Impact of corporate leverage through network effects on firm performance in CESEE countries

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Outline

- Motivation:
  - NPLs in CESEE as a drag on growth
  - Some evidence on corporate leverage concentration
- Novel approach on accounting for direct and indirect effects of corporate leverage on firm performance
- Empirical methodology
- Data
- Main results
- Conclusions & policy implications

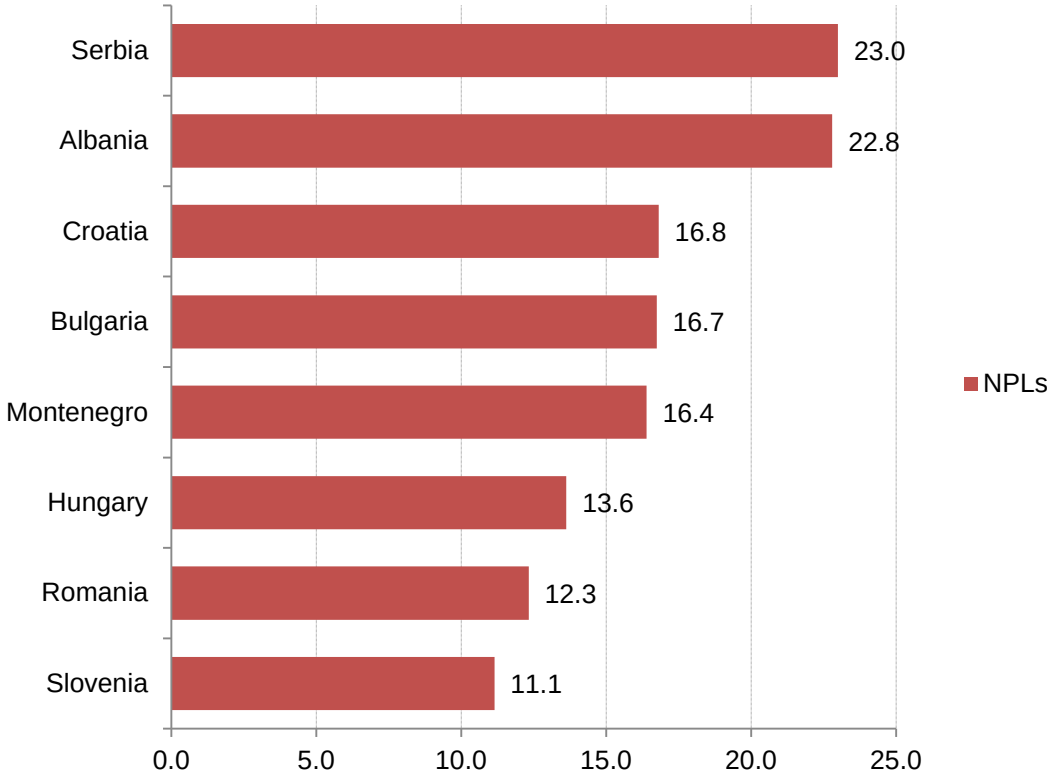
Motivation

- In the post-2008 period, private sector in CESEE countries undergone painful deleveraging,
  - which not only aggravated the overall economic downturn but also worsened the prospect of economic recovery.

- IMF Report (2015) report shows that seven years into the crisis the financial distress in the corporate sector in many CESEE countries is still pervasive
  - hampering growth and investment.

Extent of NPLs in CESEE countries

(Q3 2015; in % of total loans)

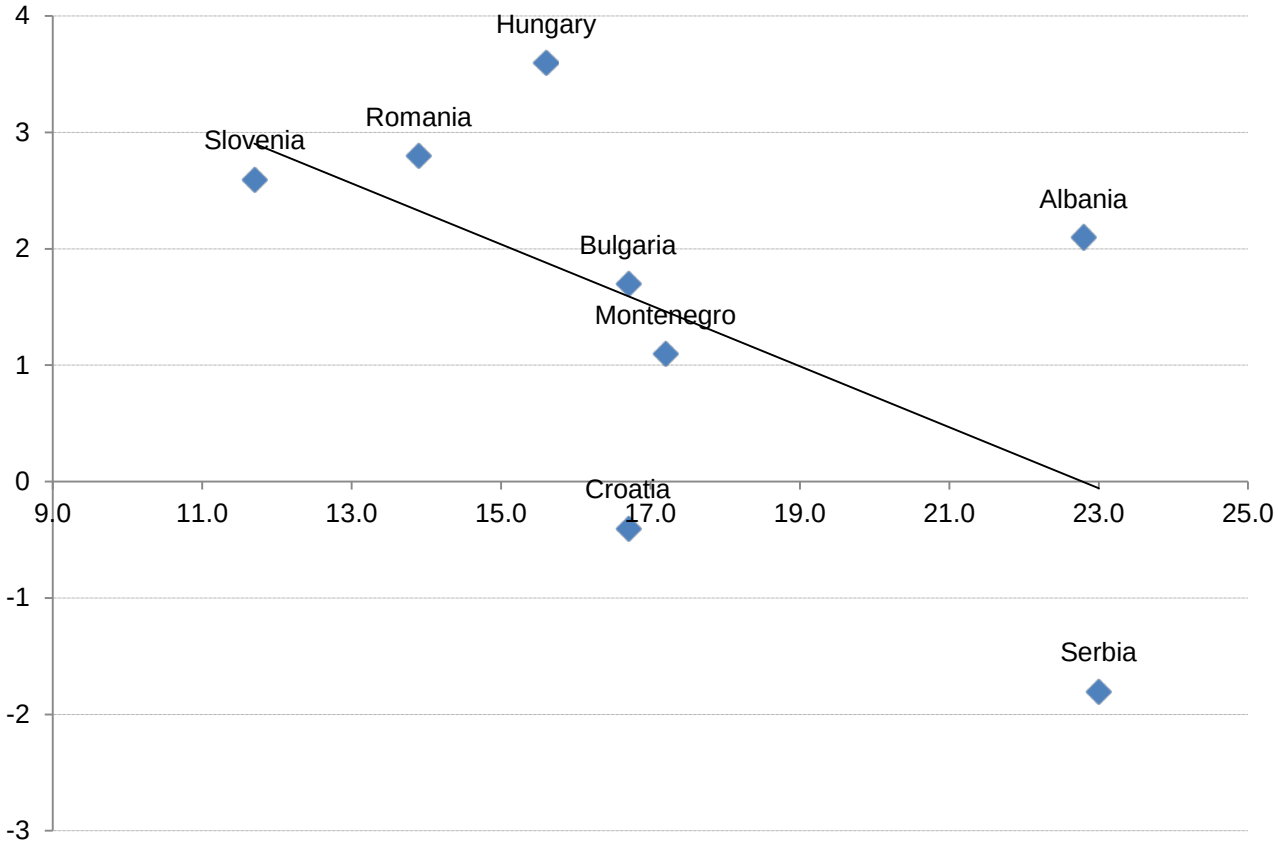


- Extent of NPLs very high and persistent

Source: IMF, Financial Soundness Indicators (FSI), 2016

NPLs and GDP growth in CESEE countries

(2014; in %)



- NPLs as a drag on economic growth

Source: IMF, Financial Soundness Indicators (FSI); World Bank

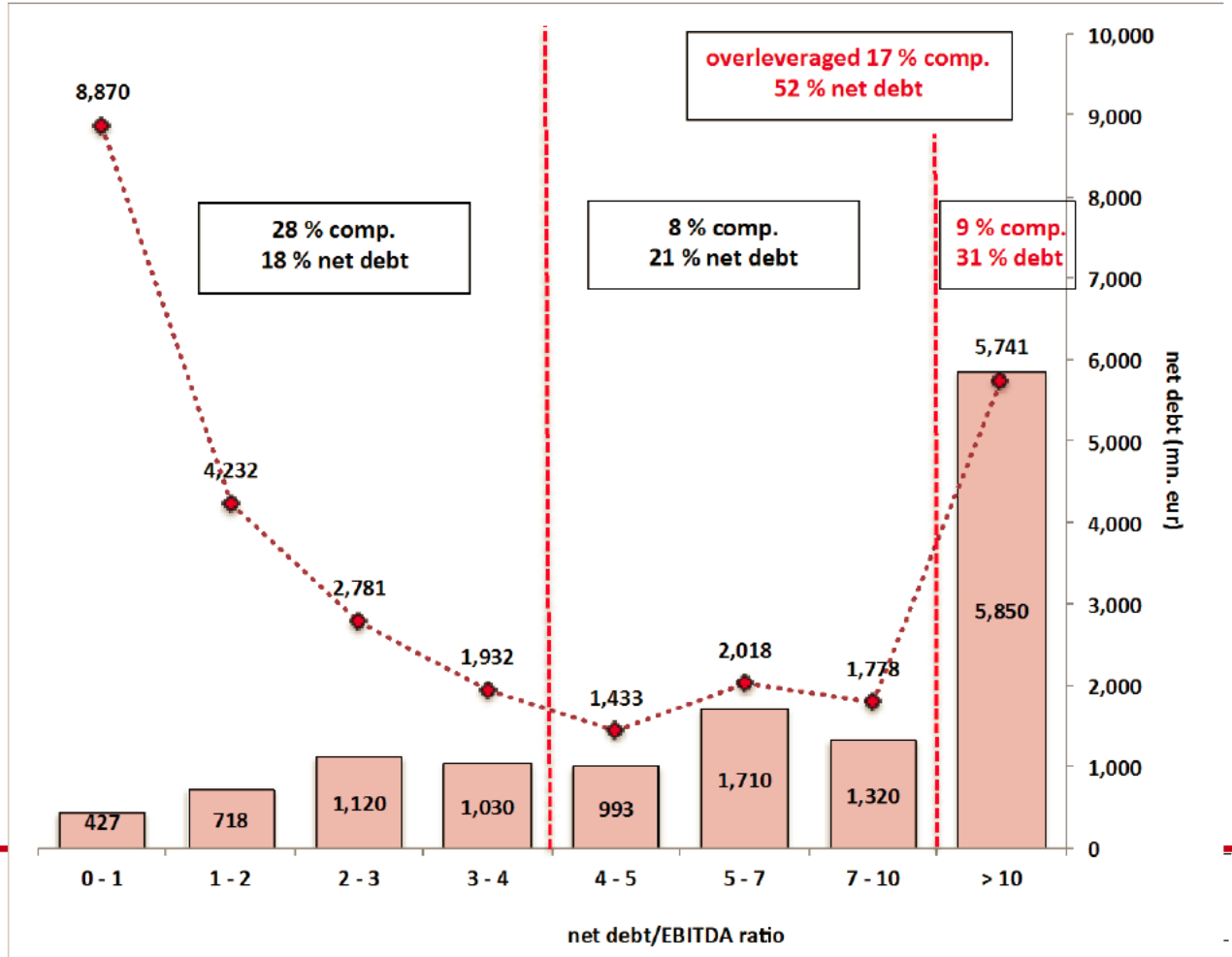
Motivation

- Another issue that was overlooked when dealing with the overall financial distress is the skewed distribution of excessive debt of corporate sector in CESEE countries and its impact on the economy

- Debt and debt overhang are highly concentrated

Extent of leverage
(Croatia, 2014)

- 17% companies with excess debt ≈ 52% total net debt

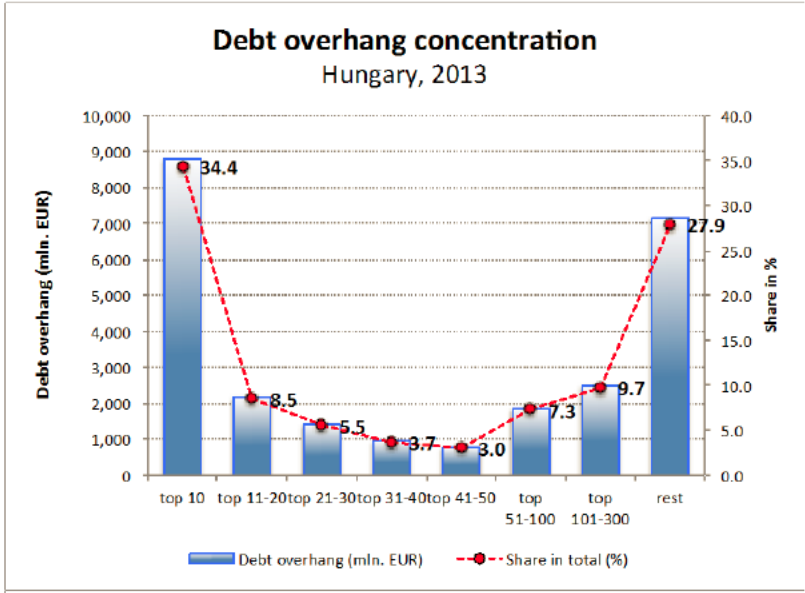


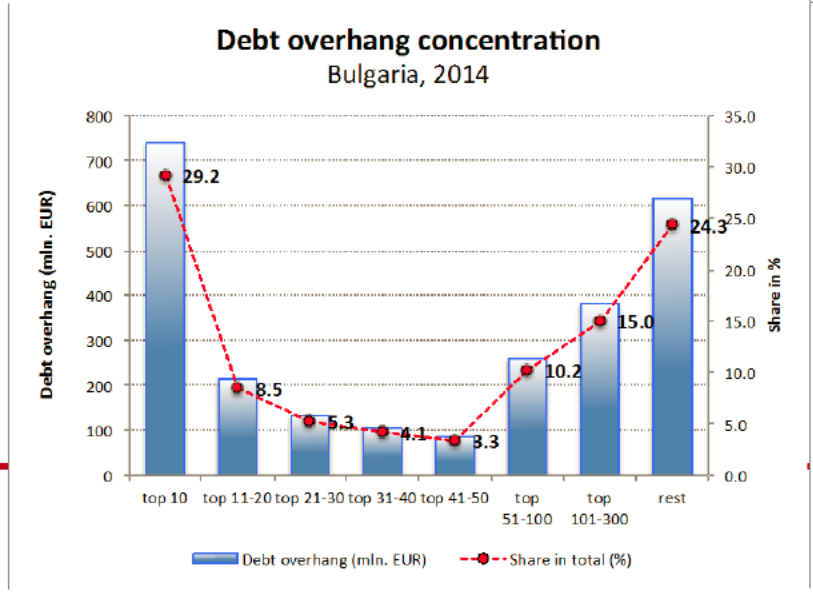
Net debt =
Debt – (cash + liq.ass.)

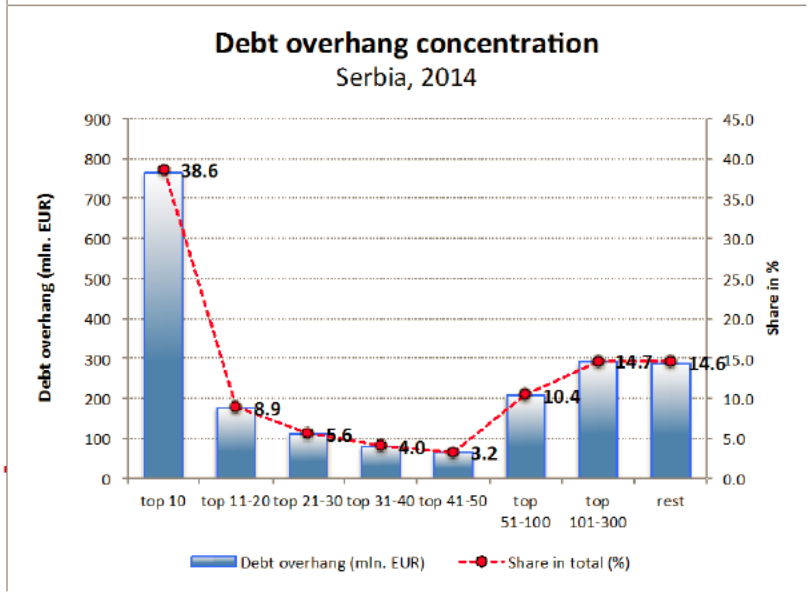
Concentration of debt overhang (2014)

In some CESEEs:

- Top-10 comp. ≈ 1/3 debt overhang
- Top-100 comp. ≈ 60% debt overhang
- Top-300 comp. ≈ 3/4 debt overhang



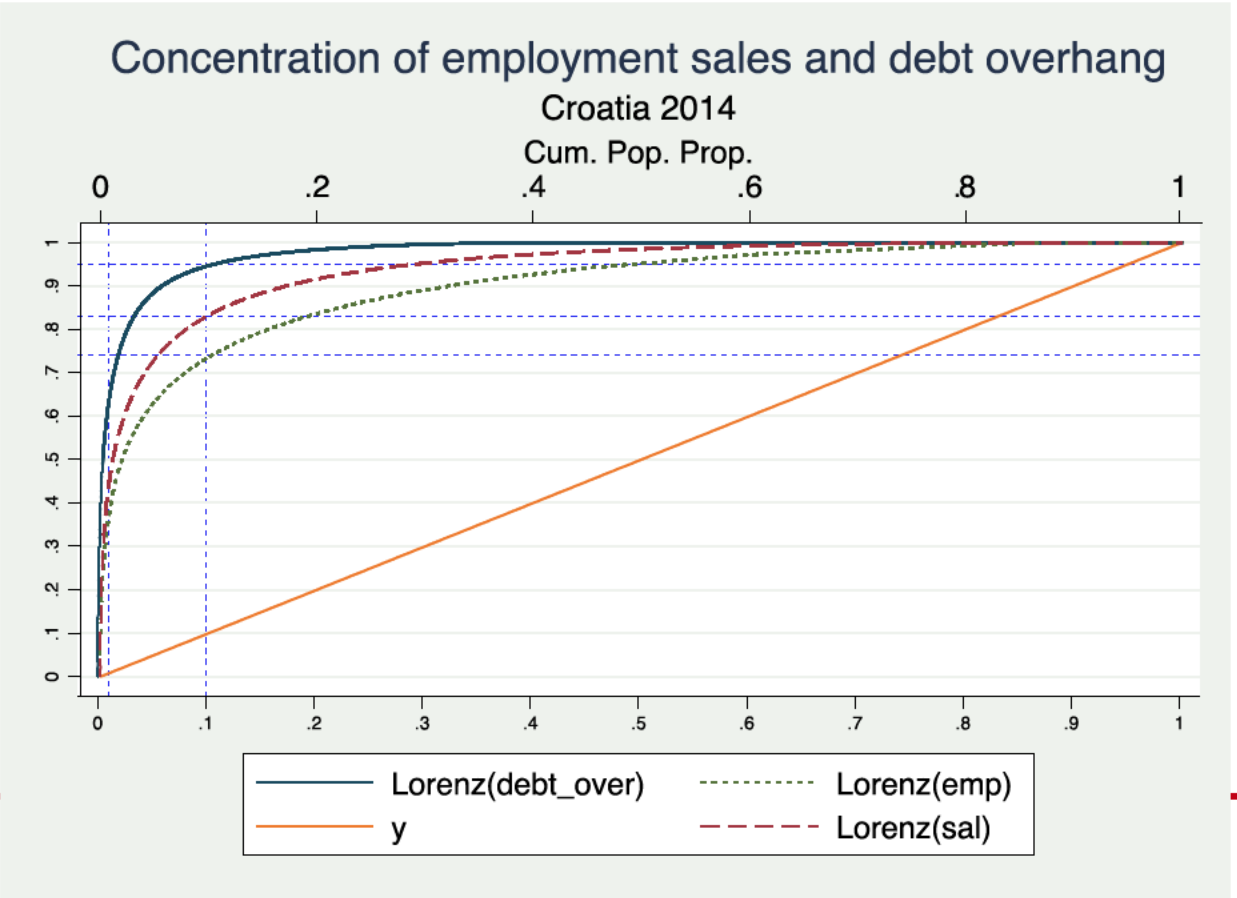




Debt concentration not due to economic structure

- High concentration of debt overhang is not a feature of economic structure
- Debt overhang more concentrated than the usual 20 / 80 rule
- Top-10% largest debtors account for 95% of debt overhang

Croatia (2014)



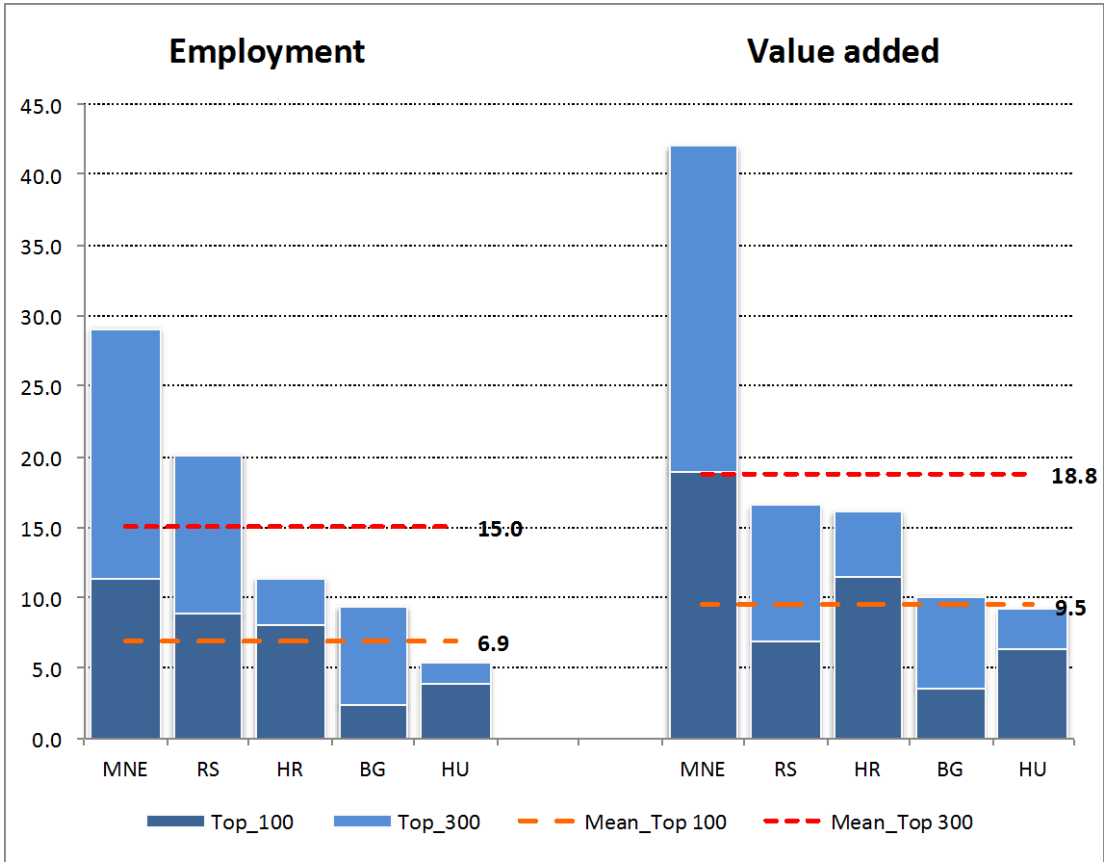
Importance of debt concentration

- Why debt concentration can be a drag for economic growth?
- Two channels
- **First**, due to direct effects of financially distressed firms
  - Overleveraged firms cannot borrow for current operations (working capital) and LT investments needed
  - Hence, decline of investment & growth of overleveraged firms
  - Endangered 15 - 20% of employment & output

Direct importance of debt concentration

Share in total employment & value added (%)

- Top-300 debtors account for:
  - ≈ 50 – 70 % overall debt overhang
  - ≈ 15 % overall employment
  - ≈ 19 % value added,



Importance of debt concentration

- But second channel at work as well

- Large financially distressed firms can exert important network effects
  - due to their inability to provide services or products to their upstream buyers or
  - to sustain demand and/or to meet financial obligations to their downstream suppliers
  - (depending on their size and intensity of the input-output linkages)

- In line with the recent research on "*large aggregate fluctuations due to microeconomic shocks*"
  - Gabaix (2011), Acemoglu et al (2012, 2015), Di Giovanni et al (2014)

Motivation

- Bernanke et al (1996): "*small shocks, large cycles puzzle*"
  - interaction between the input-output structure and the shape of the distribution of microeconomic shocks is important

- If the firm size distribution is sufficiently heavy-tailed (the largest firms contribute disproportionally to aggregate output), firm-level idiosyncratic shocks may translate into fluctuations at the aggregate level (Gabaix (2011)

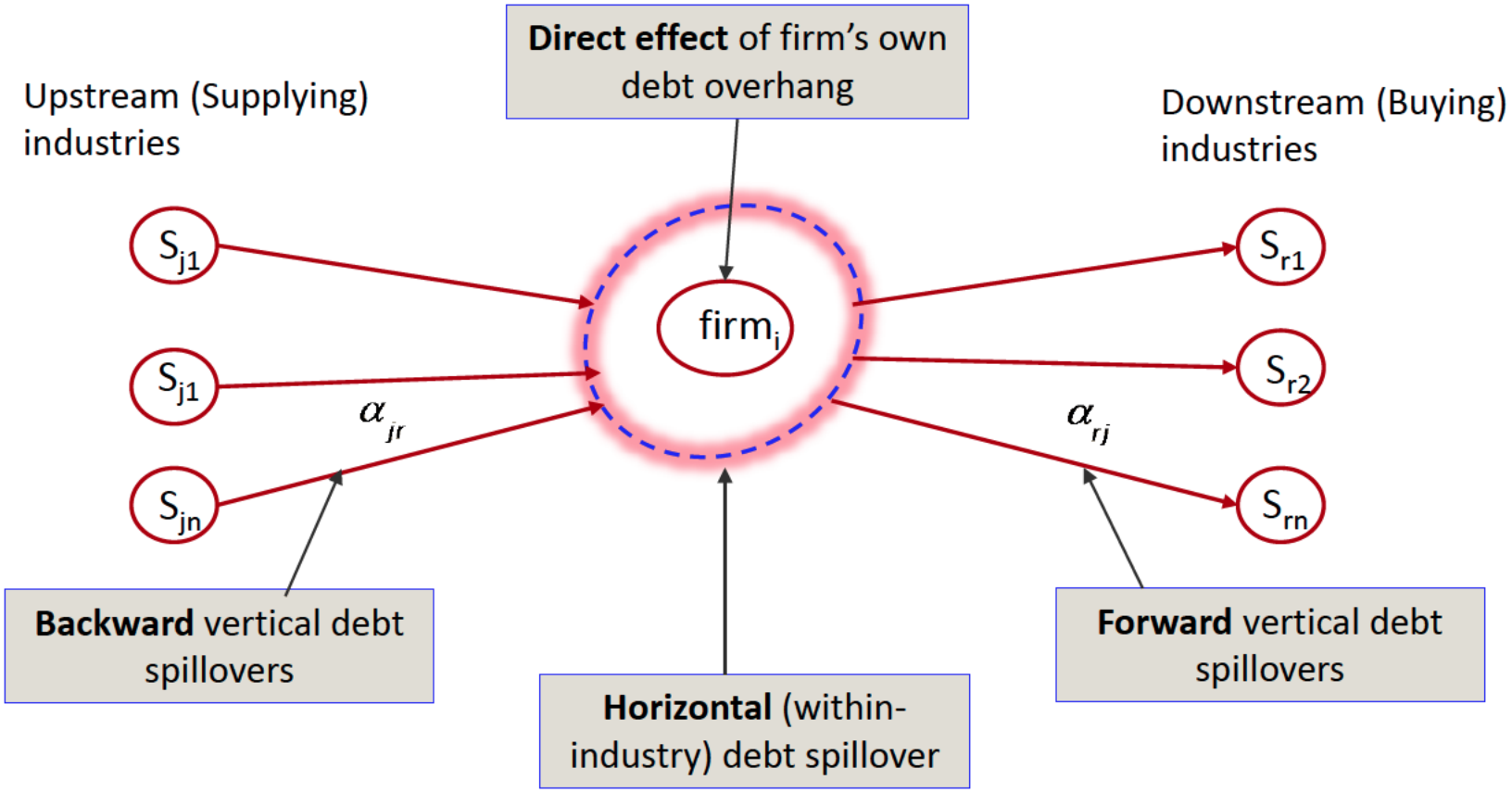
- Acemoglu et al (2015) show for sizable fluctuations to arise,
  - either input-output linkages within the economy have to be extremely unbalanced,
  - or microeconomic shocks need to have thicker tails than the normal distribution.

Aim of the paper

- This research
  - documents high debt overhang concentration in CESEEs
  - and aims to show that huge debt concentration in individual large debtors affects growth not only directly through lower firm activity,
  - but may have a depressing effect on the economy also through negative debt spillovers on vertically linked firms
- We match debt overhang of largest debtors at the sector level for 5 CESEEs with their respective Input-Output tables for 2005-2014
  - and show that the excessive debt of some important large firms spills through backward and forward input-output linkages to other sectors and firms

Conceptual framework

- Direct and spillover effects of excessive debt



Empirical approach

- Identifying Top-100 and Top-300 largest debtors in the economy
  - ranked by their absolute debt overhang
  - where debt overhang = net debt – 4*EBITDA
- Summing up debt overhang of these top debtors by industries
- Linking debt overhang aggregates across industries using backward and forward I-O coefficients
- Regressing measures of firm performance on these vertical linkages variables (and other firm-level variables)

Empirical model

- The study accounts for:
  - Firms' characteristics (size, K/L, profitability, export status, ownership)
  - Firms' financial soundness (liquidity, Interest rate coverage)
  - Firms' own financial distress
  - Intra-industry (Horizontal) spillovers of debt concentration
  - Vertical spillovers of debt concentration
    - Backward spillovers (financial health of upstream suppliers)
    - Forward spillovers (financial health of downstream buyers)

  - We study the network effects using I-O tables for each economy
  - Period 2005-2014
    - Controlling for pre- and post-crisis period

Empirical approach

Empirical model

$$\Delta y_{it} = \alpha + \beta_1 \mathbf{C}_{it} + \beta_2 ROE_{it-1} + \beta_3 ICR_{it-1} + \beta_4 DE_{it-1} + \beta_5 liquidity_{it-1} +$$
$$+ \lambda \cdot Own_{it}^{k} + \delta_1 D_{it}^{jk} + \delta_2 D_{it}^{jk} * HL_{t}^{jk} + \delta_3 D_{it}^{jk} * BL_{t}^{jk} + \delta_4 D_{it}^{jk} * FL_{t}^{jk}$$
$$+ \gamma \sum_{t=2}^{T} time_t + \phi \sum ind^{k} + \eta_i + \varepsilon_{it}$$

Where:

Δy_{it} – firm i's growth rate of TFP, VA/L, employment, value added of

ROE – return on equity

ICR – interest coverage rate (EBITDA over interest expenditures)

DE – debt to equity

Liquidity – liquidity ratio

Own – ownership dummy (foreign / domestic)

D – own debt overhang / dummy whether firm i has excessive debt

Empirical approach

Debt overhang linkages:

- Horizontal debt spillovers

$$HL_t^j = \sum D\_Over_{it}^j$$

HL is a industry sum of debt overhang by each debtor group *k* (top-100, top-300)

- Backward debt spillovers

$$BL_t^{jk} = \sum_{r,j=1}^{n} \left(\alpha_{jr} * HL_t^{jk} \right)$$

BL is weighted share of debt overhang in upstream (supplying) industries

- Forward debt spillovers

$$FL_t^{jk} = \sum_{r \neq j}^{n} \left(\sigma_{rj} * HL_t^{jk} \right)$$

FL is weighted share of debt overhang in downstream (buying) industries

- Model includes also interactions of HL, BL & FL with firm I's own excessive debt status

Data

- Matching firm-level data with I-O tables

- 6 CESEE countries covered (so far)
- Period: 2005 – 2014 (2013 for HU)

- Data sources (firm-level)
  - HU & HR: National data from local providers (whole population)
  - BG, RO, RS: Orbis, Bureau van Dijk (large samples)
- Problems:
  - MNE: covered in Orbis, but very small sample
  - AL: covered in Orbis, but empty cells
  - AL & MNE: National data from local providers still awaited

Number of firms in the sample, by size class (2014)*

	HR	HU	BG	RO	RS	MNE
Micro	96,073	370,824	663,617	710,519	80,761	2,049
Small	1,223	23,071	40,953	45,966	10,623	472
Medium	236	4,868	9,056	9,418	2,747	209
Large	9	384	375	468	148	9
Total	97,541	399,147	714,001	766,371	94,279	2,739

Number of firms in the sample, by size class (in %)

	HR	HU	BG	RO	RS	MNE
Micro	98.5	92.9	92.9	92.7	85.7	74.8
Small	1.3	5.8	5.7	6.0	11.3	17.2
Medium	0.2	1.2	1.3	1.2	2.9	7.6
Large	0.0	0.1	0.1	0.1	0.2	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

- Micro firms (0<emp<10) slightly over-represented
- Medium (50<emp<500) & large firms (emp>500) under-represented

* HU: 2013

Data

- Problems:
  - Orbis data biased towards smaller companies
    - A number of larger firms missing / incomplete info
  - Data censored: over-leveraged companies likely to be skipped in most-recent Orbis editions
    - Hence: compiling data from older annual editions of Orbis (resulting in unbalanced panel)
  - Short- & long-term liabilities of companies imperfectly covered

Data

- Input-output tables from OECD
  - for 2011 (latest available)
  - Nace Rev.1 (34 2-digit sectors)
  - Matched to firm-level data

  - Financial sector excluded from the data

Empirical outline

- Panel data structure for 1995-2014
- All data in logs
- Fixed effects estimator
  - Robustness check: dep.variables in first differences

- A number of specifications estimated:
  - Model 1: total sample, interactions for own debt overhang status
  - Model 2: controlling for pre- & post-crisis effects
  - Model 3: splitted sample into small, medium & large firms

Results (Hungary)

- Own financial soundness

	top-100 Emp	top-300 Emp	top-100 Inv	top-300 Inv	top-100 TFP	top-300 TFP
Return on equity (t-1)	0.030	0.030	0.019	0.019	0.074	0.071
	[9.49]***	[9.40]***	[3.64]***	[3.53]***	[11.65]***	[11.26]***
Crisis x Return on equity (t-1)	0.030	0.031	0.130	0.131	0.044	0.048
	[7.53]***	[7.65]***	[18.98]***	[19.11]***	[5.42]***	[5.87]***
Interest rate coverage (t-1)	0.004	0.004	0.003	0.003	0.014	0.014
	[1.47]	[1.47]	[0.88]	[0.84]	[2.80]***	[2.66]***
Crisis x Interest rate coverage (t-1)	0.000	0.001	0.027	0.027	-0.002	-0.001
	[0.14]	[0.21]	[8.47]***	[8.61]***	[-0.42]	[-0.24]
Liquidity ratio (t-1)	-0.011	-0.011	0.029	0.028	-0.029	-0.029
	[-8.05]***	[-8.11]***	[16.83]***	[16.78]***	[-9.94]***	[-10.07]***
Crisis x Liquidity ratio (t-1)	0.007	0.007	0.003	0.003	-0.014	-0.013
	[5.12]***	[5.17]***	[1.80]*	[1.96]*	[-4.34]***	[-4.03]***
Debt overhang	0.001	0.001	0.002	0.002	-0.032	-0.032
	[4.98]***	[5.03]***	[8.48]***	[8.56]***	[-73.91]***	[-73.55]***
Crisis x Debt overhang	-0.008	-0.008	-0.016	-0.016	-0.013	-0.014
	[-30.11]***	[-30.26]***	[-54.54]***	[-54.85]***	[-28.47]***	[-29.33]***

- Own financial soundness is a key for post-2008 firm performance
- While debt overhang is mostly tolerated (positive impact) before crisis,
- …it becomes a drag on firm performance after 2008

- Increase in own debt overhang by 10%, reduces post-2008 Empl. growth by 0.07% and Investment by 0.2%

Results (Hungary)

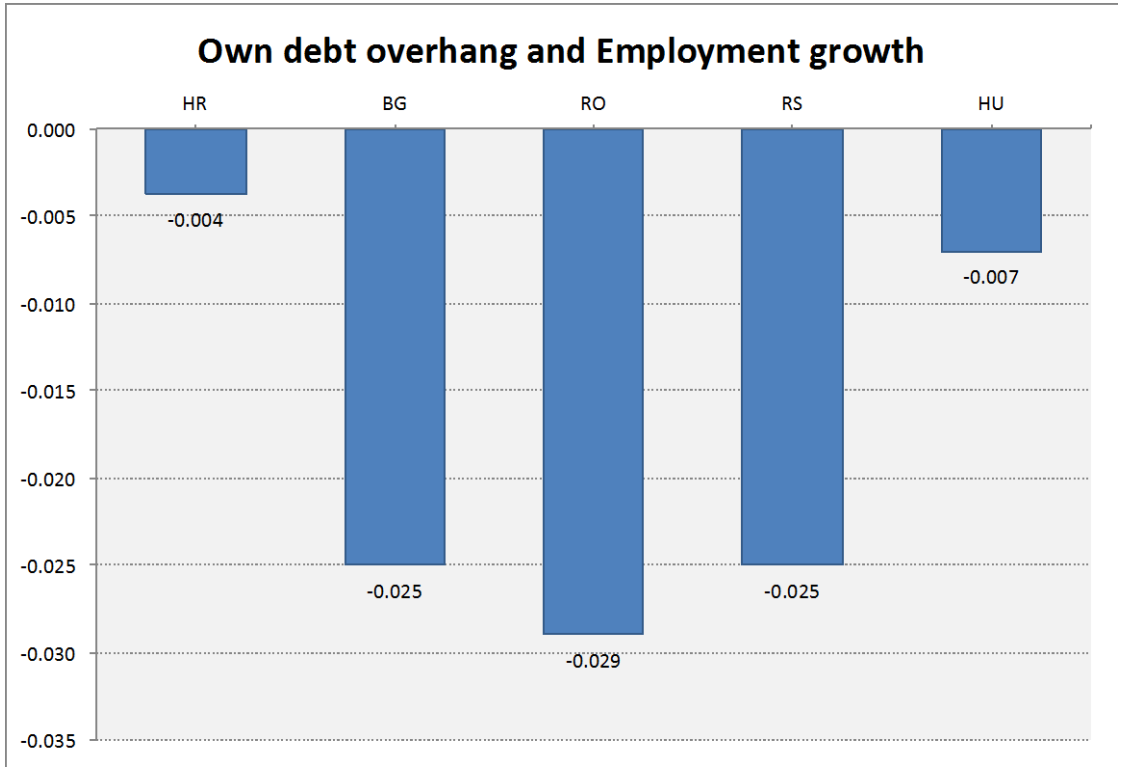
- Debt spillovers

	top-100 Emp	top-300 Emp	top-100 Inv	top-300 Inv	top-100 TFP	top-300 TFP
Hor. spillover	0.001	0.001	0.000	0.000	0.002	0.002
	[3.58]***	[3.09]***	[0.09]	[0.27]	[5.94]***	[3.85]***
Crisis x Hor	-0.002	-0.002	-0.001	-0.001	-0.003	-0.003
	[-7.81]***	[-5.62]***	[-3.57]***	[-4.35]***	[-8.34]***	[-5.47]***
Backward spillover	0.009	0.012	0.005	-0.005	0.002	-0.015
	[4.17]***	[5.27]***	[1.91]*	[-2.13]**	[0.41]	[-3.81]***
Crisis x Backward	-0.009	-0.003	-0.003	-0.003	-0.009	-0.014
	[5.45]***	[2.47]**	[1.66]*	[1.86]*	[-3.27]***	[-6.44]***
Forward spillover	-0.010	-0.013	-0.001	0.007	0.003	0.019
	[-4.98]***	[-6.61]***	[-0.59]	[3.22]***	[0.64]	[5.64]***
Crisis x Forward	-0.006	-0.013	-0.033	-0.032	-0.05	-0.057
	[1.78]*	[3.17]***	[8.62]***	[7.47]***	[8.16]***	[8.18]***

- Hor.debt spillovers have a small impact, but become more significant after 2008
- Similarly backward debt linkages, but larger in magnitude
- Forward debt linkages (from buyers) have a bigger negative impact by factor 5 - 10
- Increase in debt overhang in upstream buying sectors by 10%, reduces firms' post-2008 investment by 0.3%

Impact of debt overhang on employment growth

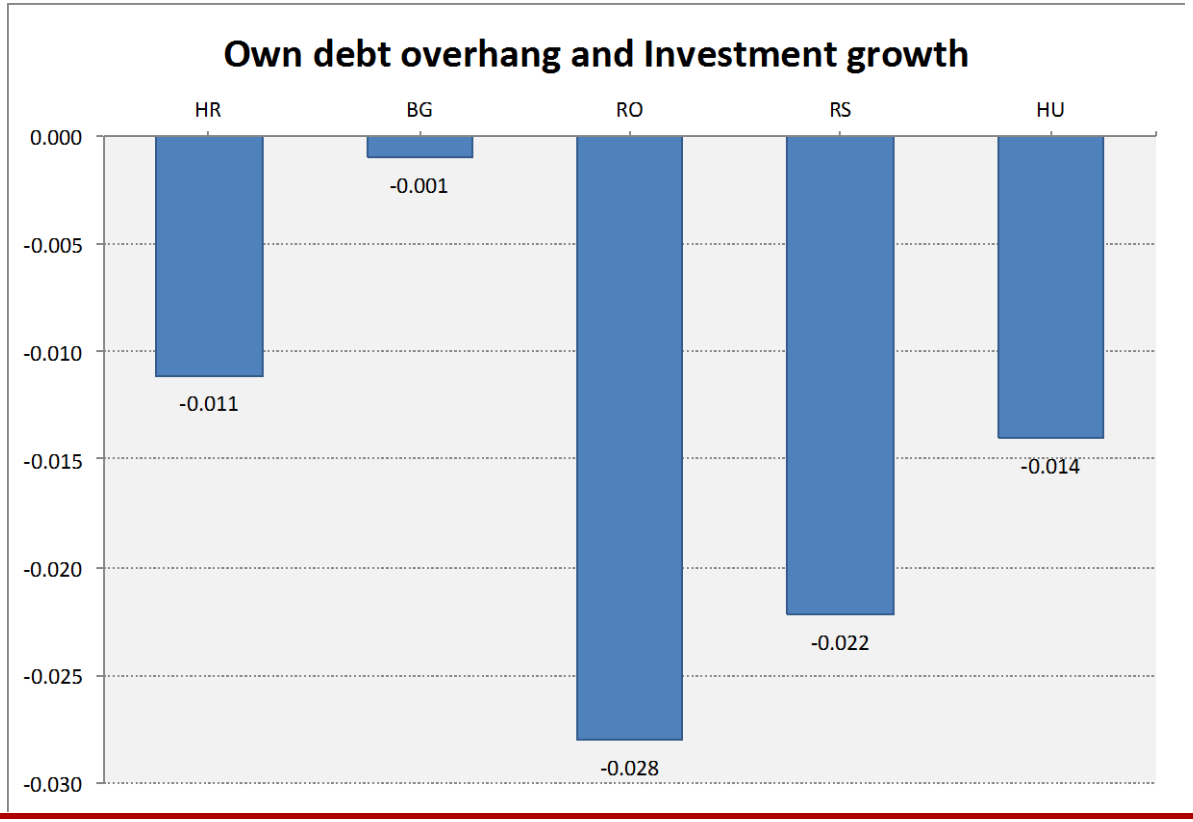
- Negative impact of own excessive leverage on employment growth in post-2008 period
- In BG, RO & RS, an increase of own debt overhang by 10% leads to lower employment growth by 0.25 – 0.3%
- In HR & HU, these effects are much smaller



- Average effects of own debt overhang on employment growth in post-crisis period (since 2008)

Impact of debt overhang on investment growth

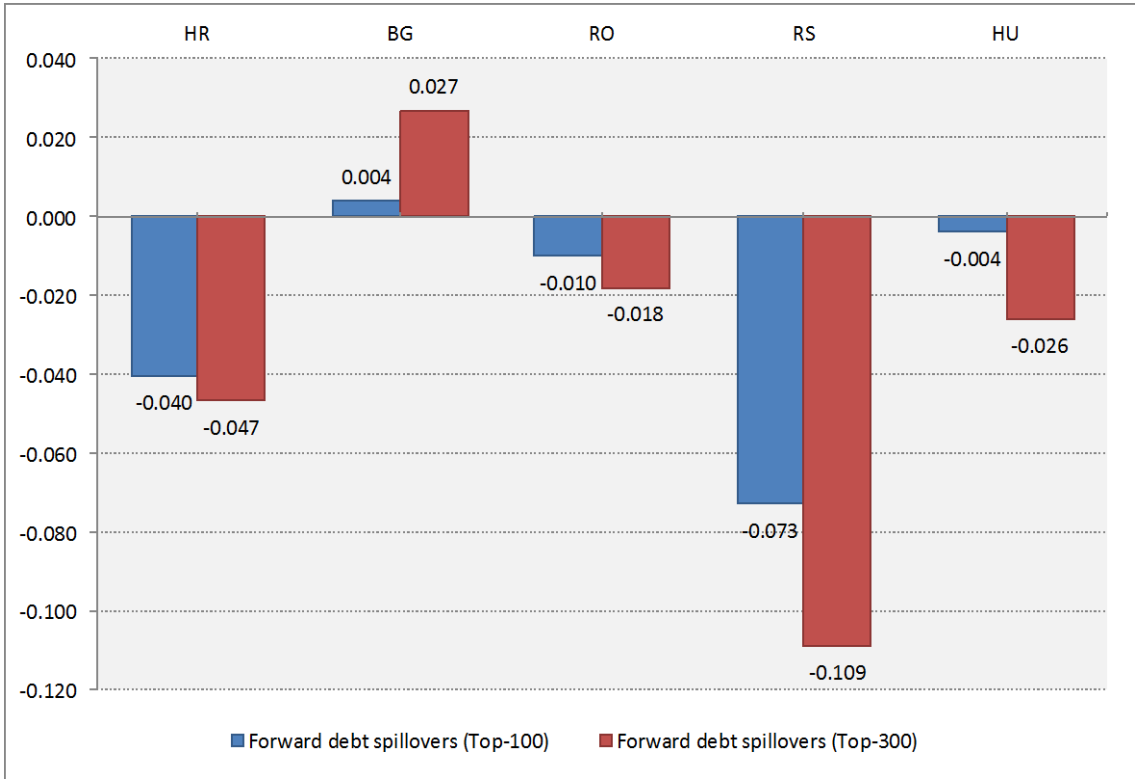
- Negative impact of own debt overhang on investment growth in post-2008 period
- An increase in own debt overhang by 10% leads to lower investment growth by 0.1 – 0.3%
- In BG, these effects are less significant



- Average effects of own debt overhang on employment growth in post-crisis period (since 2009)

Impact of debt spillovers on employment growth

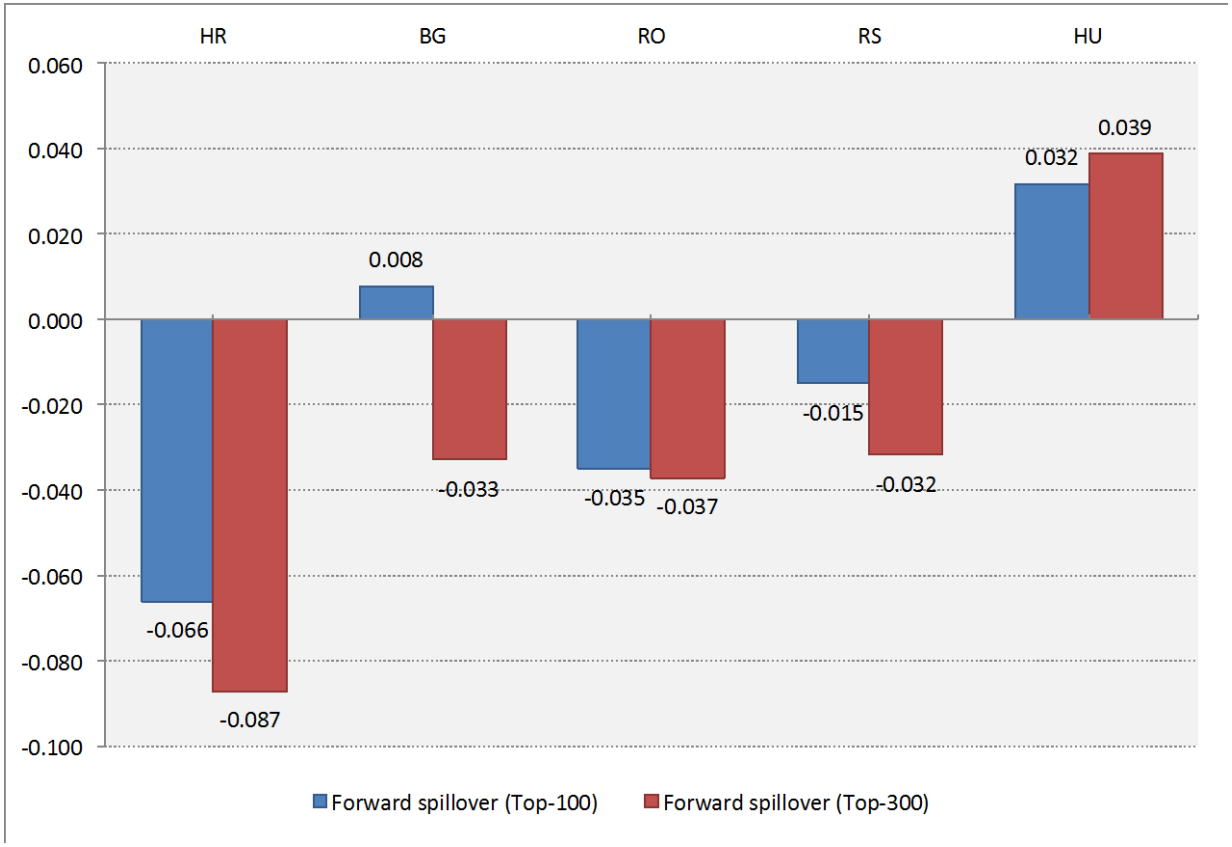
- Negative impact of debt concentration in vertically linked customers on employment growth of suppliers
- An increase of debt overhang in Top-100 most indebted downstream buyers by 10% leads to lower employment growth by 0.1 – 0.7% (except Bulgaria)
- For Top-300 most indebted customers these effects are stronger (between 0.2 and 1.1%)



- Forward debt spillover effects of top 100 and top 300 debtor firms in downstream vertically linked sectors on employment in the post-crisis period (since 2009)

Impact of debt overhang on investment growth

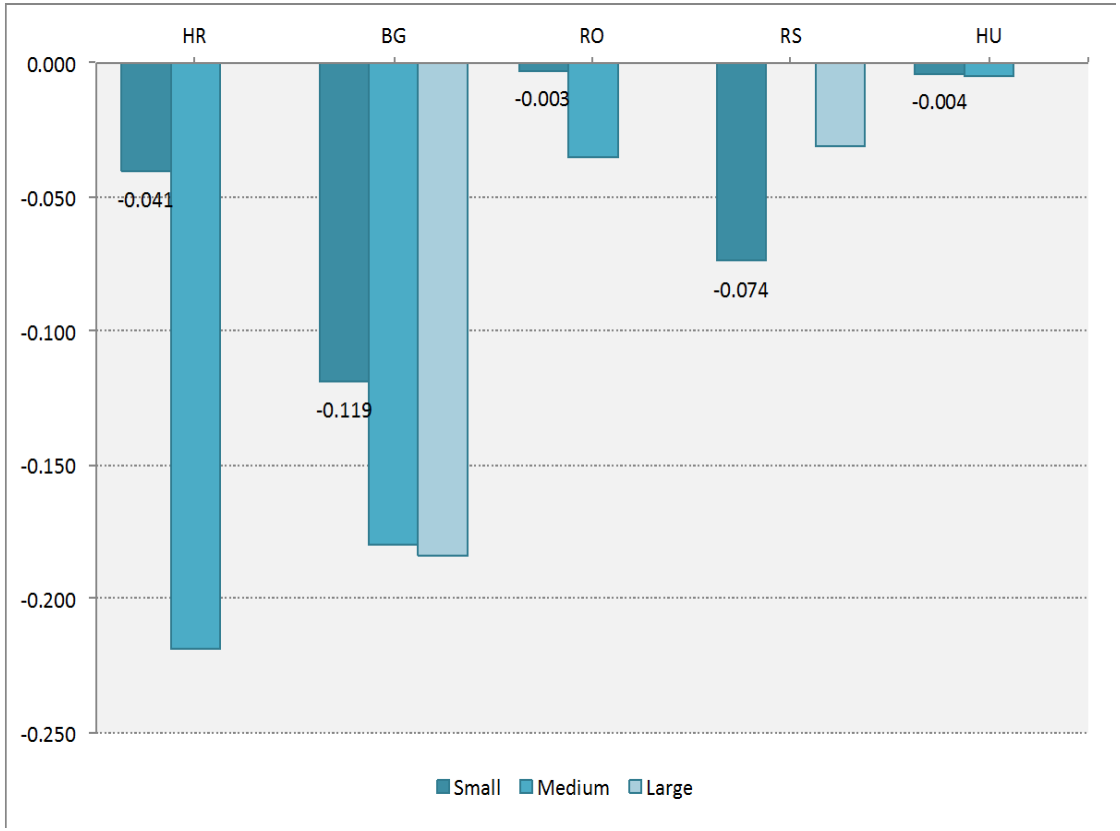
- Similar negative impact of debt concentration is found also for investment growth
- On average, an increase of debt overhang in top-300 most indebted upstream customers by 10% leads to lower investment growth by 0.3 – 0.9% (except Hungary)



- Forward debt spillover effects of top 100 and top 300 debtor firms in downstream vertically linked sectors on investment in the post-crisis period (since 2009)

Employment growth: Controlling for size

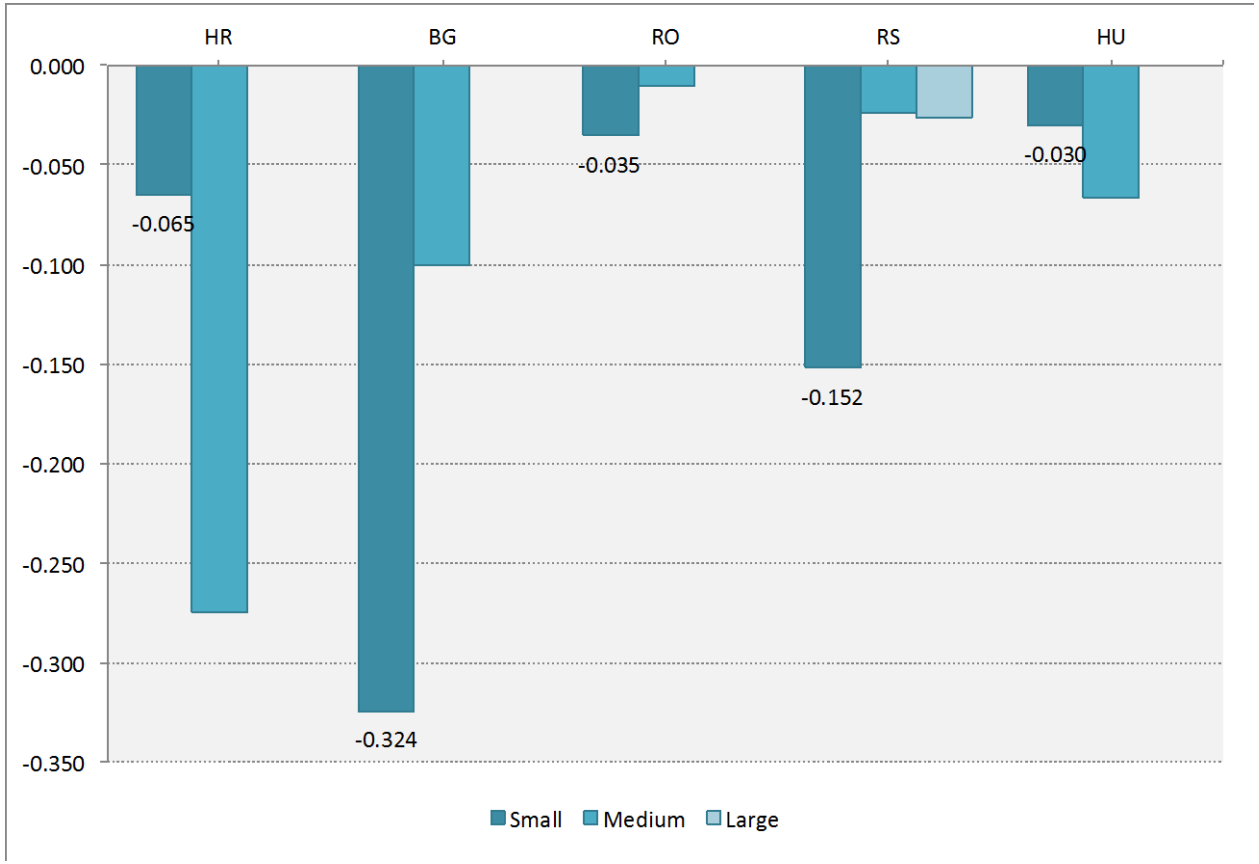
- Small & medium-sized firms are hit the most by debt spillovers of largest customers
- 10% increase in debt overhang of downstream buyers can reduce up to 2% employment in SMEs



- Forward debt spillover effects of top 100 and top 300 debtor firms in downstream vertically linked sectors on employment in the post-crisis period (since 2009)
- If not highlighted, the corresponding coefficient is not significantly different from zero

Investment growth: Controlling for size

- Even more pronounced negative effects for small & medium-sized firms
- 10% increase in debt overhang of downstream buyers can reduce up to 3% investment in SMEs



- Forward debt spillover effects of top 100 and top 300 debtor firms in downstream vertically linked sectors on investment in the post-crisis period (since 2009)
- If not highlighted, the corresponding coefficient is not significantly different from zero

Key findings

- Financial soundness is key for post-crisis performance
- Own financial distress is detrimental for employment & investment growth
  - In particular in the post-crisis period

- Debt spillovers of largest debtors among buyers have a significant negative impact on performance of suppliers
  - Within-industry debt concentration has little effect
  - Backward linkages are significant but less pronounced wrt forward debt linkages

- Small & medium-sized firms are hit the most by debt spillovers and may hence benefit the most from debt restructuring of large debtors

Policy implications

- Financial restructuring of overleveraged firms is key for growth
- … but deleveraging takes time
- A wider focus is needed as well
- While action plan focusing on Top-100 (Top-300) most indebted companies might not be feasible (costly, resource-intensive…) …
- … Targeting big overleveraged companies with significant network effects can be crucial for overall success:
  - Demonstration effects
  - Spillover effects on suppliers

    (such as Mercator, Cimos, …)
  - Small & medium-sized firms will benefit the most