



# Intangible assets, industry performance and finance during crises

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# Why intangible assets?

- Drivers of productivity (Thum-Thyssen et al., 2017; Corrado et al., 2018; Bauer et al., 2020; Adarov and Stehrer, 2019; Cincera et al., 2020)
- Intertwined with innovation and digitalisation
- Complementarity to other intangible and tangible assets (Thum-Thyssen et al., 2019).

# Our research questions are focusing on intangible investment during *crises*

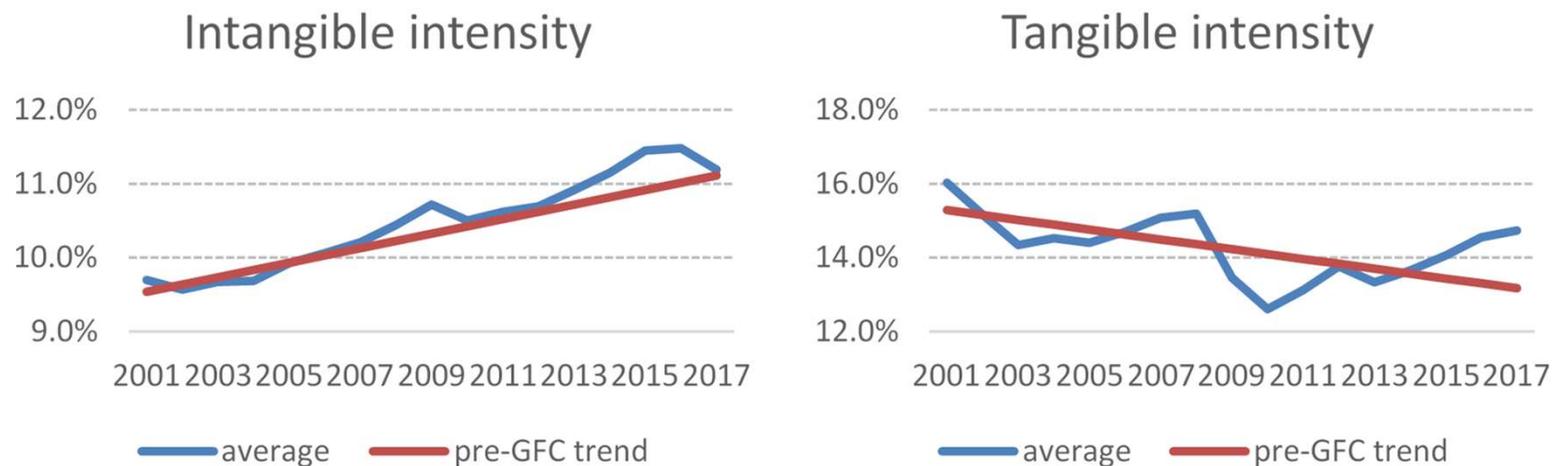
- (1) Sensitivity of intangible investment to crises
- (2) How intangible assets contribute to resilience during crises => SKIP
- (3) What is the role of finance in intangible vs tangible investment

# What kind of intangible assets?

- In the macro analysis, following Corrado et al. (2009):
  - Software, database (computerised information)
  - R&D, design, artistic originals (innovative property)
  - Brand, organisational capital, training (economic competency)
  - Source of data: EUKLEMS (2019)
- In the micro analysis, it is derived from the balance sheet of firms
  - Source of data: Orbis

# General upward trend in intangible investment intensity, with small or no impact from the crisis

Average intangible and tangible investment intensity in the EU15 and US, and the pre-crisis trend of these intensities



Note: unweighted average of country-industry data at the 2-digit level. Pre-crisis trend is estimated using the 2001-2007 period.

# Macro analysis of the role of finance in intangible investment

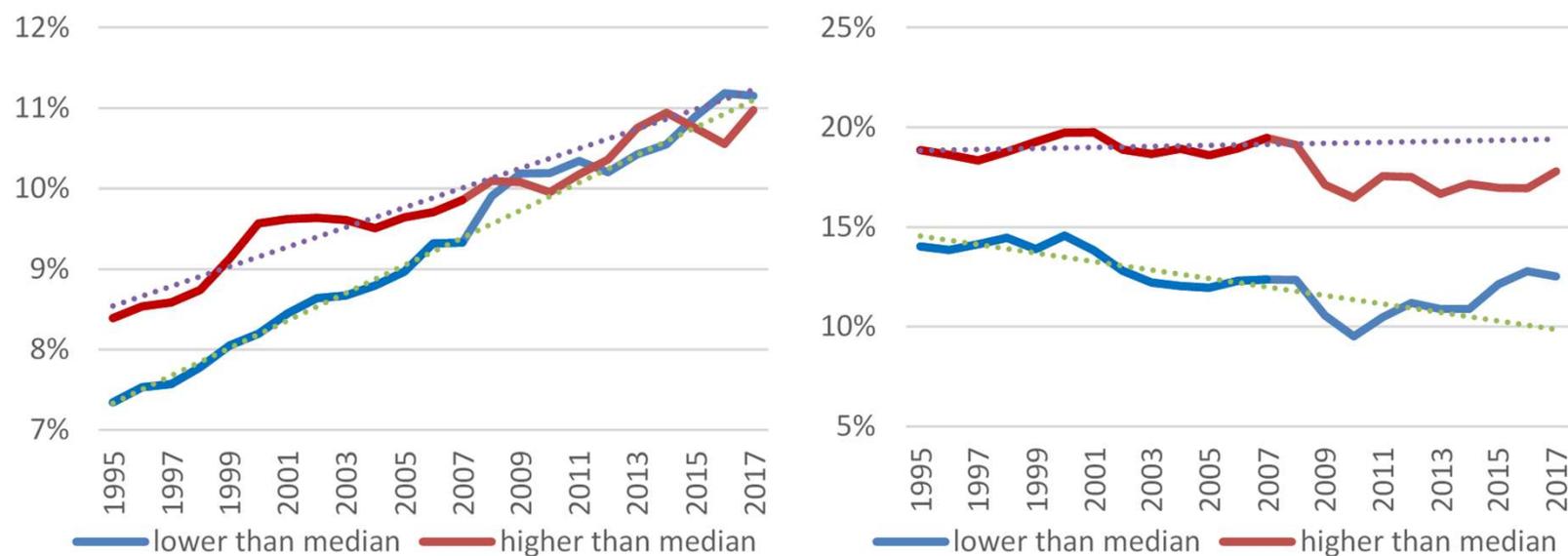
- $Int_{cst}^I = \beta EFD_{cs} * CLIFS_{ct} + \lambda_{cs} + \mu_{ct} + \rho_{st} + u_{cst},$

where the dependent variable is intangible investment intensity, EFD is external financial dependence calculated from the BACH database (BdF), CLIFS is country-level indicator of financial stress (ECB), and country-industry, country-year, industry-year fixed effects are included.

Intuition: we estimate how a financial shock affects differently the same industry in different countries compared to a period of no financial shock. Or, equivalently, we estimate the differential effect on different industries in the same country.

# Intangible investment intensity decreased in industries with high external financial dependence compared to pre-crisis trend

Average investment intensities of industries with lower and higher than median values of external financial dependence for intangibles (left panel) and tangibles (right panel)



Note: We include all country-industry cells where we have data for EFD. The linear trend lines are fitted on the pre-crisis period of 1995-2007.

# Econometric results also show the importance of finance for intangibles during periods of financial stress

Estimated coefficient of *EFD\*CLIFS*

	coef	std.err.	t-value	p-value	num. of obs.
Intangible	<b>-0.010</b>	0.004	-2.400	0.016	1858
R&D	<b>-0.006</b>	0.002	-2.450	0.014	1858
Software+DB	<b>-0.004</b>	0.001	-2.970	0.003	1858
Brand	0.000	0.001	-0.570	0.571	2158
Design	0.000	0.001	0.350	0.725	2158
Purchased orgcap	0.000	0.001	-0.520	0.605	2158
Training	<b>0.000</b>	0.000	2.090	0.037	1898
Tangible	-0.005	0.010	-0.530	0.600	1858

Note: Coefficients were estimated in individual panel regressions according to equation 2.

# Extending the research: firm-level data for 3 countries (IT, FR, ES)

- Cross-country firm-level data from Orbis generally confirm our finding about the role of finance
- It goes further because it suggests a trade-off between tangible and intangible investment during periods of financial stress
- Only manufacturing sector, while intangible and tangible investments are derived from balance sheet data
- Dependent variable: log of intangible (tangible) stock of a firm in a given year
- Variables: CL (04-08): cash-flow and leverage position (higher values indicates better liquidity)
- Post: a dummy indicating the period after the beginning of the GFC: 1 if year  $\geq$  2009.

# Similar results as for the macro analysis

## External financial dependence

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
<b>VARIABLES</b>	In Intan	In Intan	In Tang	In Tang
<b>Post</b>	-0.144*** (0.0331)		-0.184*** (0.0353)	
<b>EFD</b>	-0.132*** (0.0156)		0.125*** (0.0131)	
<b>Post*EFD</b>	-0.0738*** (0.0148)	-0.0946*** (0.0281)	-0.135*** (0.0141)	-0.0412 (0.0301)
<b>Observations</b>	1,125,570	1,125,570	1,483,277	1,483,277
<b>R-squared</b>	0.046	0.092	0.016	0.093
<b>Year-Sector FE</b>	No	Yes	No	Yes
<b>Year-Country FE</b>	No	Yes	No	Yes
<b>Country-Sector FE</b>	No	Yes	No	Yes
<b>Country FE</b>	Yes	No	Yes	No

Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# More liquidity does not help firms anymore to invest into intangibles during crises

The liquidity channel: financial independence

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
<b>VARIABLES</b>	In Intan	In Intan	In Tang	In Tang
<b>Post</b>	-0.0315*** (0.00856)		-0.0425*** (0.00489)	
<b>In CL (04-08)</b>	0.0644*** (0.0207)	0.0592*** (0.0208)	0.0133 (0.0105)	0.0215** (0.00987)
<b>Post*In CL (04-08)</b>	-0.0620*** (0.0193)	-0.0627*** (0.0194)	0.0739*** (0.0103)	0.0640*** (0.00979)
<b>Observations</b>	1,107,877	1,107,877	1,470,556	1,470,556
<b>R-squared</b>	0.804	0.805	0.912	0.913
<b>Year FE</b>	No	Yes	No	Yes
<b>Firm FE</b>	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Lower sensitivity of intangibles vs tangibles to demand both before and after the GFC

## The demand channel

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
<b>VARIABLES</b>	In Intan	In Intan	In Tang	In Tang
<b>Post</b>	-0.289*** (0.0502)		-0.861*** (0.0317)	
<b>In Turnover (Lagged)</b>	0.249*** (0.00910)	0.265*** (0.00877)	0.334*** (0.00593)	0.338*** (0.00602)
<b>Post*In Turnover (Lagged)</b>	0.0146*** (0.00346)	0.0135*** (0.00344)	0.0609*** (0.00218)	0.0636*** (0.00219)
<b>Observations</b>	1,002,758	1,002,758	1,319,427	1,319,427
<b>R-squared</b>	0.808	0.808	0.924	0.925
<b>Year FE</b>	No	Yes	No	Yes
<b>Firm FE</b>	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Conclusions

- Tangible investments are more elastic to demand and less to financial conditions, compared to intangible investments
- During times of abundant liquidity, firms tend to use cash-flow for financing intangibles (see Altomonte et al., 2021 for causal evidence), while during financial stress, firms tend to move part of the cash-flow to finance tangibles.
- These findings point to the importance of sustained financing for intangible investment, in particular during crises
- Preliminary data confirm the different behaviour of intangible and tangible investment during the COVID-19 crisis: total investments decreased by around 10% for the average of the 3 analysed country, while intangible investment decreased only by 2%.