected.
  - **recessions**: we examine three recessions.

# Likelihood of Switching from Employment to Unemployment

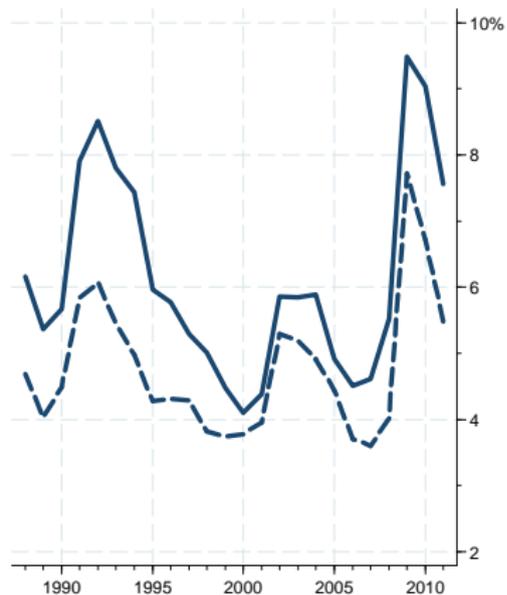
Low External Financial Dependence

— Small Firms    - - - Large Firms



High External Financial Dependence

— Small Firms    - - - Large Firms



Source: March Current Population Surveys, 1988-2011. Small firms have at most 99 employees.

- Specification of interest is,

$$(E \Rightarrow U)_{ijst}^d = \alpha_j^d + \lambda_{sj}^d + \theta^d \mathbf{x}_{ijst} + \beta^d rec_t + \\ + \mu^d small_{ijst} + \rho^d (rec_t \times small_{ijst}) + u_{ijst}^d,$$

- $i$ -person,  $j$ -industry,  $s$ -state,  $t$ -time.
- $d = \{high, low\}$  indicates external financial dependence.
- We are interested in  $\hat{\rho}^{high} - \hat{\rho}^{low}$ .
- We adjust the standard errors for potential within-group correlation of  $u_{ijst}$ .

## data (1/2)

- Current Population Survey (March Supplements 1988-2011)
  - official source of U.S. unemployment statistics.
  - (un)employment status, industry, geography, demographics.
  - this paper: private sector workers, ages 16-65.
  - “What was the size of your main employer in the previous year?”
    - conditional on having an employer in the previous year.
  - "Are you employed now?"
    - “No” means switched from employment to unemployment/NILF.

## data (2/2)

- CPS (worker level): (un)employment status, firm size ( $t - 1$ ), **industry**, demographics.
- COMPUSTAT (firm level): % of capital expenditures financed with external funds, **industry**.

$$\frac{\text{capital expenditures} - \text{cash flows}}{\text{capital expenditures}}$$

- Measures demand for external finance.
- Negative when the median firm in the industry has free cash.
- Technology is the reason for cross-industry differences in external financial dependence (Rajan and Zingales, 1998).

### Transition to Unemployment following the December 2007 Recession

	Low External Financial Dependence		High External Financial Dependence	
	Small Firms (1)	Large Firms (2)	Small Firms (3)	Large Firms (4)
Recession	.020 (.003)***	.021 (.004)***	.032 (.007)***	.021 (.006)***
Small – Large		-.000 (.004)		.011 (.004)***
(Small – Large) <sup>high</sup> – (Small – Large) <sup>low</sup>			.012 (.005)**	
Observations	61,572	61,860	118,824	131,621

Note - The dependent variable is an indicator that equals to one if a person transitioned from employment to unemployment between years  $t-1$  and  $t$ . The table reports Ordinary Least Squares estimates. Standard errors are adjusted for clustering at 2-digit Standard Industrial Classification code and appear in parentheses. All estimates are weighted by probability sampling weights provided by the CPS. \*\* and \*\*\* indicate statistical significance at the 5% and 1% levels, respectively.

### Transition to Unemployment following the March 2001 Recession

	Low External Financial Dependence		High External Financial Dependence	
	Small Firms (1)	Large Firms (2)	Small Firms (3)	Large Firms (4)
Recession	.006 (.002)**	.012 (.003)***	.006 (.002)***	.008 (.002)***
Small – Large		-.007 (.003)*		-.003 (.002)
(Small – Large) <sup>high</sup> – (Small – Large) <sup>low</sup>			.004 (.004)	
Observations	48,934	53,076	93,496	110,102

Note - The dependent variable is an indicator that equals to one if a person transitioned from employment to unemployment between years  $t-1$  and  $t$ . The table reports Ordinary Least Squares estimates. Standard errors are adjusted for clustering at 2-digit Standard Industrial Classification code and appear in parentheses. All estimates are weighted by probability sampling weights provided by the CPS. \*\* and \*\*\* indicate statistical significance at the 5% and 1% levels, respectively.

### Transition to Unemployment following the July 1990 Recession

	Low External Financial Dependence		High External Financial Dependence	
	Small Firms (1)	Large Firms (2)	Small Firms (3)	Large Firms (4)
Recession	.015 (.004)***	.019 (.003)***	.033 (.008)***	.020 (.004)***
Small – Large		-.004 (.003)		.013 (.006)**
(Small – Large) <sup>high</sup> – (Small – Large) <sup>low</sup>			.017 (.007)**	
Observations	42,538	45,031	88,396	97,811

Note - The dependent variable is an indicator that equals to one if a person transitioned from employment to unemployment between years  $t-1$  and  $t$ . The table reports Ordinary Least Squares estimates. Standard errors are adjusted for clustering at 2-digit Standard Industrial Classification code and appear in parentheses. All estimates are weighted by probability sampling weights provided by the CPS. \*\* and \*\*\* indicate statistical significance at the 5% and 1% levels, respectively.

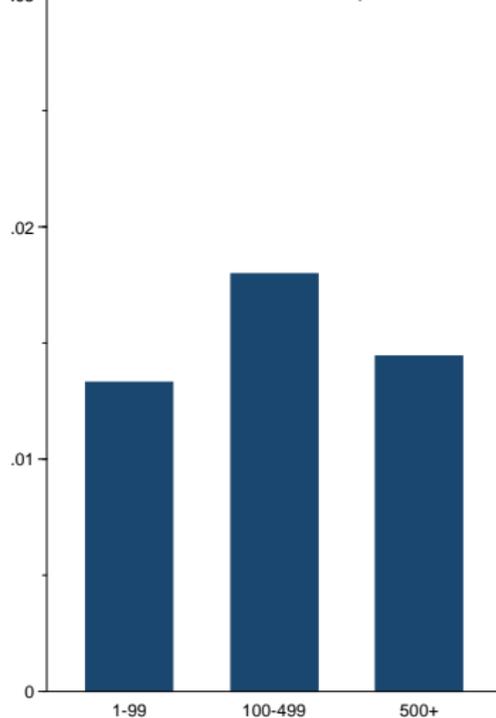
## demand vs supply

- In a recession, industry-wide demand for goods and services declines.
  - compare small and large firms within the same industry.
  - control for lag of region-specific growth rate of real per capita income.
- Within an industry, small firms may face a larger decline in demand for their products.
  - has to be primarily in industries with high external financial dependence.
  - has to be monotonic with respect to firm size and external financial dependence (next slides).
- We repeat the analysis around the 1990 and 2001 recessions.

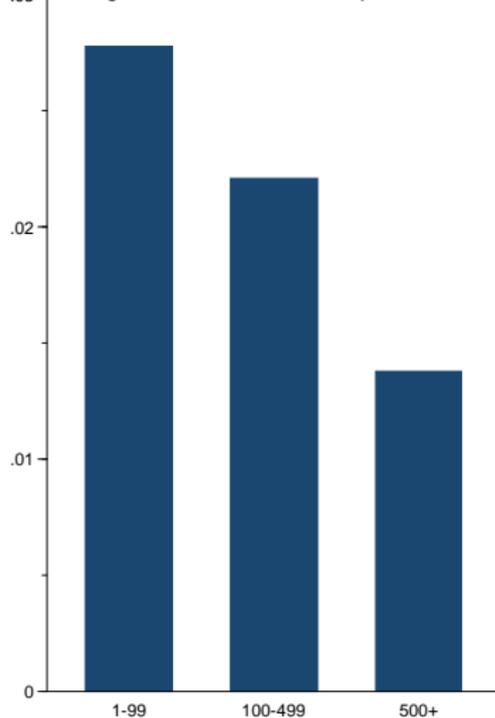
## continuity by firm size

bars represent regression estimates

Low External Financial Dependence

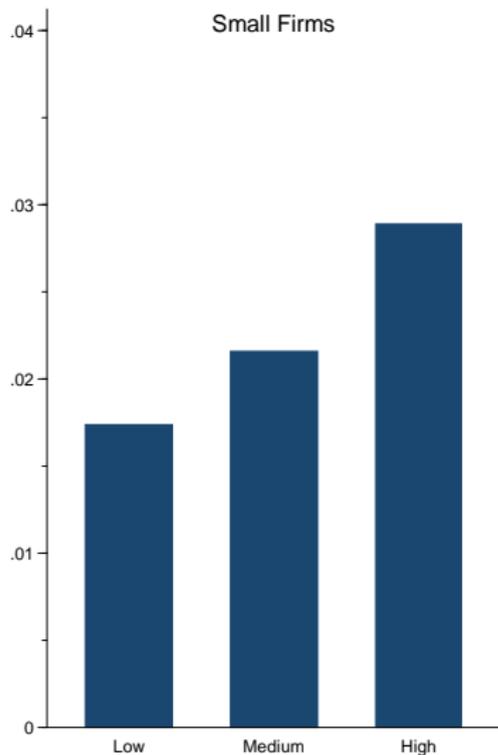
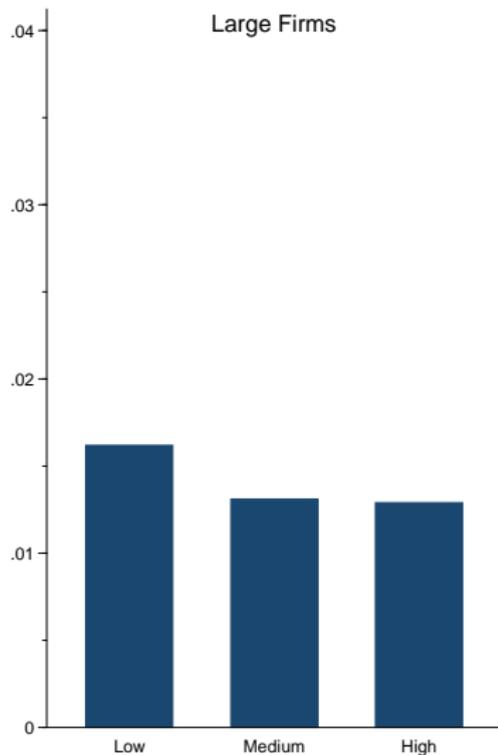


High External Financial Dependence



# continuity by external financial dependence

bars represent regression estimates



The Impact of the 2007-09 Recession on Log Establishments Per Capita

	External Financial Dependence			
	Low		High	
	Small Firms	Large Firms	Small Firms	Large Firms
	(1)	(2)	(3)	(4)
Recession	-.035*** (.003)	-.036*** (.004)	-.052*** (.003)	-.040*** (.005)
<u>Differences:</u>				
Small – Large		.001 (.004)		-.012*** (.004)
(Small – Large) <sup>High</sup> – (Small – Large) <sup>Low</sup>			-.013*** (.005)	
$R^2$	.72	.62	.74	.49
Observations	37,635	30,108	67,210	53,768

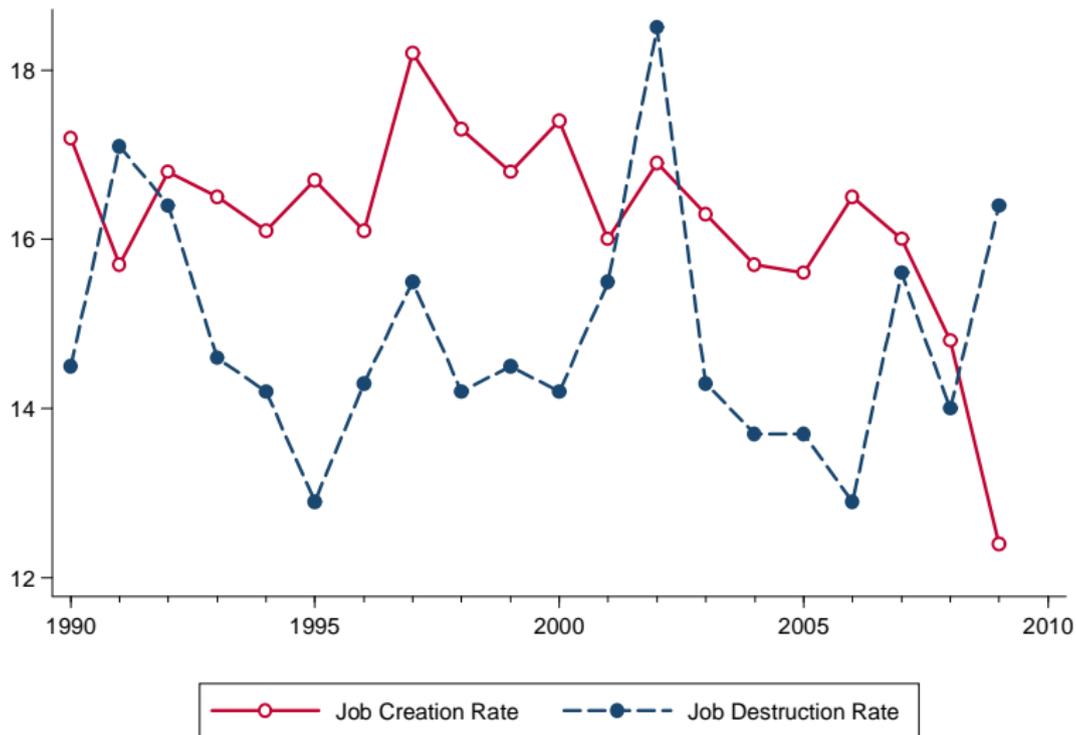
Note – The dependent variable is the natural logarithm of the number of establishment per capita in an industry/state/year. The recession indicator equals to one in the years 2008 and 2009 and equals to zero in the years 2005-07. "Small" firms are firms with 1-99 employees; "Large" firms are firms with 100+ employees. External financial dependence equals the proportion of capital expenditures financed with external funds. It is calculated using mature Compustat firms in the period 1980-1996 using the procedures described in Cetorelli and Strahan (2006). "Low" external financial dependence means that firms have free cash; "High" external financial dependence means that firms need to issue debt or equity to finance their investment. All regressions include state-industry fixed effects. Number of establishments is from County Business Patterns for the years 2005-2009. Population estimates are from the U.S. Census Bureau. Standard errors are adjusted for clustering at the state level and appear in parentheses. \*\*\* indicates statistical significance at the 1%.

## summary

- Likelihood of unemployment increases in small firms more than in large firms **ONLY** in industries with **high external financial dependence**.
  - Results hold for 2007-09 and 1990-91 recessions.
  - Results do not hold for 2001 recession.
- **Continuity** by firm size and external financial dependence.
- Similar results for the number of **establishments**.

## appendix materials

## job creation and destruction



Source: Business Dynamics Statistics, U.S. Census Bureau.

APPENDIX TABLE 1  
 The Impact of the December 2007 Recession on Unemployment:  
 Robustness to Functional Form

	Low External Financial Dependence		High External Financial Dependence	
	Small Firms (1)	Large Firms (2)	Small Firms (3)	Large Firms (4)
A. OLS Estimates				
December 2007 recession	.014 (.003)***	.014 (.003)***	.027 (.006)***	.014 (.004)***
B. Probit Marginal Effects				
December 2007 recession	.013 (.002)***	.014 (.003)***	.025 (.004)***	.012 (.003)***
C. Logit Marginal Effects				
December 2007 recession	.013 (.002)***	.013 (.003)***	.024 (.004)***	.012 (.003)***
Observations	61,262	36,457	135,386	84,601

The Impact of the December 2007 Recession on Transition to Unemployment  
(Excluding the Construction Sector)

	Low External Financial Dependence		High External Financial Dependence	
	Small Firms (1)	Large Firms (2)	Small Firms (3)	Large Firms (4)
December 2007 recession	.014 (.003)***	.014 (.003)***	.021 (.004)***	.012 (.003)***
Small – Large		.000 (.004)		.009 (.003)***
(Small – Large) <sup>High</sup> – (Small – Large) <sup>Low</sup>			.009 (.005)*	
Observations	61,262	36,457	107,985	81,166

Note - The dependent variable is an indicator that equals to one if a person is unemployed. The table reports Ordinary Least Squares estimates. Standard errors are adjusted for clustering at 2-digit Standard Industrial Classification code and appear in parentheses. The sample includes respondents to the March Current Population Surveys (CPS) in the years 2005-2009. Information about each worker's employer size is available for the year prior to the survey, i.e., 2004-2008. The sample is limited to adult civilians aged 16-65 in the year of the survey and excludes workers in the military, the public sector, and the financial sector. Additionally, we exclude the construction sector. External financial dependence equals the proportion of capital expenditures financed with external funds. A negative value indicates that firms have free cash flow, whereas a positive value indicates that firms must issue debt or equity to finance their investment. External financial dependence is calculated using mature COMPUSTAT firms for the period 1980-1996. Mature firms are firms that have been on COMPUSTAT for at least 10 years. Recession equals to one in the years 2008 and 2009. Small firms have at most 499 employees. Large firms have at least 500 employees. All specifications control for workers' characteristics which include: age, gender, ethnicity (white indicator), and indicators of years of completed education (0-11, 12, 13-15, 16, and 17+). The specifications also control for region fixed effects (New England, Middle Atlantic, East North, West North, South, East South, West South, Mountain, and Pacific), industry fixed effects (manufacturing non-durable goods, manufacturing durable goods, trade, services, and other), and metropolitan area growth rate of household income over the period 2004-2008. All estimates are weighted by probability sampling weights provided by the CPS. \* and \*\*\* indicate statistical significance at the 10% and 1% levels, respectively.

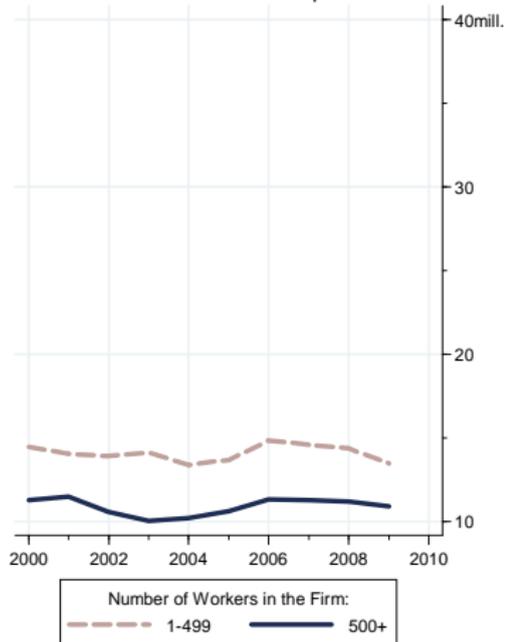
Proportion of Young Firms Among Firms with Less than 500 Employees

Industry	External	% of Firms Ages 0-5
	Financial Dependence	
Mining	High	36.7
Construction	High	29.2
Transportation and Utilities	High	42.6
Retail	High	43.8
Average.....		38.1
Agriculture	Low	41.0
Manufacturing	Low	27.2
Wholesale	Low	30.7
Finance, Insurance, Real Estate	Low	40.2
Other Services	Low	40.0
Average.....		35.8

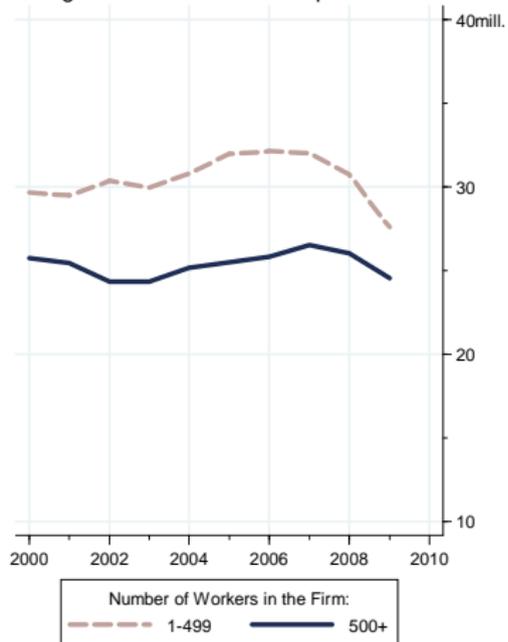
Source: Business Dynamics Statistics, 2005-2009.

# Total Private Sector Full-Time Full-Year Employment

## Low External Financial Dependence



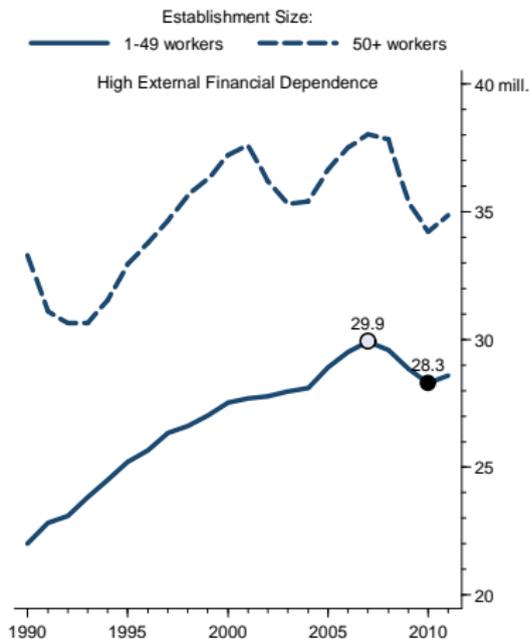
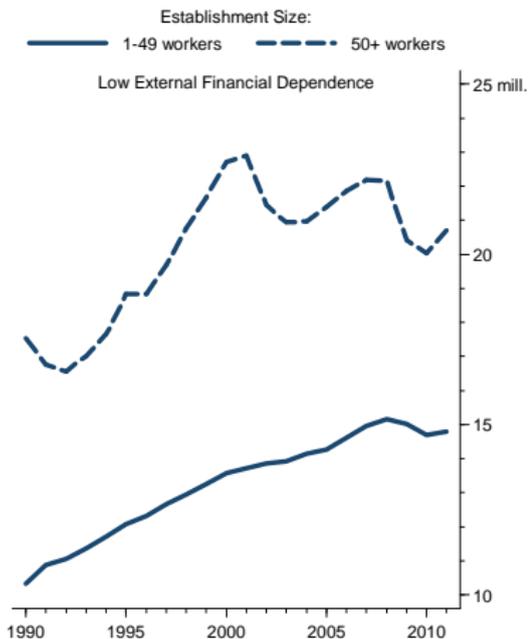
## High External Financial Dependence



Source: March Current Population Surveys.

# Total Private Employment

by external financial dependence and size of employer, 1990-2011



Source: Quarterly Census of Employment and Wages.

APPENDIX TABLE 2  
External Financial Dependence by Industrial Sectors

Industry	SIC
<i>Industries with the lowest dependence on external finance</i>	
Forestry	08
Insurance carriers	63
Leather and leather products	31
Tobacco products	21
Apparel and other finished products made from fabrics and similar materials	23
Educational services	82
...	
...	
...	
<i>Industries with the highest dependence on external finance</i>	
Transportation by air	45
Construction	15-16-17
Water transportation	44
Home furniture, furnishings, and equipment stores	57
Metal mining	10
<u>Pipelines, except natural gas</u>	<u>46</u>

Note - This table reports measures of external financial dependence (EFD) for each industry at the 2-digit SIC category. External financial dependence equals the proportion of capital expenditures financed with external funds. A negative value indicates that firms have free cash flow, whereas a positive value indicates that firms must issue debt or equity to finance their investment. External financial dependence is calculated using mature COMPUSTAT firms for the period 1980-1996. Mature firms are firms that have been on COMPUSTAT for at least 10 years.

### Characteristics of Compustat Firms by External Financial Dependence

	Low External Financial Dependence (1)	High External Financial Dependence (2)	Difference (3)
Assets growth	.042	.021	-.021 (.017)
Capital expenditures growth	.203	.137	-.066 (.084)
Sales growth	.062	.044	-.017 (.032)

Note - The table reports characteristics of Compustat firms by external financial dependence of their industry. Column (3) reports the difference between the first two columns. Robust standard errors are in parentheses. The table is based on 4,708 mature Compustat firms in the years 1980-1996. Mature firms are firms that have been on Compustat for at least 10 years. The growth rates of assets, capital expenditures, and sales are median values of year-to-year real (\$1997, CPI adjusted) growth rates over the period 1980-1996. External financial dependence equals the proportion of capital expenditures financed with external funds. A negative value (low external financial dependence) indicates that firms have free cash flow. A positive value (high external financial dependence) indicates that firms must issue debt or equity to finance their investment. External financial dependence is calculated at a 2-digit Standard Industrial Classification codes using mature Compustat firms for the period 1980-1996.

### Characteristics of Workers by External Financial Dependence

	Low External Financial Dependence (1)	High External Financial Dependence (2)	Difference (3)
Male	.507	.587	.080 (.005)***
White	.829	.843	.014 (.004)***
Have at least college education	.365	.213	-.152 (.005)***
Unemployed	.035	.051	.017 (.002)***
Number of workers (small firms)	25.0M	38.7M	
Number of workers (large firms)	16.5M	31.2M	

Note - The table reports characteristics of CPS workers by external financial dependence of their industry. Column (3) reports the difference between the first two columns. Robust standard errors are in parentheses. The table is based on 63,657 adult (ages 16-65) civilian respondents to the 2005 March Current Population Survey (CPS), excluding military and public-sector workers. The estimates are weighted by probability sampling weights provided by the CPS. External financial dependence equals the proportion of capital expenditures financed with external funds. A negative value (low external financial dependence) indicates that firms have free cash flow. A positive value (high external financial dependence) indicates that firms must issue debt or equity to finance their investment. External financial dependence is calculated at a 2-digit Standard Industrial Classification codes using mature COMPUSTAT firms for the period 1980-1996. \*\*\* indicates statistical significance at the 1% level.

## DATA SOURCES

Data	Variables	Period	Notes
Quarterly Census of Employment and Wages (QCEW).	Quarterly count of employment and wages by state, industry (up to 6-digit NAICS) and establishment size.	1990–2011 (quarterly).	Data by establishment size are available only in the first quarter. NAICS are consistent for the entire period.
Business Employment Dynamics (BED). <i>Derived from the QCEW.</i>	Gross job gains and losses by new/existing/closing establishments, state, sector (14 sectors), and firm size.	1992–2010 (quarterly after 2002).	Data are available either by industry or by firm size, but not both.
County Business Patterns (CBP).	Counts of establishments by county, industry (SIC and NAICS), and the size of the <i>establishment</i> .	1986–2009 (annual).	
Statistics of U.S. Businesses (SUSB).	Counts of establishments and firms by state, industry (SIC and NAICS) and the size of the <i>firm</i> .	1988 –2008 (annual).	

## DATA SOURCES

Data	Variables	Period	Notes
Business Dynamics Statistics (BDS). <i>Derived from the Longitudinal Business Database (LBD).</i>	Count of firms and establishments and their entry and exit, job creation and destruction, by state, sector (9 sectors only) firm age, firm size, and initial firm size.	1977–2009 (annual).	The sectors are: (1) Construction, (2) Finance, Insurance, and Real Estate, (3) Agriculture, (4) Manufacturing, (5) Mining, (6) Retail, (7) Services, (8) Transp. and Utilities, and (9) Wholesale.
Current Population Survey (CPS).	Detailed, worker-level information on labor force participation in the current and the previous year.	1987–2011 (monthly).	Size of employer is available only in the March supplement and refers to the main employer in the previous year.
Job Openings and Labor Turnover Survey (JOLTS).	Job openings, hires, and separations (quits and layoffs) by industry (24 categories) and region.	2001–2011 (monthly).	No firm size information.
Current Employment Statistics (CES).	Working hours and employment by industry.	1990–2011. (monthly).	No firm size information.