Debt Overhang, Rollover Risk, and Investment in Europe
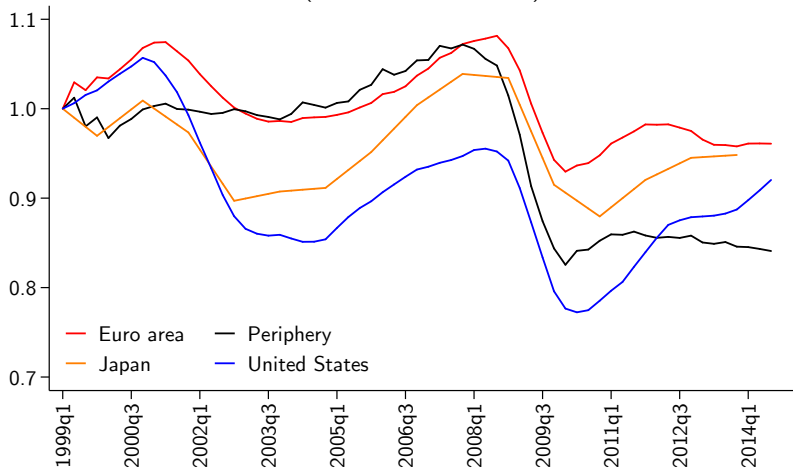
Şebnem Kalemli-Özcan, University of Maryland, CEPR and NBER

Luc Laeven, ECB and CEPR

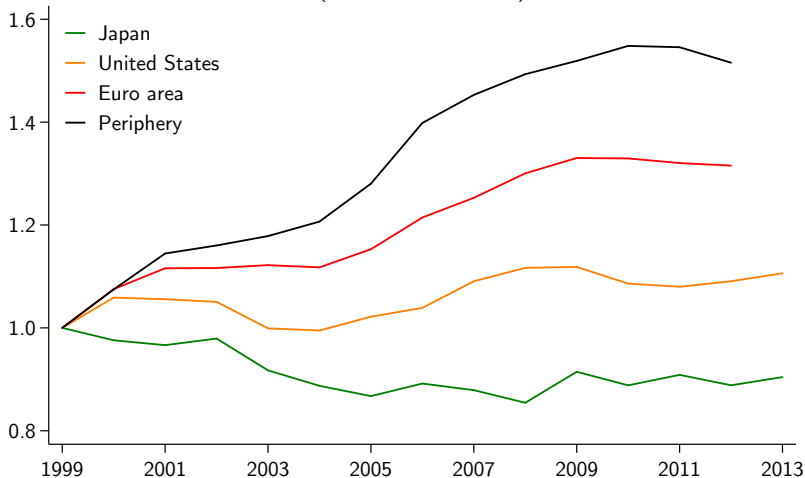David Moreno, University of Maryland

June 9, 2015

Corporate Investment/GDP

Gross Investment by Non-Financial Corporations
(% of GDP, 1999Q1=1)

Legend: Euro area, Japan, Periphery, United States

Sources: Eurostat, Cabinet Office, and Bureau of Economic Analysis.

Debt of Non-Financial Corporations
(% of GDP, 1999=1)

Sources: Organisation for Economic Co-operation and Development, and World Bank Organization.

Can Sluggish Investment Be Due to Corporate Indebtedness?

We ask whether high levels of corporate debt and the composition of debt are holding back private corporate investment

1. We consider both the level of corporate indebtedness and the maturity structure of debt, to capture the effects from debt overhang and rollover risk

2. Data: Europe-wide firm- level data relating real outcomes to financial decisions

## Outline

What is Debt Overhang?

- Myers (1977): High levels of debt curtailing investments because the benefits from additional investment in firms financed by risky debt accrue largely to existing debt holders rather than shareholders

- More generally in finance literature: A debt burden that is so large that a firm cannot take on additional debt to finance future projects, even if the investment opportunities are profitable enough to enable it to reduce its indebtedness over time

- We capture debt overhang using the ratio of corporate debt to corporate earnings (debt repayment capacity)

- Different than what has been emphasized by macro literature: Due to limited commitment by government, a negative correlation between government debt and investment

What is Rollover Risk?

- Consider role of debt maturity
- Short term debt increases rollover risk during crises, when lenders are unwilling to renew expiring credit lines as collateral values drop and financial conditions deteriorate (Diamond 1991)

- Even small changes in collateral values can lead to dramatic changes in debt capacity when firms' short term debt needs to be frequently rolled over (Acharya, Gale, and Yorulmazer 2011)

- Measure rollover risk using ratio of short term debt (less than 1 year remaining maturity) in total debt
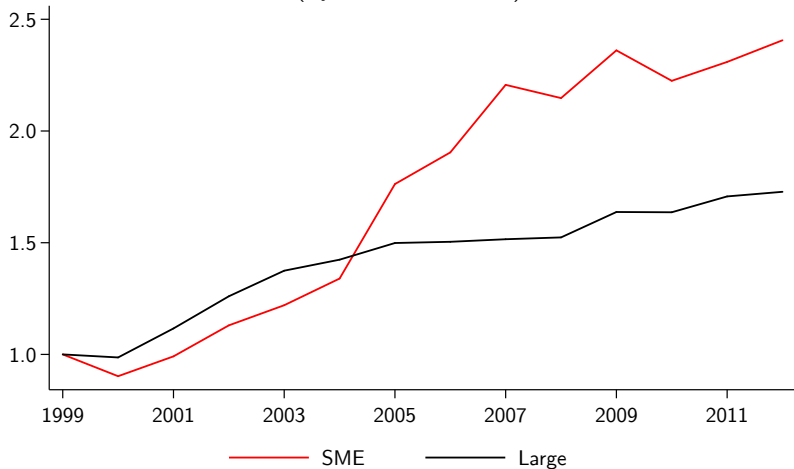
Periphery: Long-Term Debt/Total Debt
(1999=1)
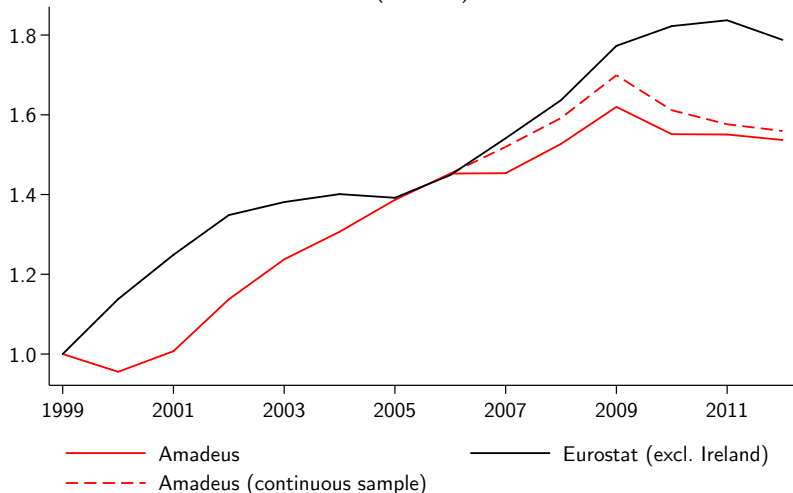
Share of Long Term Debt by SME

Euro area: Long-Term Debt/Total Debt
(By firm size, 1999=1)

Source: Amadeus data, unbalanced panel of our dataset.

Corporate Indebtedness as an Overlooked Channel

Existing explanations for low investment and growth in Europe

- Low demand

- Collateral damage

    - Firms with collateral damage from declining real estate values invest less (Chaney, Sraer, and Thesmar 2012)

- Weak financial conditions from sovereign and bank distress

    - Banks are weakened by losses from real estate and sovereign exposure, reducing credit supply
    - Sovereign stress further reduces credit supply by imposing losses on banks with sovereign exposure and deteriorating bank funding conditions (sovereign-bank linkages)

    A high debt overhang firm may choose not to invest even if its bank is not weak or its net worth is high

Difference between Debt Overhang and Leverage

- Myers debt overhang: Not only about high levels of debt but ability to generate cash flow relative to cost of debt (interest-coverage ratio)

- No debt overhang with zero debt: An all-equity firm with no debt, will have investment correlated perfectly with firm value/net worth.

- Firm balance sheet channel (leverage) and debt overhang:
  - A firm with debt overhang will underinvest, hence net worth (inverse leverage) and investment correlation might be low.
  - If financial frictions bind, then net worth (inverse leverage) and investment correlation will be high.

Leverage and Debt Overhang

- Non-financial firms in Europe did not have high leverage at the onset of the crisis but rising spreads, falling profits, and rollover risk increased debt burdens during the crisis, especially in the periphery
- Financial firms on the other hand had high leverage at the onset
    - Adrian and Shin (2008); Kalemli-Özcan, Sørensen, and Yeşiltaş (2012)

Leverage of Non-Financial Corporations
(Debt over Assets, 1999=1)
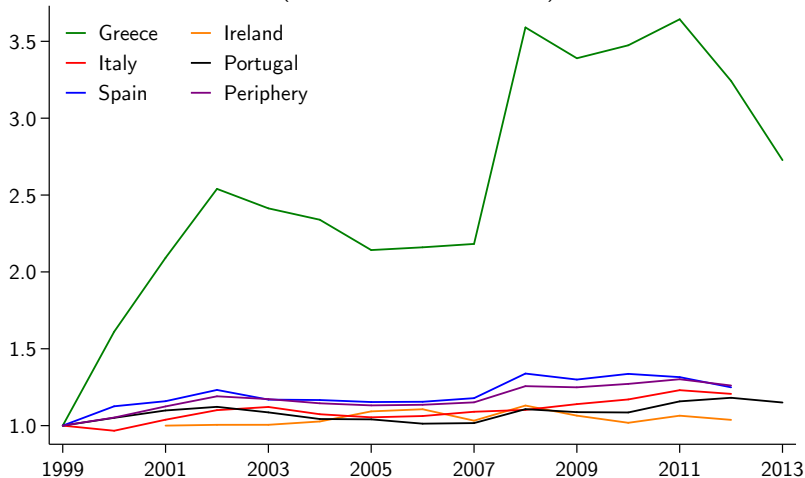
Source: Organisation for Economic Co-operation and Development.

Debt Overhang

Euro area: Debt Overhang
(Net Debt to EBITDA)

Source: Amadeus data from unbalanced panel of our dataset.

Our Contribution

1. Focus on identifying an overlooked channel–corporate indebtedness–conditional on other channels

2. Pan-European setting where we exploit heterogeneity not only of banks but also of sovereigns for real outcomes

3. Use a unique hand-matched firm-bank-sovereign data from all Europe that includes <u>small firms</u>

   - Small firms make up a large fraction of economic activity in Europe
   - Cannot switch to alternative sources of funding
   - Debt overhang effects are presumably larger in small firms given higher information asymmetry and riskiness

Findings

- Debt overhang (debt/earnings) has a negative influence on investment during regular times and even more so during crisis times

- Short term debt has a positive effect on investment during regular times but a negative one during crisis times especially in GIIPS, consistent with an increase in rollover risk

- The worsening of debt overhang and increasing rollover risk during the crisis can be linked to an increase in sovereign risk in peripheral European countries

- Rollover risk in peripheral Europe increased especially for firms with borrower relationships with banks weakened by sovereign exposure, highlighting role of sovereign-bank linkages

- The debt overhang and rollover risk channels together explain about half of the actual decline in aggregate corporate investment during the crisis

Related Literature

- Macro models with corporate debt overhang: Lamont (1995), Whited (1992), Occhino and Pescatori (2010)

- Empirical debt overhang literature: focus on banks, sovereigns and households): Philippon and Schnabl (2013), Becker and Ivashina (2014), Melzer (2012).

    - Lack of corporate sector focus is due to data limitations—with listed US firms: Bond and Meghir (1994), Hennessy (2004), Hennessy, Levy, Whited (2007)

- Bank and firm balance sheet channel for credit supply: Jiménez et al. (2013), Kalemli-Özcan, Kamil and Villegas-Sánchez (2014), Amiti and Weinstein (2014).

- Weak sovereign-bank channel for credit supply: Bofondi, Carpinelli and Sette (2013), Peydró and Maddaloni (2013, 2014), Popov and van Horen (2014).

- Real effects of shocks to credit supply: Acharya, Eisert, Eufinger, and Hirsch (2014), Cingano, Manaresi, Sette (2014), Paravisini et al. (2014), Chodorow-Reich (2014).

ORBIS-AMADEUS Data

- ORBIS database provided by Bureau van Dijk (BvD), harmonized worldwide (130million+). Focus on AMADEUS, the European subset of ORBIS starting 1999.

- We merge across different vintages of data and across different disks within vintage to increase coverage: we capture 50 to 90 percent of the real economic activity

- Balance sheets and income statements at 4 digit NACE industry classification.

- Collected from official business registers, annual reports, and newswires.

- Private and public firms (advantage over Compustat/Worldscope).

- 58 percent of firms are less than 10 employees; 40 percent between 10-250 employees; 2 percent more than 250 employees: mimics official size distribution where less than 250 employee firms account for 70 percent of the economic activity

Table: Coverage Relative to Eurostat: Selected Countries

	Spain	Italy	Germany	France
1999	0.69	0.59		0.70
2000	0.71	0.63		0.70
2001	0.73	0.62		0.72
2002	0.75	0.69		0.75
2003	0.74	0.68		0.73
2004	0.75	0.71		0.66
2005	0.74	0.72		0.67
2006	0.74	0.73	0.34	0.72
2007	0.74	0.73	0.34	0.73
2008	0.72	0.84	0.28	N/A
2009	0.72	0.81	0.28	0.71
2010	0.73	0.83	0.30	0.73
2011	0.74	0.86	0.28	0.75
2012	0.71	0.85	0.25	0.73

Size Distribution: Manufacturing, 2006

		Spain	Italy	Portugal	Germany	France	Norway
	Employment						
ORBIS-AMADEUS	1-19 employees	0.24	0.13	0.25	0.05	0.10	0.18
	20-249 employees	0.50	0.55	0.53	0.32	0.35	0.47
	250+ employees	0.26	0.32	0.22	0.63	0.56	0.35
Eurostat (SBS)	0-19 employees	0.31	0.41	0.34	0.15	0.20	0.20
	20-249 employees	0.43	0.37	0.48	0.32	0.34	0.42
	250+ employees	0.26	0.22	0.18	0.53	0.46	0.38
	Gross Output						
ORBIS-AMADEUS	1-19 employees	0.14	0.12	0.12	0.06	0.05	0.11
	20-249 employees	0.42	0.49	0.43	0.27	0.23	0.40
	250+ employees	0.45	0.40	0.46	0.67	0.72	0.49
Eurostat (SBS)	0-19 employees	0.14	0.21	0.15	0.06	0.10	0.13
	20-249 employees	0.38	0.41	0.42	0.22	0.27	0.36
	250+ employees	0.49	0.38	0.43	0.72	0.63	0.51

Euro area: Net Investment by Non-Financial Firms
(% Value Added, 1999 = 1)
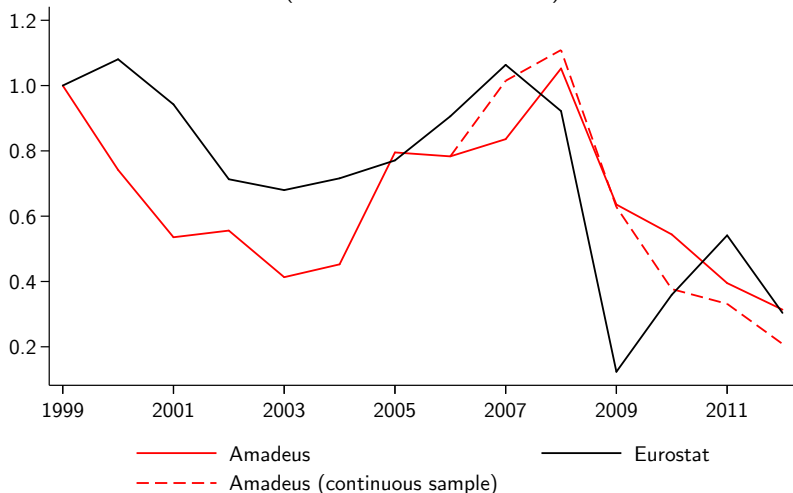
Matching firms to banks and sovereigns

- We use KOMPASS database to match bank and firms (firms report their main banker that they borrow from and secondary banker in most cases).

- Giannetti and Ongena (2012), Ongena, Peydró, van Horen (2013) used same matching for Eastern Europe to track the role of foreign banks in transmitting the crisis.

- Then use Bankscope to get the bank balance sheet

- We match firms both to their relationship bank, and in some specifications to the parent bank of the relationship bank

- For most observations, bank and firm sovereign are identical (with exception of Eastern Europe)

Identification Methodology

- A key challenge is to control for changes in demand (or productivity shocks)—four-digit sector-country-year fixed effects

- Identifying assumption is that firms face demand shocks at their four-digit-sector level but subject to similar idiosyncratic demand shocks if they are high-low debt.

- A differences-in-differences specification based on high-low debt (whatever remaining variation in firm specific demand should not vary with indebtedness)

- An additional challenge is weak firms borrow from weak banks: we have the balance sheet for both and the relationship so can account for this directly

Benchmark Regression

$$
\left(\frac{\text{Investment}}{\text{Capital}} \right)_{isct} = \beta \ \text{Overhang}_{isc,t-1} \times POST_{ct} + \lambda \ \text{Overhang}_{isc,t-1}
$$
$$
+ \ \delta \ \text{Maturity}_{isc,t-1} \times POST_{ct} + \omega \ \text{Maturity}_{isc,t-1}
$$
$$
+ \ \psi \ \text{Debt}_{isc,t-1} \times POST_{ct} + \epsilon \ \text{Debt}_{isc,t-1}
$$
$$
+ \ \mathbf{X}_{isc,t-1}{}' \boldsymbol{\gamma} + \alpha_i + \omega_{cst} + \varepsilon_{isct}
$$

$POST_{c,t}$ is country-year specific dummy, depending on the recession date.

Measurement

- **Net Investment-to-Capital** Ratio: $\frac{K_t - K_{t-1}}{K_{t-1}}$, where K_t is tangible fixed assets net of depreciation

- **Debt overhang**: Debt to Capital and Debt/EBITDA (total debt or net debt)

- **Maturity**: Long term debt (credit institutions and bonds) and short term debt (bank loans, trade credit, LT payable)

- To proxy for **firm profitability**: Cash Flow to Capital

- To proxy for **firm growth opportunities**: Sales growth

- To proxy for **firm size**: log (Capital)

Benchmark Results: All Firms

Sample: All Firms
Dependent variable: I/K

	(1) Europe	(2) Euro area	(3) GIIPS
Debt	0.0381***	0.0390***	0.0398***
	(106.40)	(94.85)	(73.84)
Maturity	-0.218***	-0.237***	-0.225***
	(-61.92)	(-56.41)	(-41.30)
Cash Flow	0.0285***	0.0270***	0.0241***
	(54.71)	(42.82)	(27.52)
Sales growth	0.0483***	0.0464***	0.0513***
	(37.93)	(29.30)	(27.14)
Size	-0.367***	-0.346***	-0.334***
	(-228.12)	(-177.36)	(-142.14)
Observations	4,469,687	3,037,897	1,935,803
R^2	0.41	0.39	0.37
Firm FE	yes	yes	yes
Country-sector-year FE	yes	yes	yes
Banker FE	no	no	no

High Debt of Low Earnings?

Sample: All Firms
Dependent variable: I/K

	(1) Europe	(2) Euro area	(3) GIIPS
Debt	0.0382***	0.0391***	0.0400***
	(106.62)	(94.94)	(73.88)
Debt Service Capacity	0.0279***	0.0309***	0.0313***
	(12.35)	(8.88)	(7.12)
Maturity	-0.215***	-0.234***	-0.221***
	(-61.06)	(-55.71)	(-40.63)
Cash Flow	0.0268***	0.0254***	0.0225***
	(47.49)	(36.76)	(23.80)
Sales growth	0.0475***	0.0458***	0.0508***
	(37.15)	(28.87)	(26.78)
Size	-0.368***	-0.347***	-0.335***
	(-228.27)	(-177.49)	(-142.37)
Observations	4,469,557	3,037,869	1,935,789
R^2	0.41	0.39	0.37
Firm FE	yes	yes	yes
Country-sector-year FE	yes	yes	yes
Banker FE	no	no	no

Debt Overhang and Rollover Risk: Crisis Results

Sample: All Firms
Dependent variable: I/K

	(1) Europe	(2) Euro area	(3) GIIPS
POST × Debt	-0.0128***	-0.0125***	-0.0173***
	(-27.58)	(-23.35)	(-23.77)
Debt	0.0453***	0.0464***	0.0503***
	(101.31)	(88.62)	(71.42)
POST × Maturity	0.0718***	0.0875***	0.119***
	(14.55)	(14.71)	(15.47)
Maturity	-0.250***	-0.280***	-0.285***
	(-58.34)	(-53.34)	(-40.74)
POST × Debt Service Capacity	0.0436***	0.0558***	0.0728***
	(13.08)	(11.11)	(11.13)
Debt Service Capacity	0.00938***	0.00454	-0.00284
	(3.46)	(1.06)	(-0.51)
POST × Cash Flow	-0.0000989	0.000663	-0.00367**
	(-0.12)	(0.65)	(-2.54)
Cash Flow	0.0264***	0.0243***	0.0230***
	(36.85)	(27.46)	(18.54)
POST × Sales growth	0.00184	-0.00207	-0.0109***
	(0.73)	(-0.66)	(-2.88)
Sales growth	0.0462***	0.0466***	0.0563***
	(25.69)	(19.56)	(19.29)
POST × Size	0.00898***	0.00710***	0.0107***
	(10.83)	(6.79)	(8.07)
Size	-0.374***	-0.353***	-0.344***
	(-221.93)	(-170.52)	(-137.80)
Observations	4,469,557	3,037,869	1,935,789
R^2	0.41	0.39	0.38
Firm FE	yes	yes	yes
Country-sector-year FE	yes	yes	yes

Can Bank-Sovereign Linkages Explain the Results?

There are several channels where weak banks and weak sovereigns can be linked:

- Sovereign-debt holdings–bank balance-sheet/collateral channel (Gennaioli, Martin and Rossi, 2014; Başkaya and Kalemli-Özcan, 2014)

- Government backstopping the financial system (Acharya, Dreschsler and Schnabl, 2014; Adelino and Ferreira, 2014)

- Banks were already weak so might have carry-trade incentives with zero-risk-weight sovereign bonds (Acharya and Steffen, 2014)

Measuring Weak Banks and Weak Sovereigns

We have several measures for weak banks and weak sovereigns; results below use:

- **Weak bank**: measured using the ratio of total sovereign holdings of the bank over its total assets
- **Weak sovereign**: measured by the spread of the sovereign bond over the *Deutsche Bund* of constant 10-year maturity

The Role of Weak Sovereigns

Sample: All Firms
Dependent variable: I/K

	(1) Europe	(2) Euro area	(3) GIIPS
Weak Sovereign × Debt	-0.00181***	-0.00201***	-0.00212***
	(-13.27)	(-14.24)	(-14.32)
Debt	0.0210***	0.0226***	0.0244***
	(56.38)	(55.24)	(38.54)
Weak Sovereign × Maturity	0.00746***	0.00873***	0.0108***
	(4.80)	(5.37)	(6.45)
Maturity	-0.172***	-0.178***	-0.201***
	(-40.19)	(-38.66)	(-30.54)
Weak Sovereign × Debt Service Capacity	0.00365***	0.00295**	0.00371**
	(2.92)	(2.24)	(2.80)
Debt Service Capacity	0.0104***	0.00850**	-0.00133
	(2.87)	(2.09)	(-0.27)
Weak Sovereign × Cash Flow	-0.000312	-0.000535	-0.000161
	(-0.81)	(-1.33)	(-0.39)
Cash Flow	0.0283***	0.0290***	0.0255***
	(30.73)	(28.58)	(16.18)
Weak Sovereign × Sales growth	0.00126	0.000895	-0.000349
	(1.07)	(0.70)	(-0.27)
Sales growth	0.0442***	0.0461***	0.0500***
	(19.30)	(18.54)	(16.01)
Weak Sovereign × Size	0.00293***	0.00319***	0.00277***
	(9.83)	(10.40)	(9.13)
Size	-0.271***	-0.268***	-0.255***
	(-125.26)	(-114.19)	(-92.30)
Observations	1,509,221	1,230,813	735,145
R^2	0.36	0.34	0.31
Firm FE	yes	yes	yes
Country-sector-year FE	yes	yes	yes
Banker FE	no	no	no

The Role of Weak Banks

Sample: Matched Firms
Dependent variable: I/K

	(1) Europe	(2) Euro area	(3) GIIPS
Weak Bank × Debt	-0.0245***	-0.0278***	-0.0479***
	(-4.66)	(-5.13)	(-5.93)
Debt	0.0176***	0.0189***	0.0205***
	(32.91)	(33.78)	(23.07)
Weak Bank × Maturity	-0.0129	0.0136	0.294***
	(-0.22)	(0.22)	(3.40)
Maturity	-0.158***	-0.170***	-0.227***
	(-26.79)	(-27.21)	(-23.83)
Weak Bank × Debt Service Capacity	0.000229	-0.000984	-0.000783
	(0.46)	(-1.61)	(-1.12)
Debt Service Capacity	0.0195***	0.0346***	0.0244***
	(4.08)	(5.71)	(3.33)
Weak Bank × Cash Flow	0.00752	0.00565	0.0548*
	(0.45)	(0.32)	(2.38)
Capital	0.0214***	0.0216***	0.0123***
	(14.10)	(12.99)	(5.26)
Weak Bank × Sales growth	0.0666	0.0890	0.0450
	(1.43)	(1.62)	(0.70)
Sales growth	0.0319***	0.0272***	0.0342***
	(8.72)	(6.48)	(6.47)
Weak Bank × Size	0.0570***	0.0641***	0.0745***
	(4.91)	(5.10)	(5.29)
Capital	-0.390***	-0.377***	-0.367***
	(-104.54)	(-89.38)	(-81.58)
Observations	1,275,006	993,970	628,125
R^2	0.48	0.47	0.41
Firm FE	yes	yes	yes
Country-sector-year FE	yes	yes	yes
Banker FE	yes	yes	yes

Do Weak Banks and Weak Sovereigns Reinforce Each Other?

Sample: Matched firms
Dependent variable: I/K

Periphery-dependence: Region:	Parent Bank		Subsidiary Bank	
	Europe	Euro area	Europe	Euro area
POST × GIIPS dependence × Debt	-0.0104***	-0.0120***	-0.0126***	-0.0136***
	(-14.96)	(-16.52)	(-15.03)	(-16.05)
GIIPS dependence × Debt	0.00694***	0.00706***	0.00805***	0.00812***
	(11.79)	(11.45)	(10.97)	(11.05)
POST × Debt	-0.00387***	-0.00239***	-0.00498***	-0.00399***
	(-8.74)	(-4.83)	(-12.00)	(-8.69)
Debt	0.0217***	0.0225***	0.0230***	0.0239***
	(53.83)	(49.76)	(60.54)	(56.74)
POST × GIIPS dependence × Maturity	0.0653***	0.0701***	0.0982***	0.0921***
	(8.71)	(8.46)	(11.55)	(10.57)
GIIPS dependence × Maturity	-0.0502***	-0.0475***	-0.0736***	-0.0653***
	(-8.70)	(-7.49)	(-10.62)	(-9.36)
POST × Maturity	0.00678	0.0115	0.0106**	0.0186***
	(1.24)	(1.83)	(2.15)	(3.30)
Maturity	-0.145***	-0.169***	-0.151***	-0.177***
	(-33.26)	(-33.36)	(-38.67)	(-39.60)
POST × GIIPS dependence × Debt Service Capacity	-0.0174***	-0.0152**	-0.0254***	-0.0167**
	(-3.21)	(-1.98)	(-3.81)	(-2.22)
GIIPS dependence × Debt Service Capacity	0.000481	-0.00596	0.0155***	0.00676
	(0.12)	(-1.00)	(2.86)	(1.18)
POST × Debt Service Capacity	0.0276***	0.0170***	0.0255***	0.0154***
	(7.67)	(2.72)	(7.71)	(2.87)
Debt Service Capacity	0.000818	0.0146***	-0.00104	0.00891**
	(0.29)	(2.73)	(-0.40)	(2.07)
Observations	2,823,435	2,127,174	2,823,435	2,127,174
R^2	0.37	0.35	0.37	0.35
Firm FE	yes	yes	yes	yes

Robustness and Further Analysis

- Propensity score matching

- Dynamic panel with lagged investment

- Define $POST = 1$ in 2010 and afterwards, for all firms.

- Different definitions for weak bank and weak sovereign (sovereign spreads, bank sovereign holdings)

- Continuing sample of Firms

- Manufacturing firms

- *TFP*, intangible assets

Conclusions

- We document significant debt-overhang effects in Europe which cause sluggish investment.

- The overhang effect deteriorates with declining macroeconomic conditions: sovereign risk, uncertainty

- If low investment is mostly due to debt-overhang effect, recapitalizing banks will not solve the problem.