CompNet The Competitiveness Research Network

Ida Dorn & Alessandro Zona Mattioli

MDI Progress & Research:

Status, Current Efforts, and Application

23 June 2023

Roadmap

- MDI Status Update

- Application I : Product Reallocation and Innovation Dynamics

- Application II : Long Term Trends in Corporate Leverage

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IWH

- The construction and harmonization of the **data** is on its way.
    - Noticeable progress in Slovenia and Portugal, where we will run the first codes over the summer.

- We are launching Pilot programs with External Users to test the **code infrastructure**
    - European Commission, EBRD
    - Productivity Boards with whom we share access to the data

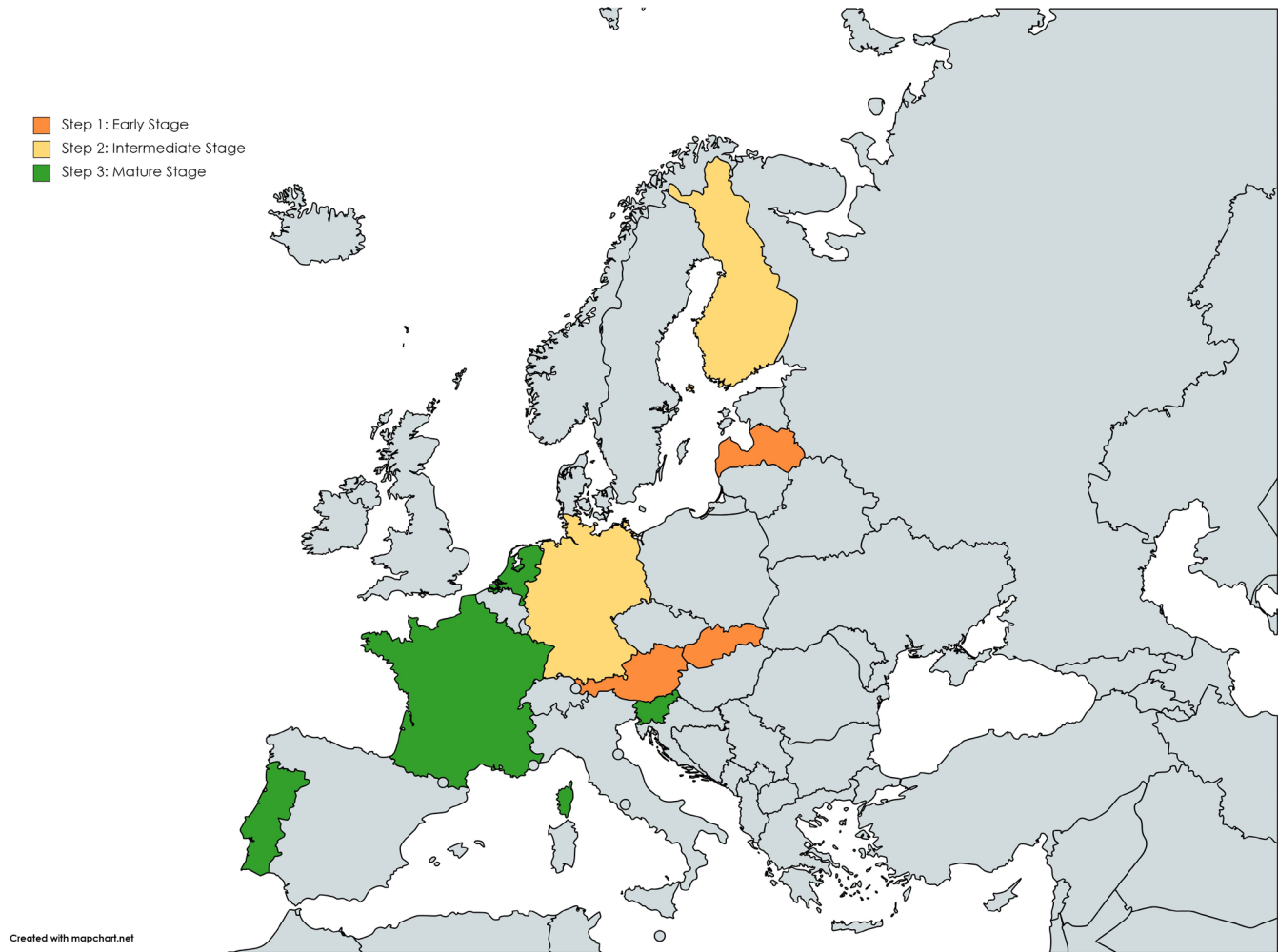# MDI Status Update

- **Step 1**: **Early Stage**
  - **LV**: currently assessing feasibility of the MDI setup with statistical office
  - **SK**: currently assessing best way of implementing data access
  - **AT**: drafting the application

- **Step 2**: **Intermediate Stage**
  - **DE, FI**: dataset is being set-up

- **Step 3**: Mature Stage
  - **FR, NL**: MDI is largely established
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Step 1: Early Stage
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Step 3: Mature Stage

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Application:

Product innovation and reallocation dynamics

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- Changes in product output (product innovation in terms of quality or portfolio) basis of productivity growth (creative destruction)

- Speed and dynamics of product churn shapes aggregate productivity growth
  1. Changes in distribution of firm-level productivity
  2. Composition and interactions between firms on product markets (market structure)

- Looking at reallocation dynamics on the firm-product level helps to understand
  1. Innovation and R&D activities of firms
  2. Market structures and market power
  3. Knowledge diffusion

- Informs about recent decline in **business dynamism** and **aggregate productivity**

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1. **Identify and explore product dynamics**
   - Firm-level and aggregate product entry and exit
   - contribution to aggregate growth

2. **Their relation to business dynamism measures (employment flows, firm entry and exit rates)**
   - Comparison between employment reallocation and product reallocation
   - Contribution of exiting, entering and incumbent products to product reallocation
   - Product reallocation along firm characteristics

3. **Their development over time**

Data

ICTeC

CIS   SBS

FATS   BR   PRODCOM

ITS   EN

FIN   BD
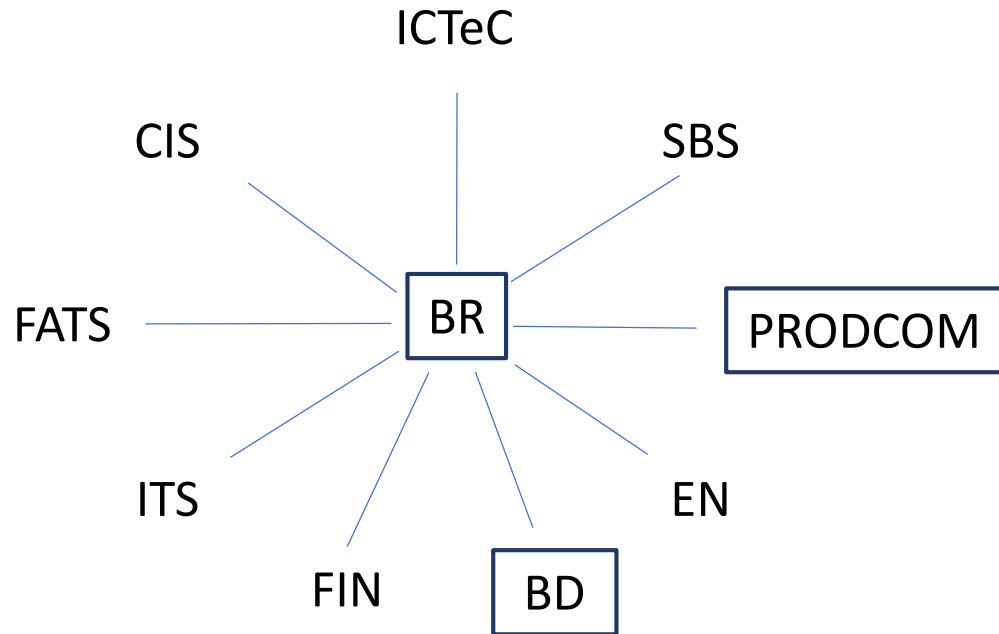
Datasets Used:

- **BR** = Business Registry

- **BD** = Business Demography

- **PRODCOM** = Firm Product Level Data

Analysis planned for **Germany, France, Netherlands**

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METADATA

	Germany	France	Netherlands
Time Coverage	2002-2017	2009-2020	2006-2020
Product classification	GP95/GP02/GP09	PRODFRA (10-digit)	PRODCOM
Survey cut-off rule	20 employees	20 employees	20 employees
Manufacturing employment share*	16.5%	9%	8%
Manufacturing VA share*	20%	10%	12%

*in 2022

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PRODUCT CLASSIFICATION

- 8-digit product identifier
- 4 digits (NACE) + 2 digits (CPA) + 2 additional digits

10.31   Processing and preserving of potatoes
   10.31.11   Potatoes, frozen
      10.31.11.10   Frozen potatoes, uncooked or cooked by steaming or boiling in water
      10.31.11.30   Frozen potatoes, prepared or preserved (including potatoes cooked or partly cooked in oil and then frozen; excluding by vinegar or acetic acid)
   10.31.12   Dried potatoes whether or not cut or sliced but not further prepared
      10.31.12.00   Dried potatoes whether or not cut or sliced but not further prepared
   10.31.13   Dried potatoes in the form of flour, meal, flakes, granulates and pellets
      10.31.13.00   Dried potatoes in the form of flour, meal, flakes, granules and pellets
   10.31.14   Potatoes prepared or preserved
      10.31.14.30   Potatoes prepared or preserved in the form of flour, meal or flakes (excluding frozen, crisps, by vinegar or acetic acid)
      10.31.14.60   Potatoes prepared or preserved, including crisps (excluding frozen, dried, by vinegar or acetic acid, in the form of flour, meal or flakes)

*Figure 1: Exemplary structure of the PRODCOM product classification*

DUTCH META DATA

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total number of firms	8930	9017	8801	8693	8052	7876	7526	7545	7380	7228	7069	6923	6795	6668	6492
Share of firms covered by Prodcom	62%	62%	66%	55%	59%	60%	61%	62%	61%	61%	63%	65%	67%	71%	73%
Employment share covered by Prodcom	85%	84%	84%	78%	83%	83%	83%	84%	83%	85%	86%	86%	87%	89%	90%
Share of observations with quantity information	54%	53%	52%	49%	51%	51%	55%	78%	77%	77%	0%	80%	81%	84%	85%

2020 snapshot

Average number of products per firm	2.45
Share of multiproduct firms	53%
Revenue share of multiproduct firms	75%
Employment share of multiproduct firms	38%
Output share of multiproduct firms	81%

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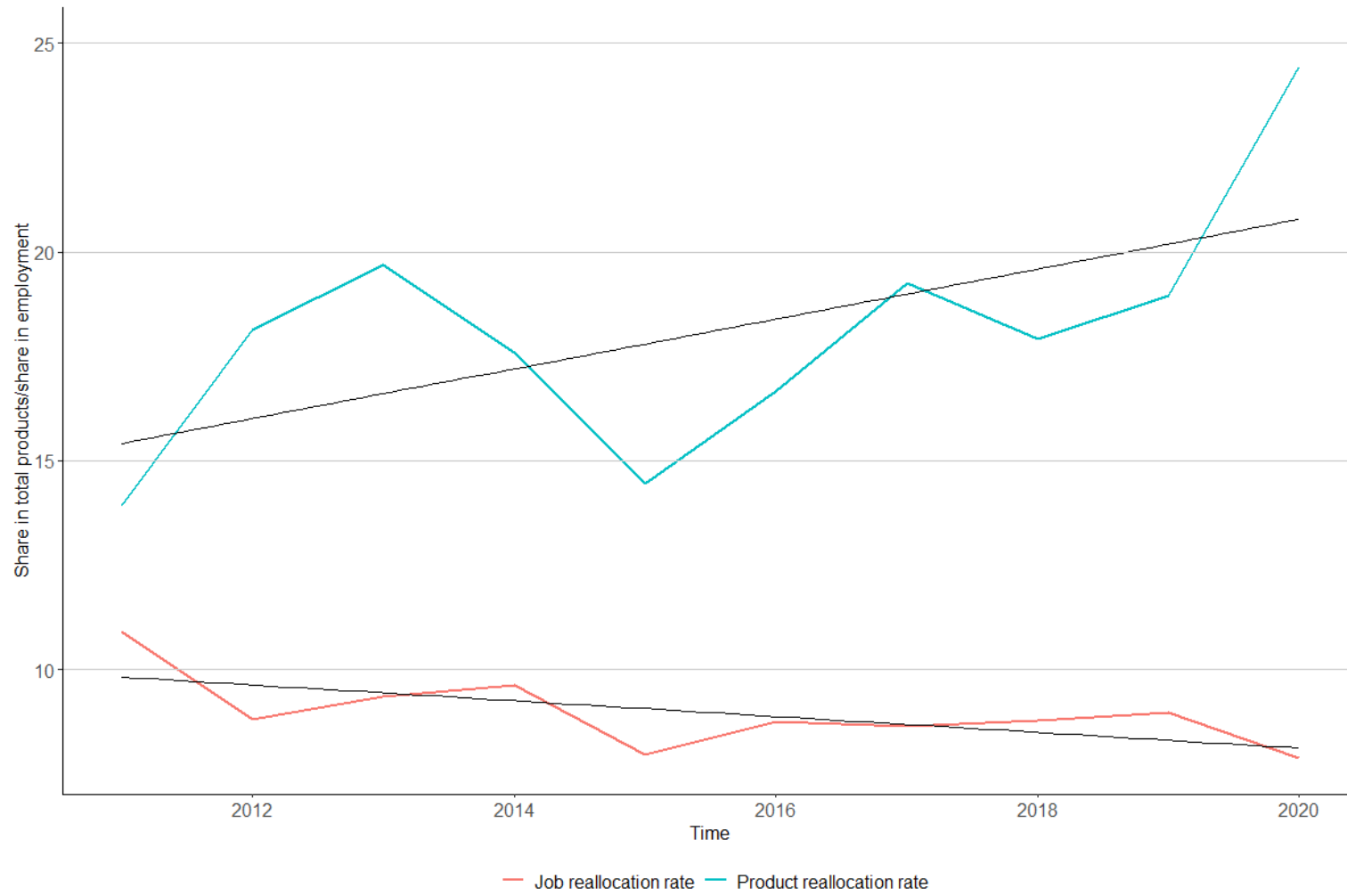
Product reallocation rate:

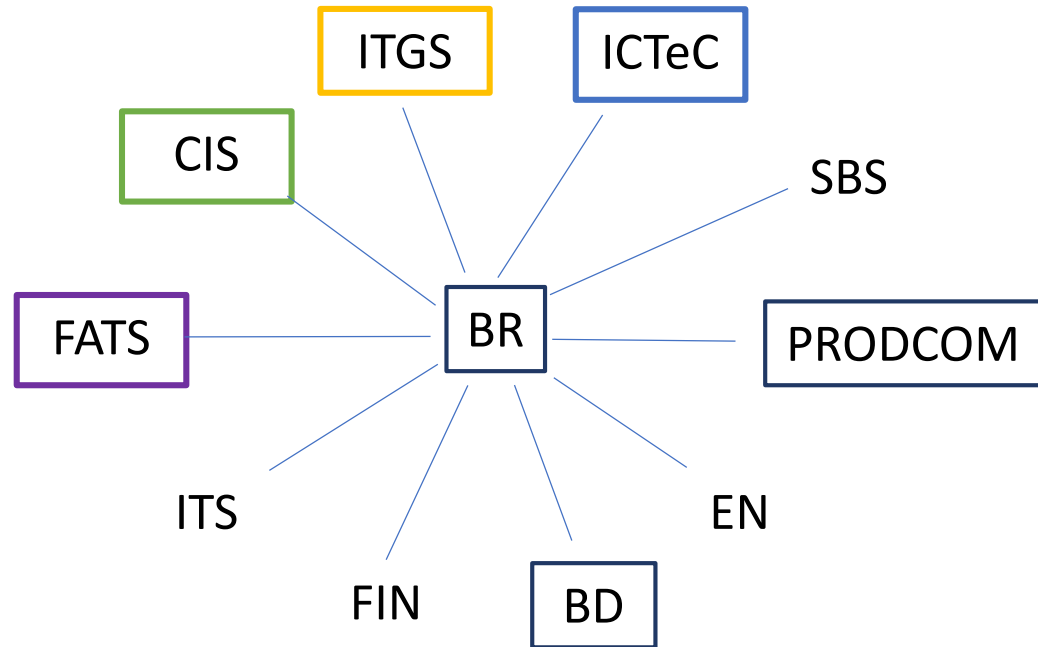$$r_t = \frac{\sum_i N_{it}}{\sum_i T_{it}} + \frac{\sum_i X_{it}}{\sum_i T_{it-1}}$$

Job reallocation rate:

$$JR_t = \sum_i \left(\frac{X_{it}}{\sum_i X_{it}} * \left| \frac{E_{it} - E_{it-1}}{X_{it}} \right| \right)$$

with

$$X_{it} = 0,5 * (E_{it} + E_{it-1})$$

FURTHER AVENUES OF RESEARCH

1) Causal identification of exogenous shocks (policies, weather and climate, trade shocks) for certain, relevant product markets

2) Analyze cross-country product market dynamics (i.e. in combination with trade data or foreign ownership data)

3) Impact of R&D and patenting behavior for product reallocation

4) Impact of ICT technology for innovation behavior

Application:

Long Term Trends in Corporate Leverage

from joint work with T. Ladika (UvA) and E. Perotti (UvA)

- Growing concern around increasing levels of indebtedness
  - Visibly rising public borrowing, household mortgage debt

- What about the rest of the economy?

- Aggregate accounts for European countries display a mixed pattern.

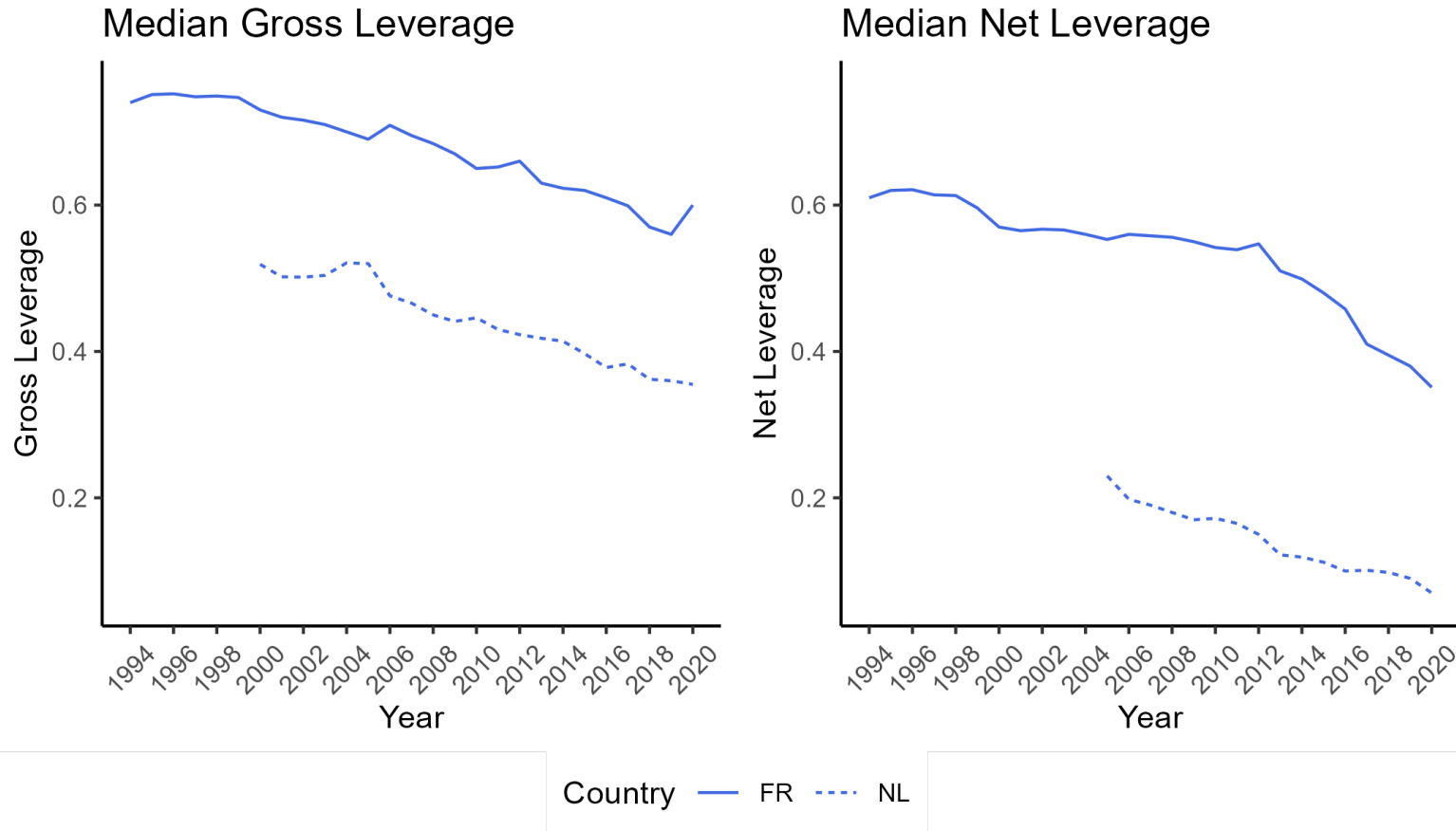- Dobridge et al. (2022) find opposite trends between listed and non-listed firms in the US.

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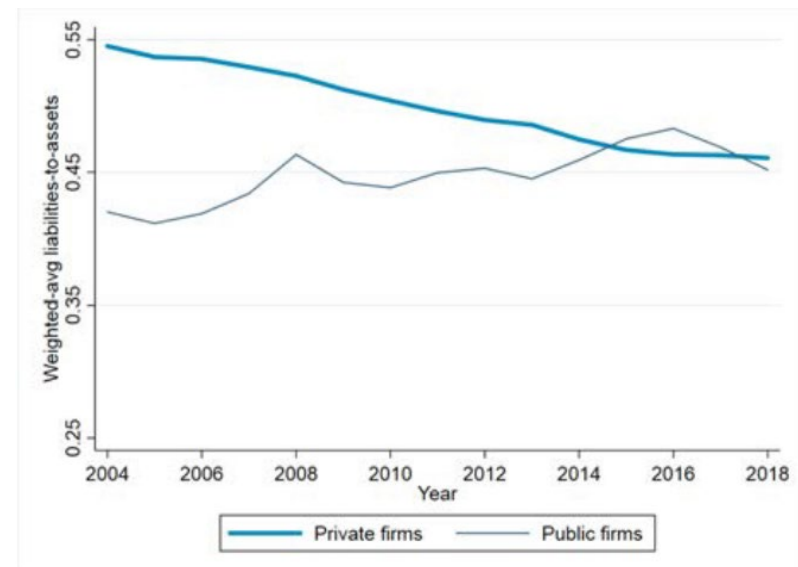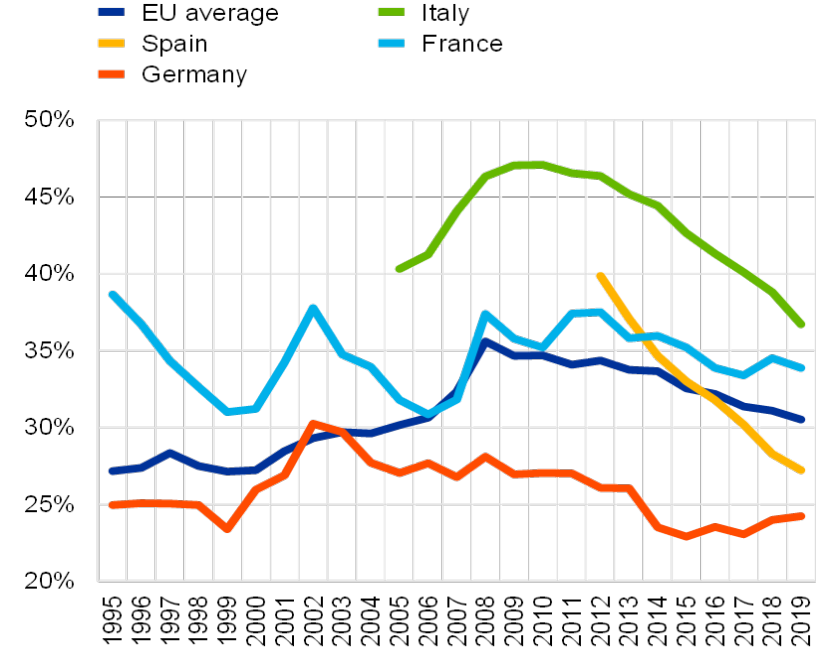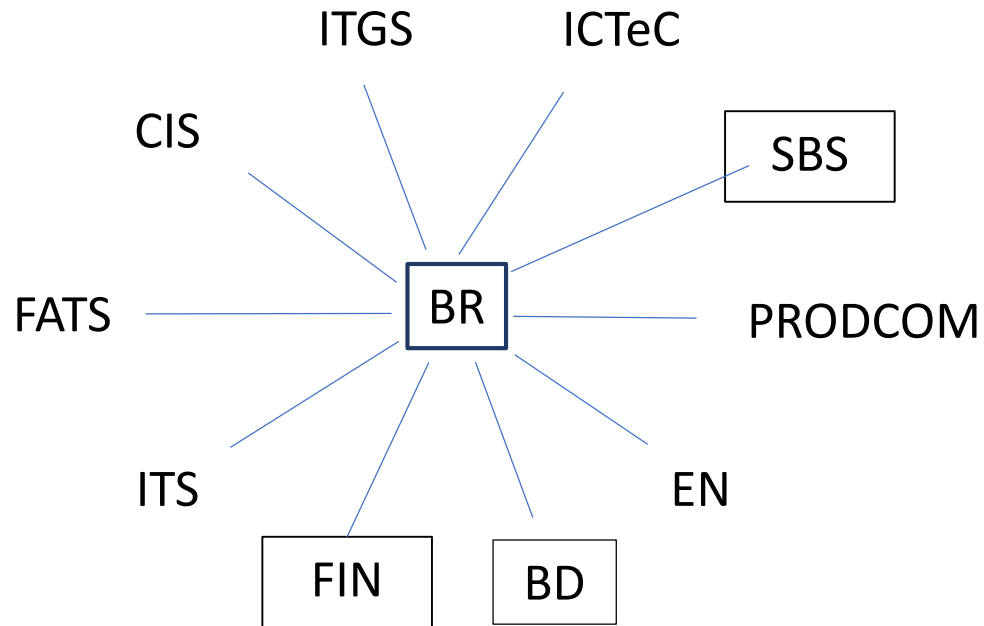
- Not only listed firms, but also private companies

- Not only balance sheet information, but also high quality data on production, investment and business demography.
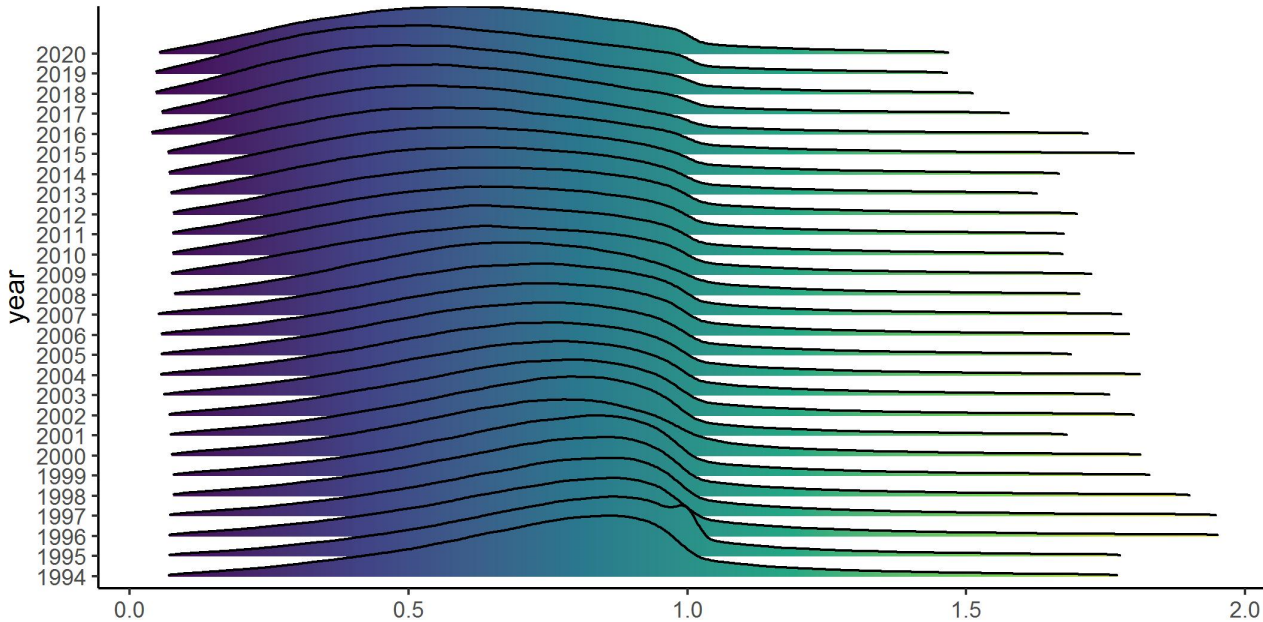
- ...

Declining Leverage

Median Gross Leverage / Median Net Leverage

- **Gross Leverage**: Current Liabilities and Long-term Debt, divided by Total Assets.

- **Net Leverage**: Current Liabilities and Long-term Debt minus Cash & Trade Credit, scaled by Total Assets.
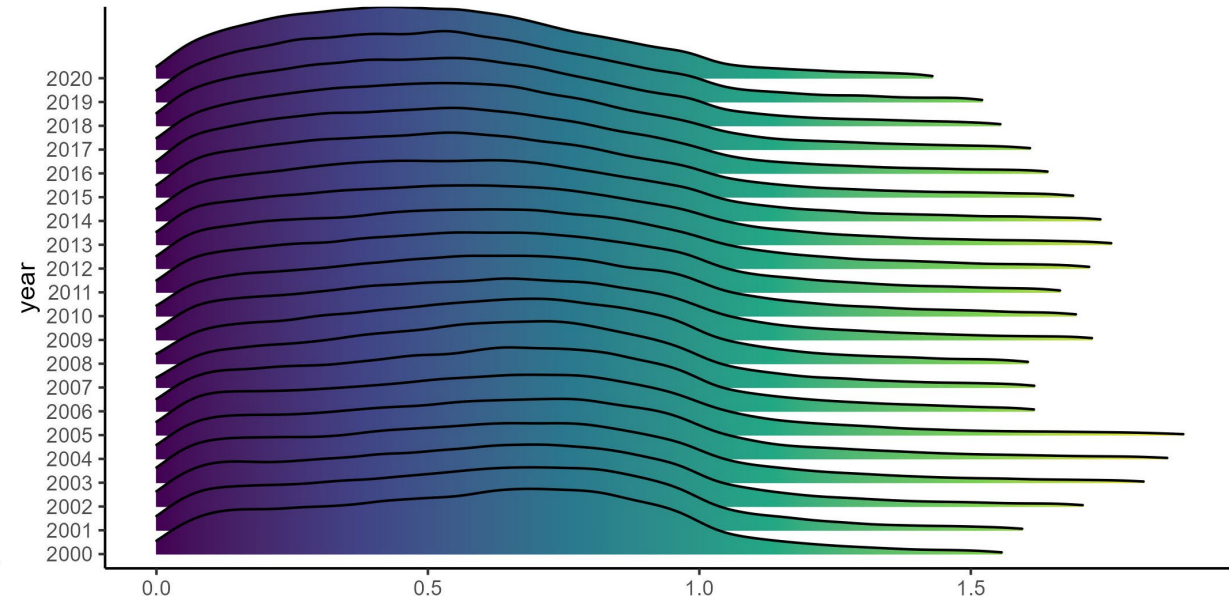
Declining Gross Leverage- Full Distribution

Leverage Distribution Over Time — France

Leverage Distribution Over Time — Netherlands

- **Gross Leverage**: Current Liabilities and Long-term Debt, divided by Total Assets.

- **Net Leverage**: Current Liabilities and Long-term Debt minus Cash & Net Trade Credit, scaled by Total Assets.

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- At odds with standard macro model:
  - Debt was convenient: decreasing interest rates and abundant liquidity

- What is driving the result?
  - Firm characteristics
  - Sample composition
  - Supply vs Demand (work in progress)
   - Some possible explanations

Is leverage declining for all firms?

- We check if some firm level characteristics are driving the result.

- We run a **FE panel regression** with leverage as dependent variable, controlling for size, age, profitability, share of tangible asset, productivity growth, interest payment over sales and **year FE**, further splitting the sample by multiple groups:
  - Size
  - Productivity growth
  - Share of tangible assets
  - Whether firms distribute dividends or not

- We plot the coefficients and std. err. of the year FE, to report any trend that is not accounted for by the other controls.

Results: robust declining trend
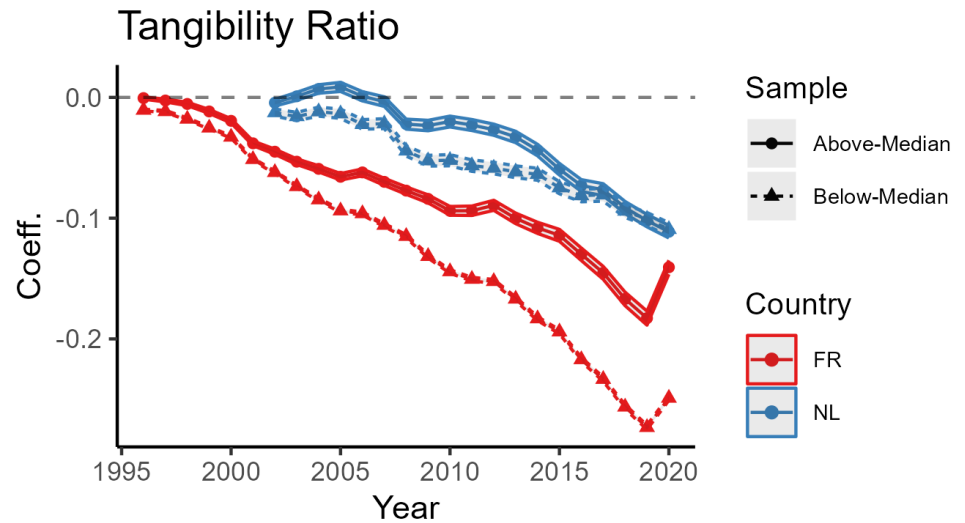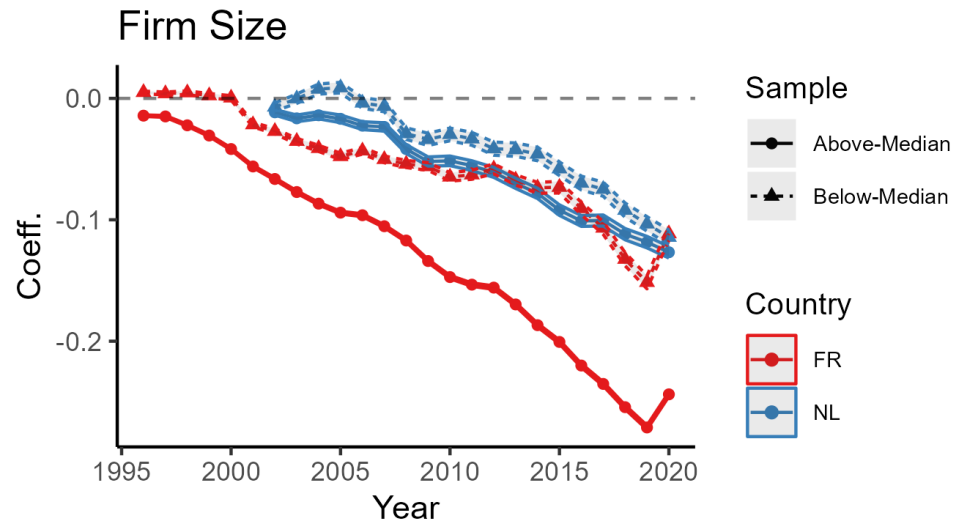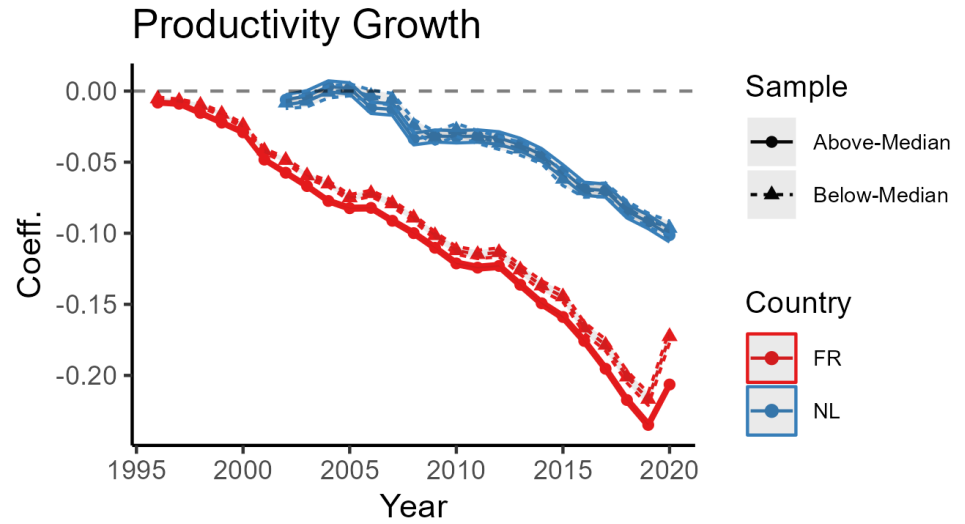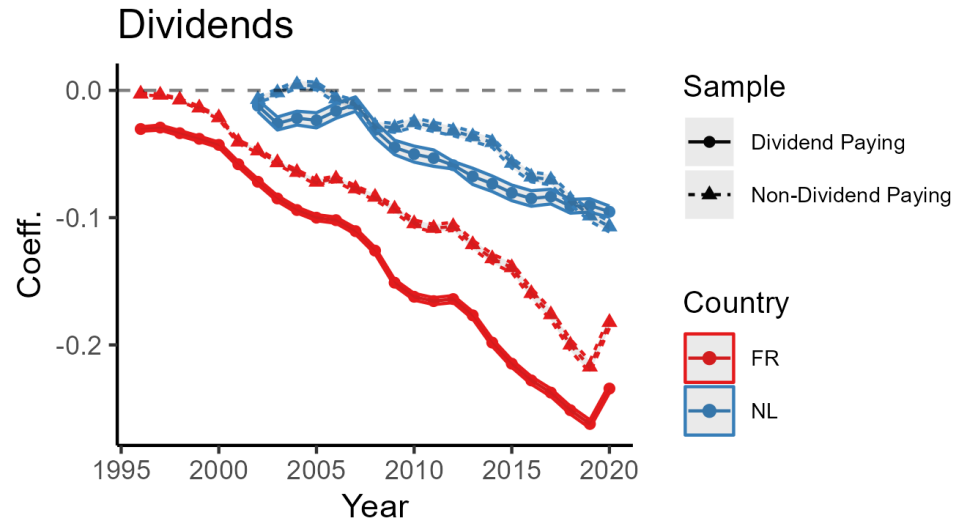
What is the contribution of business dynamism?
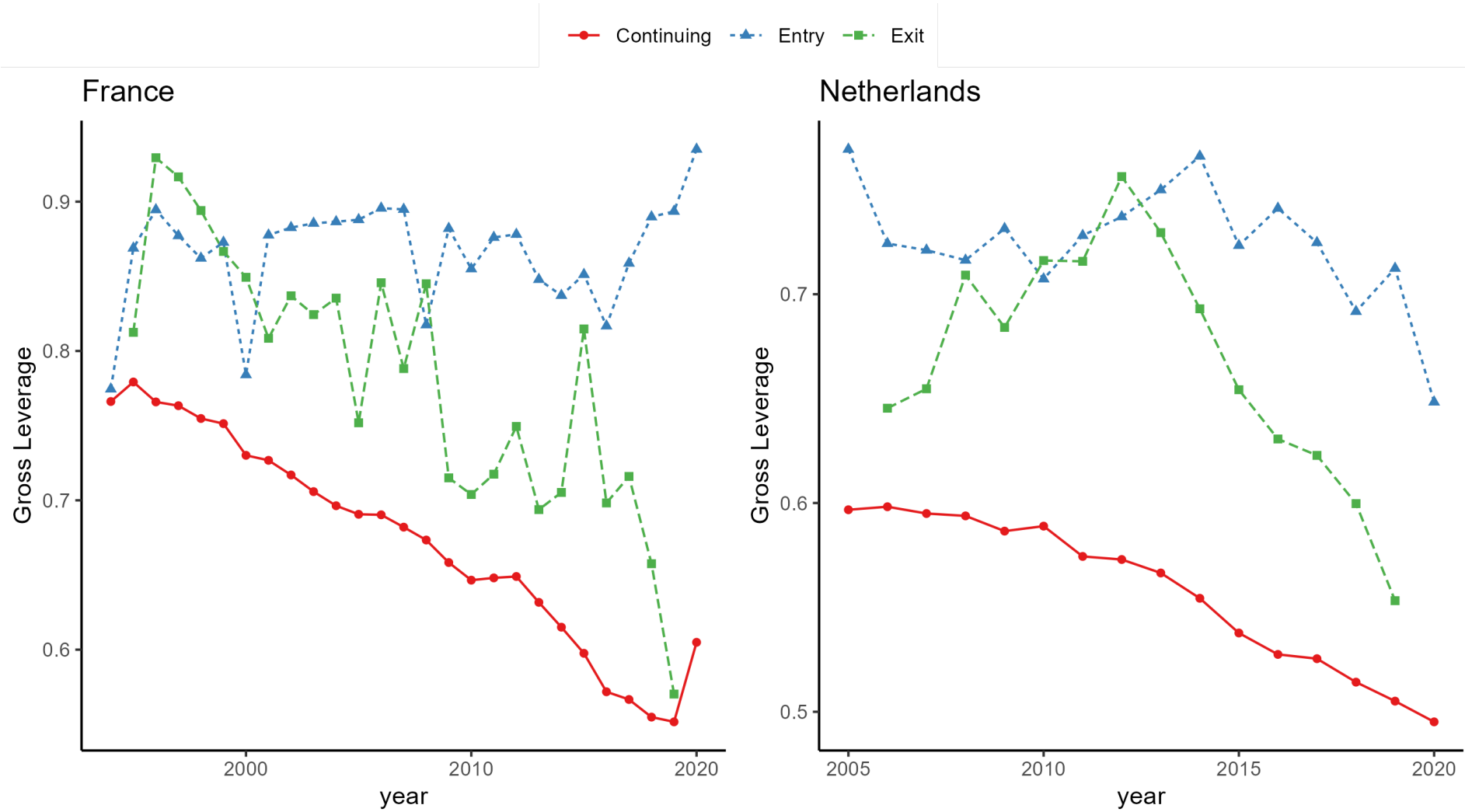
Decomposition of leverage growth

- Decompose the growth rate of the weighted average of net leverage
  - Contribution of net entry (extensive margin)
  - Contribution of incumbents (*intensive margin*)

$$\Delta\Phi \quad = \sum_{i \in S} s_{i1}\left(\varphi_{i2} - \varphi_{i1}\right) + \sum_{i \in S}\left(s_{i2} - s_{i1}\right)\varphi_{i1} + \sum_{i \in S}\left(s_{i2} - s_{i1}\right)\left(\varphi_{i2} - \varphi_{i1}\right)$$

$$+ \sum_{i \in E} s_{i2}\varphi_{i2} - \sum_{i \in X} s_{i1}\varphi_{i1},$$

1) *within*
2) between
3) covariance
4) net entry

s = employment share; φ = leverage

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Decomposition of leverage growth - France
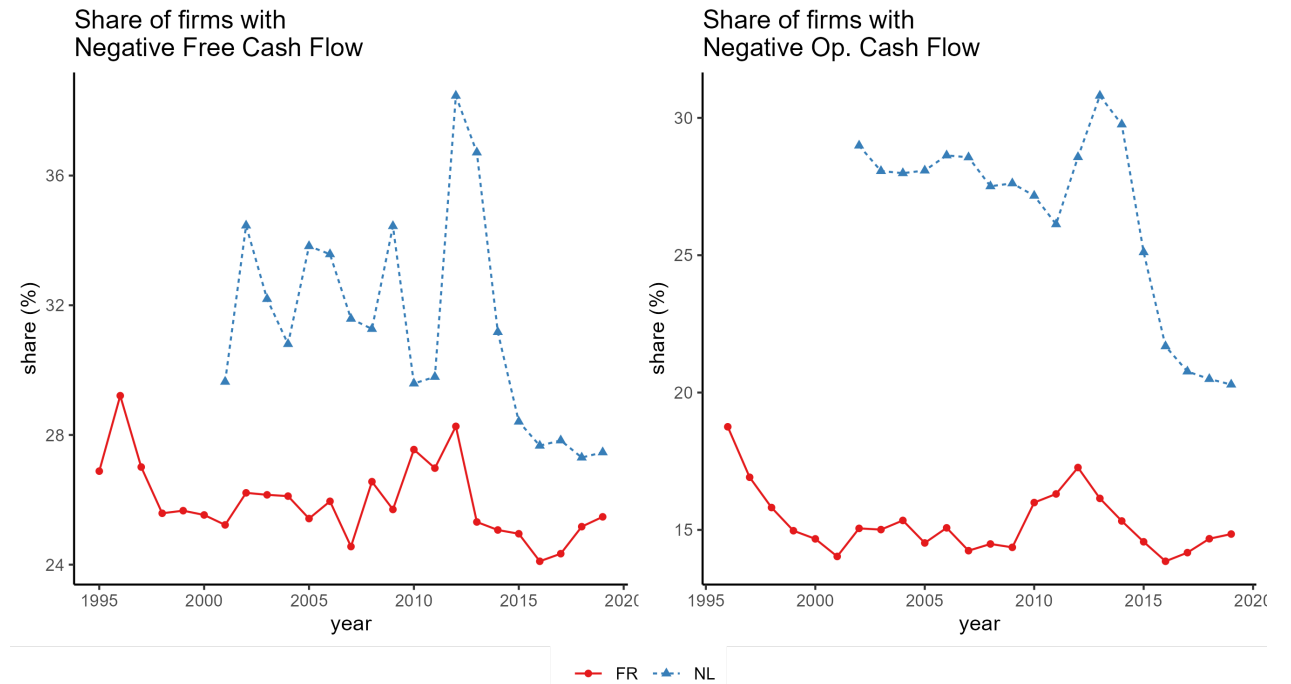

Decomposition of leverage growth
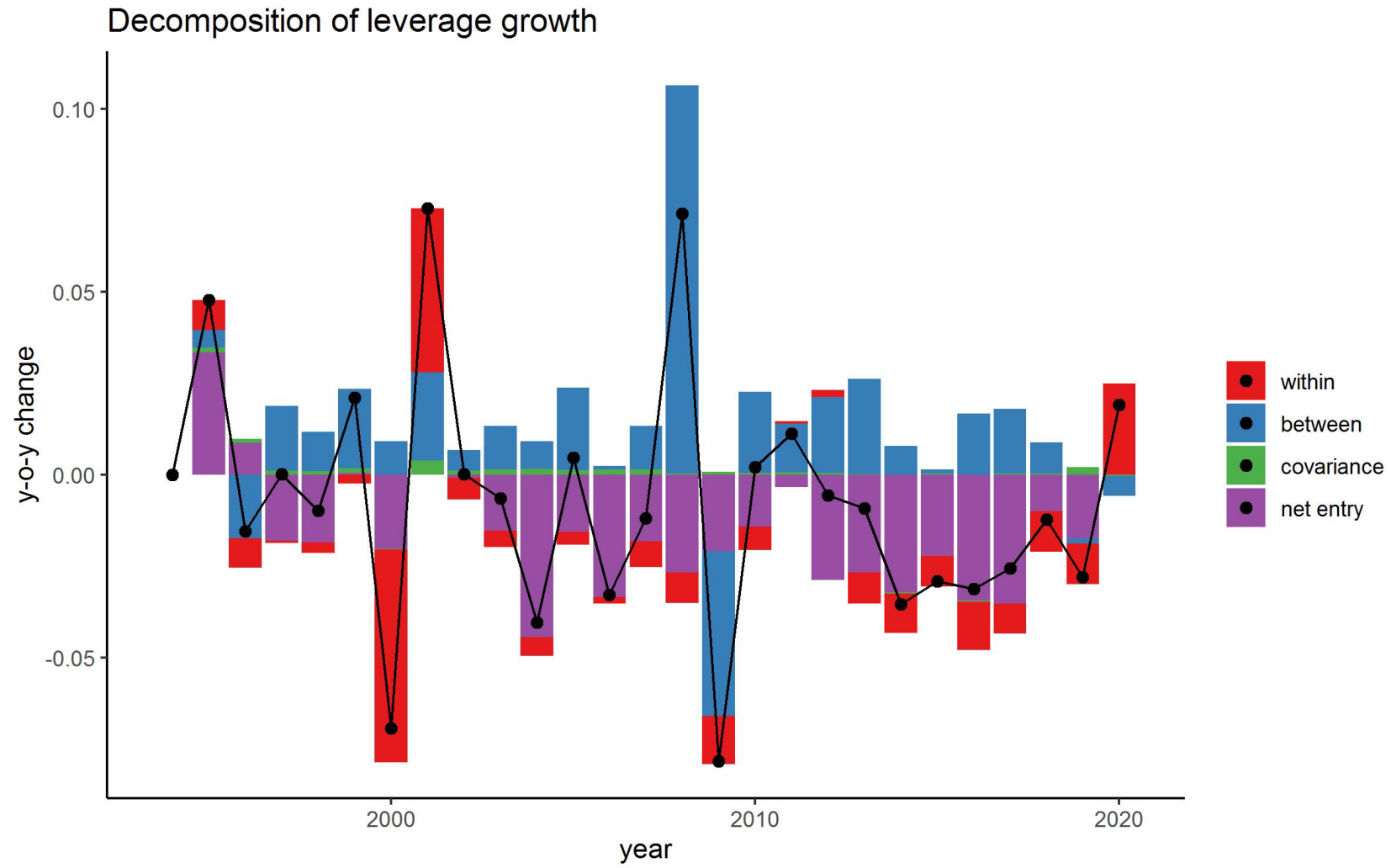
- Leverage declining could be due to:
    - Credit becoming tighter (lower <u>supply</u>)
        - Bank Regulation
    - Businesses progressively <u>demanding</u> less debt over time
        - Secular stagnation
        - Rise of Intangible Capital
        - Different methods of accessing credit

- Difficult to tell them apart

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- If it's credit getting tighter but firms need liquidity, we should:
  - See <u>increasing signs of liquidity constraints</u>
    - But share of liquidity constrained firms is stable/declining
  - If there was an exogenous shock to liquidity provision, the declining trend in leverage should revert if not slow-down.
    - => We use the <u>2016 corporate bond purchase program by the ECB</u>

Share of firms with
Negative Free Cash Flow

Share of firms with
Negative Op. Cash Flow

FR   NL

Supply

- **Shock**: Exogenous change in credit supply – ECB purchases corp. bonds as part of QE (CSPP).
- Regress net leverage in levels and growth rate on a QE dummy =1 from 2016 onwards, to measure changes in leverage trends at the firm level:

$$Y_{it} = \alpha_i + \beta_t + \beta_{QE} * QE_t + \beta_z' * Z_{it} + \beta_{Ind} + \varepsilon_{it}$$

- We then interact with size class dummies (based on total asset) to control for different degrees of reliance on bond issuance

$$Y_{it} = \alpha_i + \beta_t + \beta_{QE} \cdot QE_t + \sum_s \beta_{QE,s} \cdot QE \cdot SC_{it} + \beta_z' \cdot Z_{it} + \beta_{Ind} + \varepsilon_{it}$$

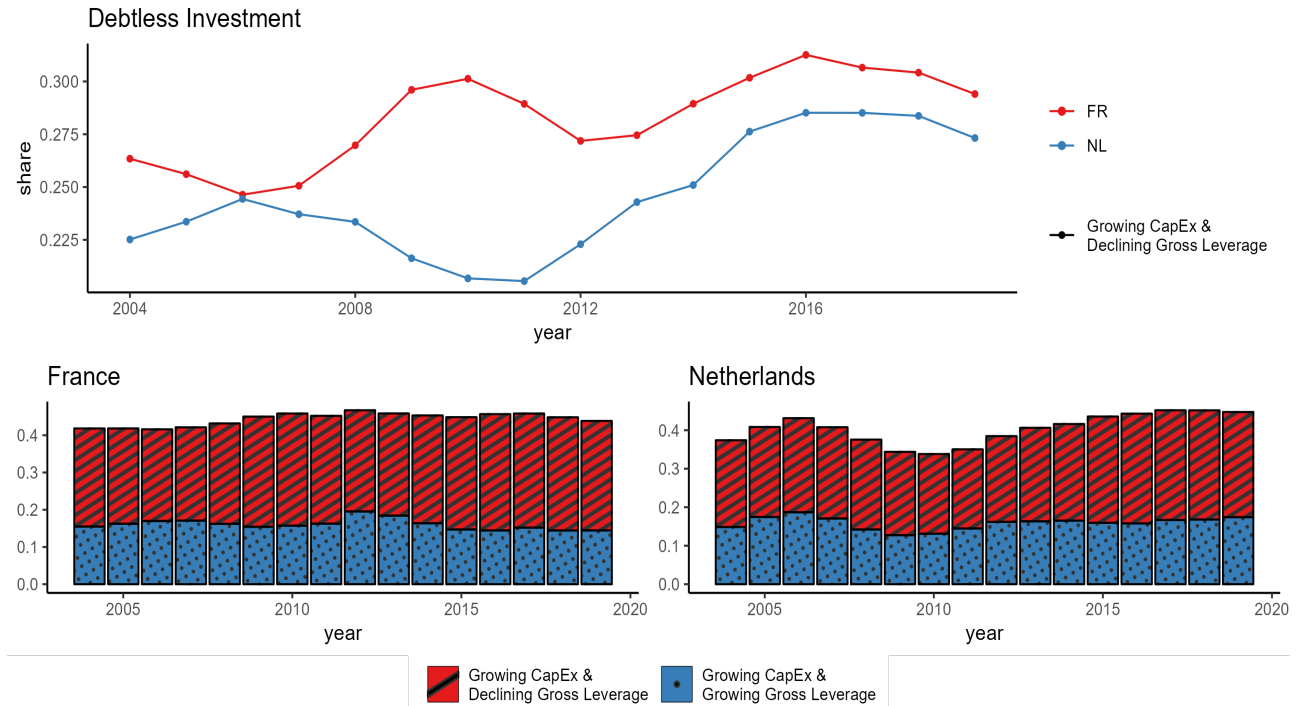- If firms were constrained, we would expect them to <u>increase leverage after 2016</u>

Variables	FRANCE net leverage				NETHERLANDS net leverage			
	(1) level	(2) growth rate	(3) level	(4) growth rate	(5) level	(6) growth rate	(7) level	(8) growth rate
post QE	-0.28*** (0.0031)	-0.11*** (0.0049)			-0.014*** (0.005)	-0.029* (0.017)		
Post_QE * sc1			-0.25*** (0.0032)	-0.025*** (0.0029)			-0.009 (0.008)	-0.010 (0.02)
Post_QE * sc2			-0.29*** (0.0031)	-0.032*** (0.0024)			-0.022*** (0.005)	-0.036* (0.019)
Post_QE * sc3			-0.30*** (0.0030)	-0.035*** (0.0020)			-0.023*** (0.005)	-0.03* (0.018)
Post_QE * sc4			-0.28*** (0.0032)	-0.026*** (0.0019)			-0.01* (0.005)	-0.028 (0.018)
Constant	0.61*** (0.013)	0.099** (0.024)	0.61*** (0.013)	0.057** (0.023)	0.27*** (0.009)	-0.21 (0.038)	0.27*** (0.009)	-0.21 (0.038)
Observations	14,120,781	13,801,040	14,120,781	13,801,040	1,095,927	1,018,550	1,095,927	1,018,550
R-squared	0.15	0.001	0.14	0.001	0.042	0.001	0.043	0.001
Num. IDs	2181221	2171316	2181221	2171316	245592	238971	245592	238971
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust std. errors in parenthesis, *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Omitted coefficients of additional control variables: CapEx, employment, age, profit over turnover, dividend share of sales, interest over debt, share of intangible assets. Clustered std. errors at the firm level

- # Firms may be <u>demanding less:</u>
  - ## Fewer investment opportunities
  - ## Intangible Capital poorly suitable for debt financing
    - ### Poor collateral
    - ### Requires less cash in advance
  - ## Different channels
    - ### Retained earnings
    - ### Non-bank sector becoming more relevant
    - ### Equity finance

- Firms may be <u>demanding less debt</u> => how is investment financed over time?
  - Naïve test: OLS of leverage on (investment * year dummy) and plot coefficients on interaction.
    - But likely to be some omitted variable that affects investment and export at the same time (e.g. managerial quality)

  - To control for endogeneity: *foreign demand shocks* as instrument.
    - Can construct them from ITGS!
    - But available only from 2009; in FR and SI will have longer data (yet to be done).

  - **INTUITION**: if a firm is experiencing booming demand for its products, it needs to scale up to adjust production capacity.
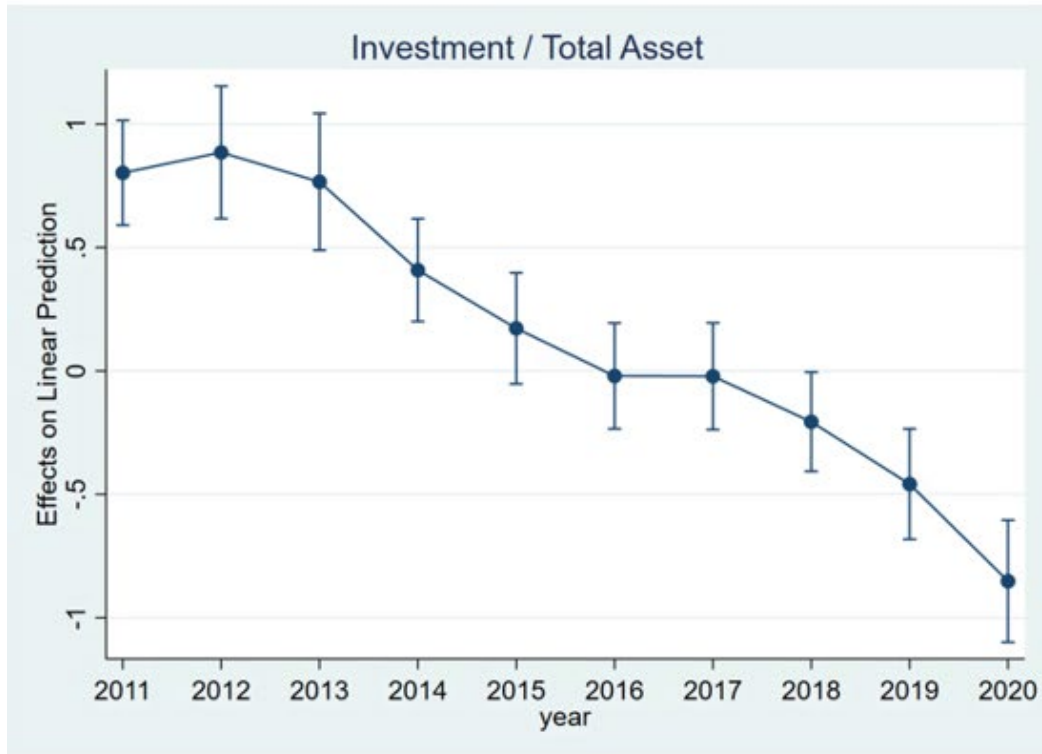
Identification of demand shocks

- We measure demand shocks at the firm level following Hummels et al. (2014), Dhyne et al. (2021), Dhyne et al. (2022):
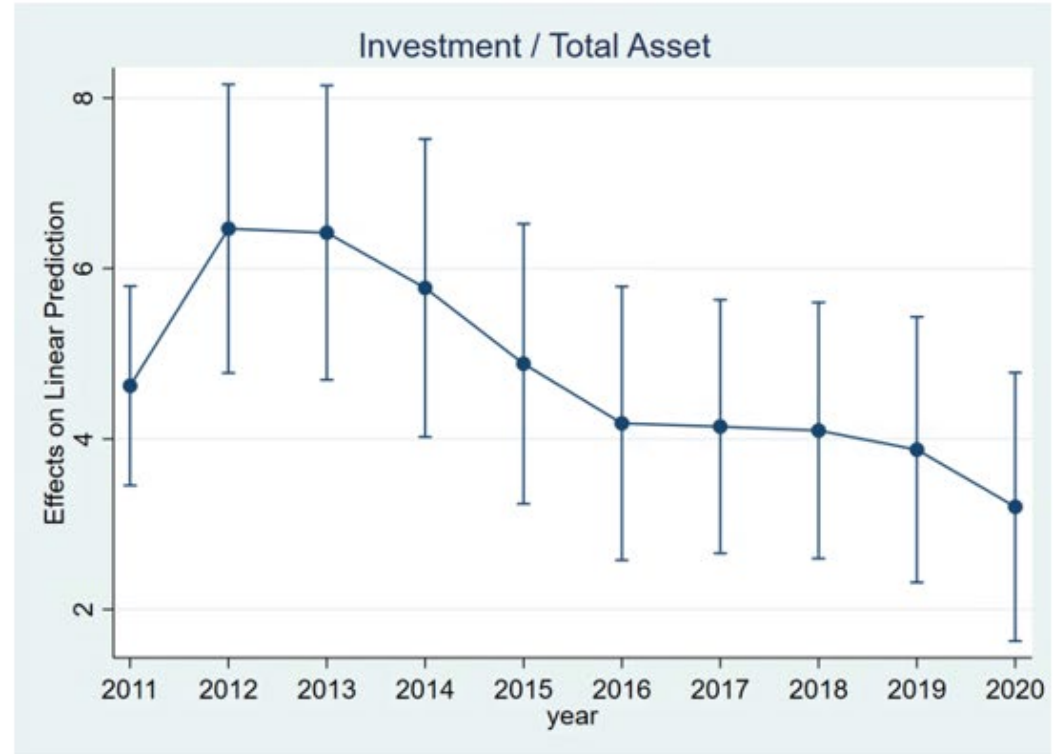
$$Z_{j,t} = \sum_{k,p} w_{j,k,p,t-1} \cdot \Delta EXP_{k,p,t}$$

- $\Delta EXP_{k,p,t}$ is the % change in total export of product p to country k from all countries <u>but</u> the Netherlands.

- $w_{j,k,p,t-1}$ is the share of export of product p to country k in firm j total export to country k.
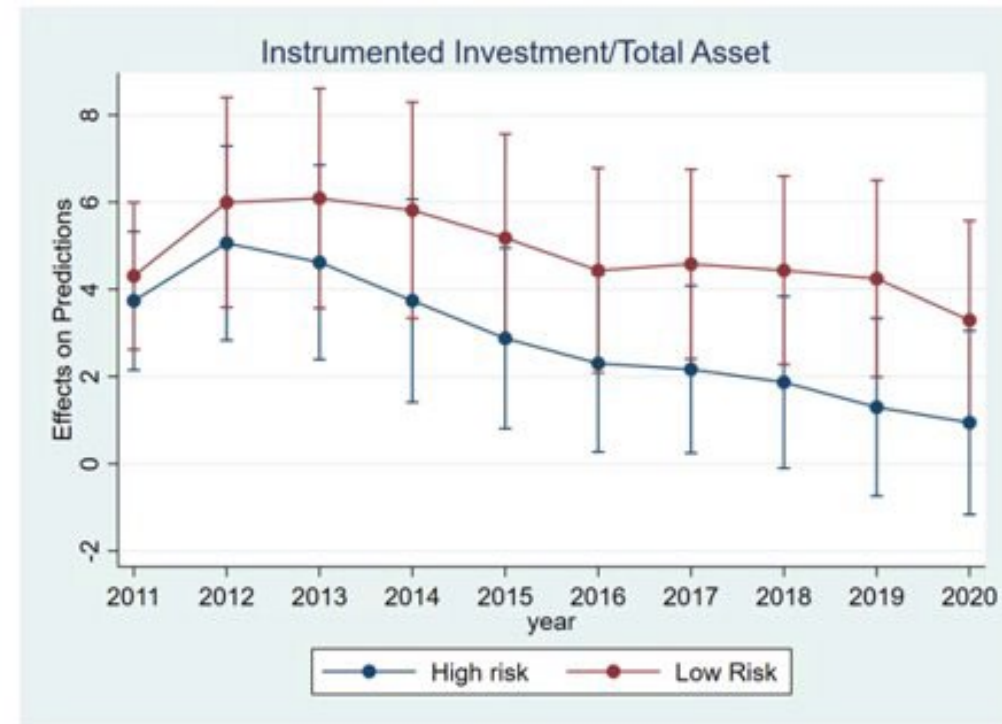
Results

OLS

2SLS

First stage F: 56.32

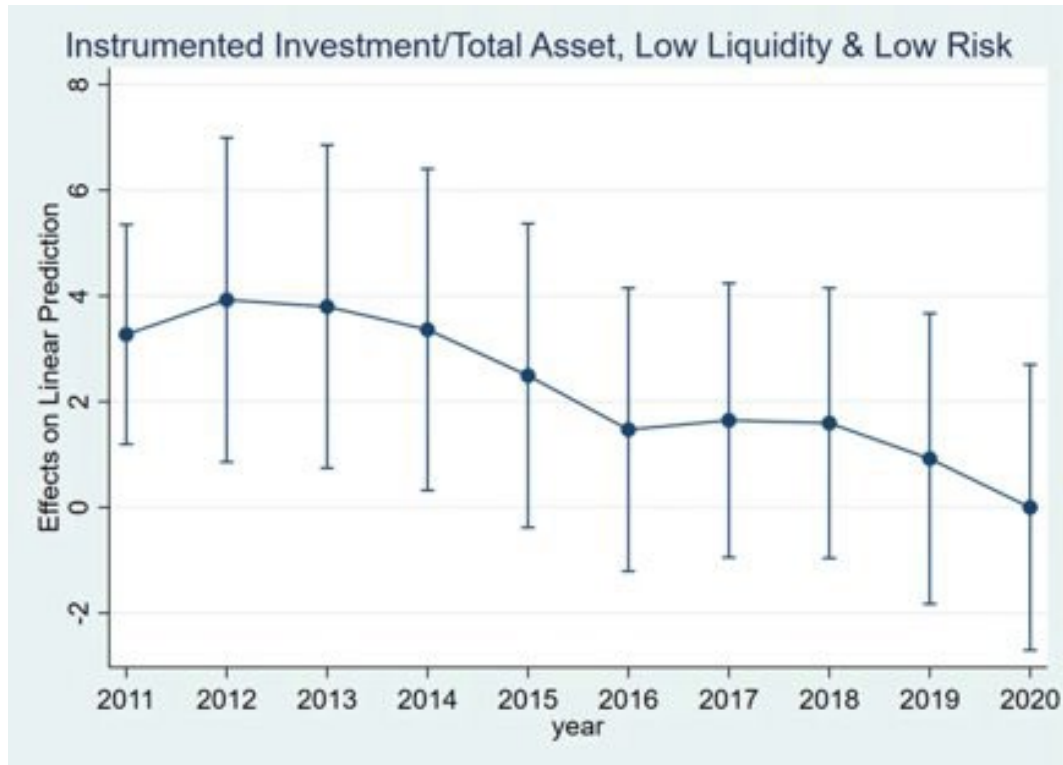# Results (control for available funds or credit risk)

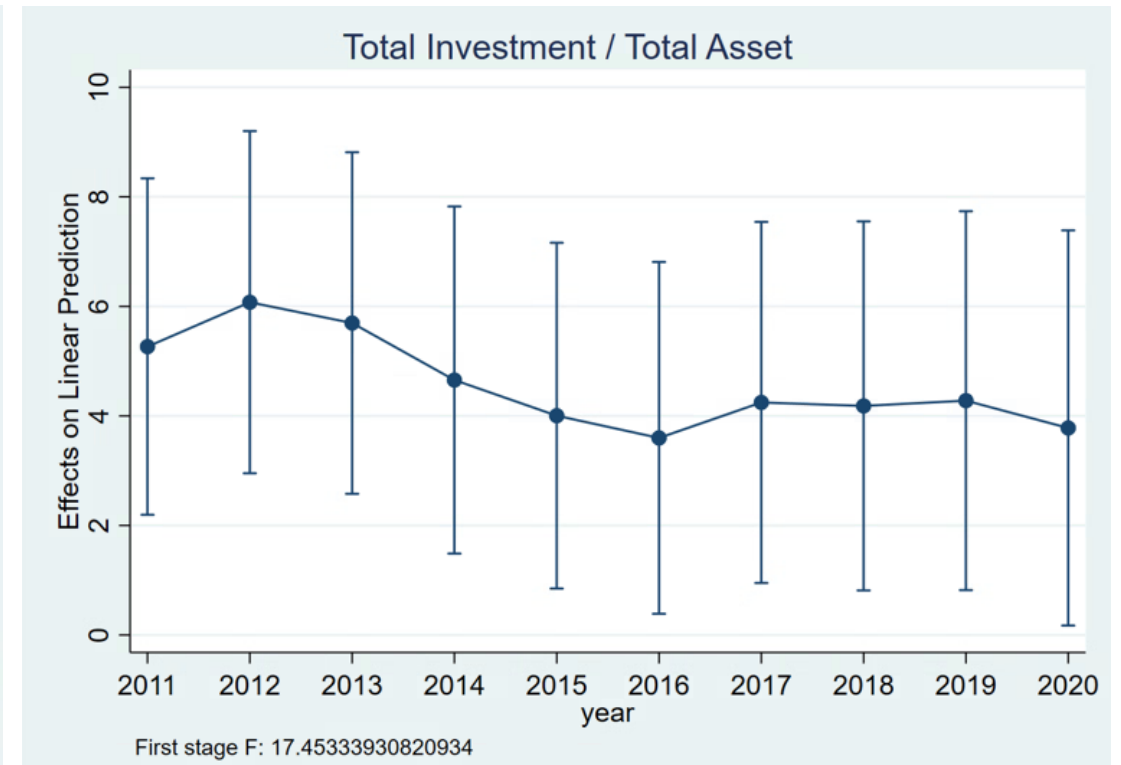First stage F: 34.5

First stage F: 36.3

2SLS

2SLS

Instrumented Investment/Total Asset, Low Liquidity & Low Risk

First stage F: 17.5

Total Investment / Total Asset

First stage F: 17.45333930820934

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- We show leverage is declining across firms in NL and FR
  - What about the other countries? We have some evidence of additional decline from CompNet
- The change is not driven by specific firm characteristics and operates through both the intensive and extensive margins.
- We show initial evidence in favour of firms demanding less credit as motivation.
  - What implications for liquidity provision? How much of this will readjust in the post covid world (higher inflation and r)? If firms moving away from debt, what other channels?

APPENDIX

- We do not exactly observe which firms issue bonds, although we know bond issuance is concentrated among larger firms.
  - Cannot observe **direct effect.**
    - Evidence that some firms increased debt, but mainly distributed it through dividends (Todorov, 2020).
- Still, ECB purchases of bonds can create GE **indirect effects**
  - Eg smaller firms have more access to credit as banks compensate for lower demand from larger companies (Arce et al. 2017 on Spain).
- So there are reasons to focus on full sample to capture **total effect**
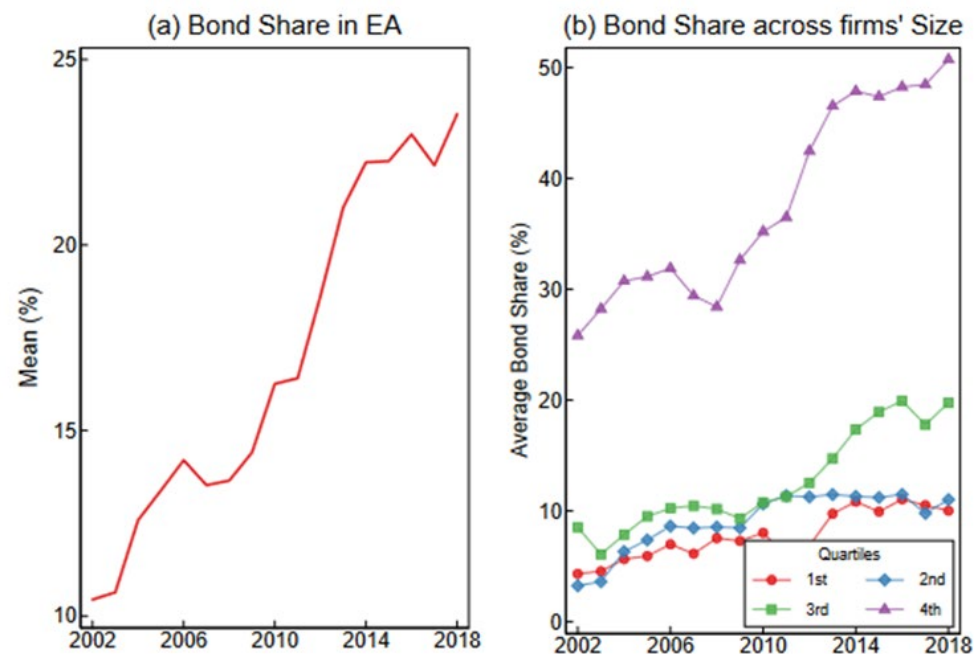
Source: Papoutsi et al. (2022)

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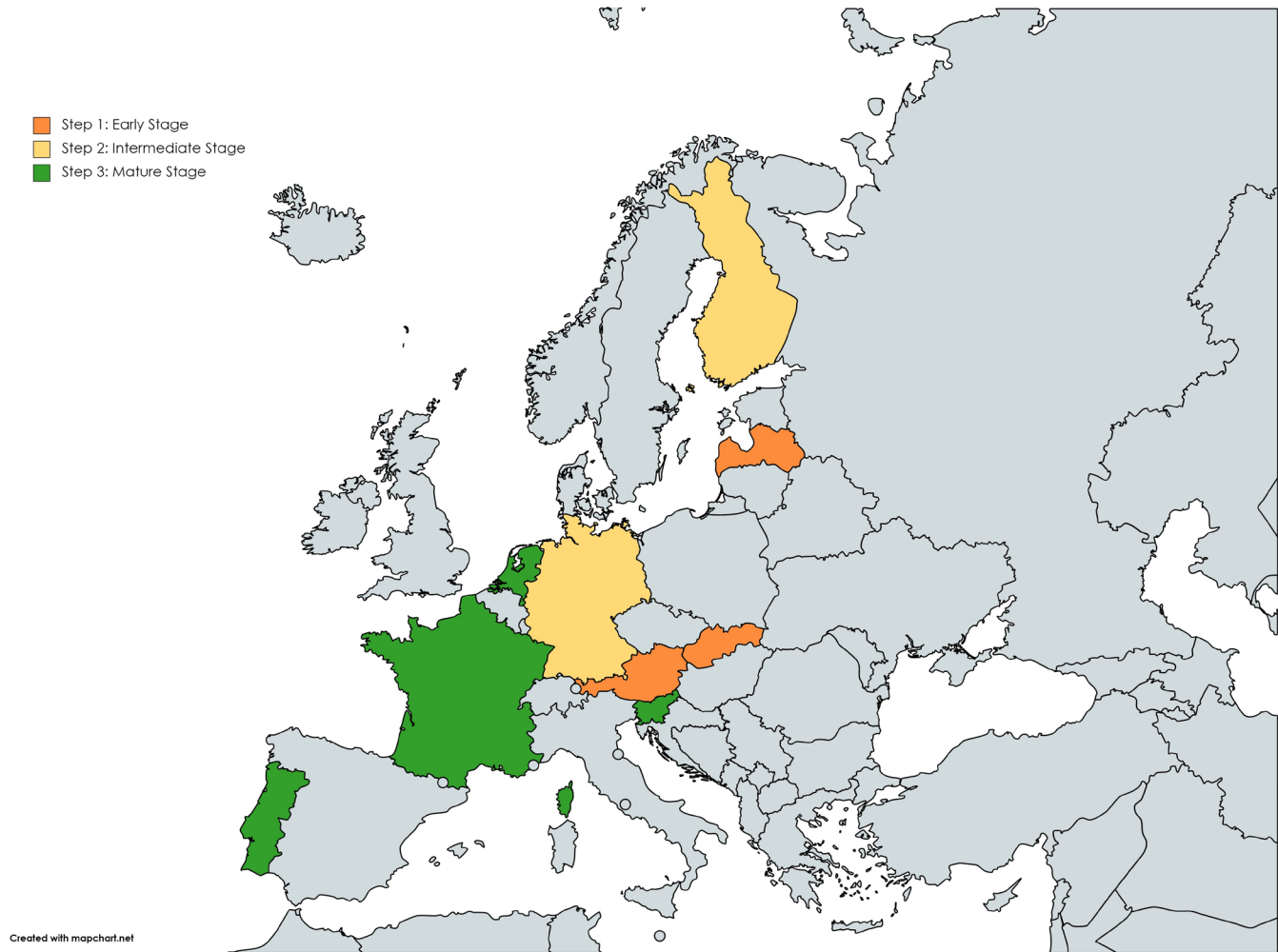
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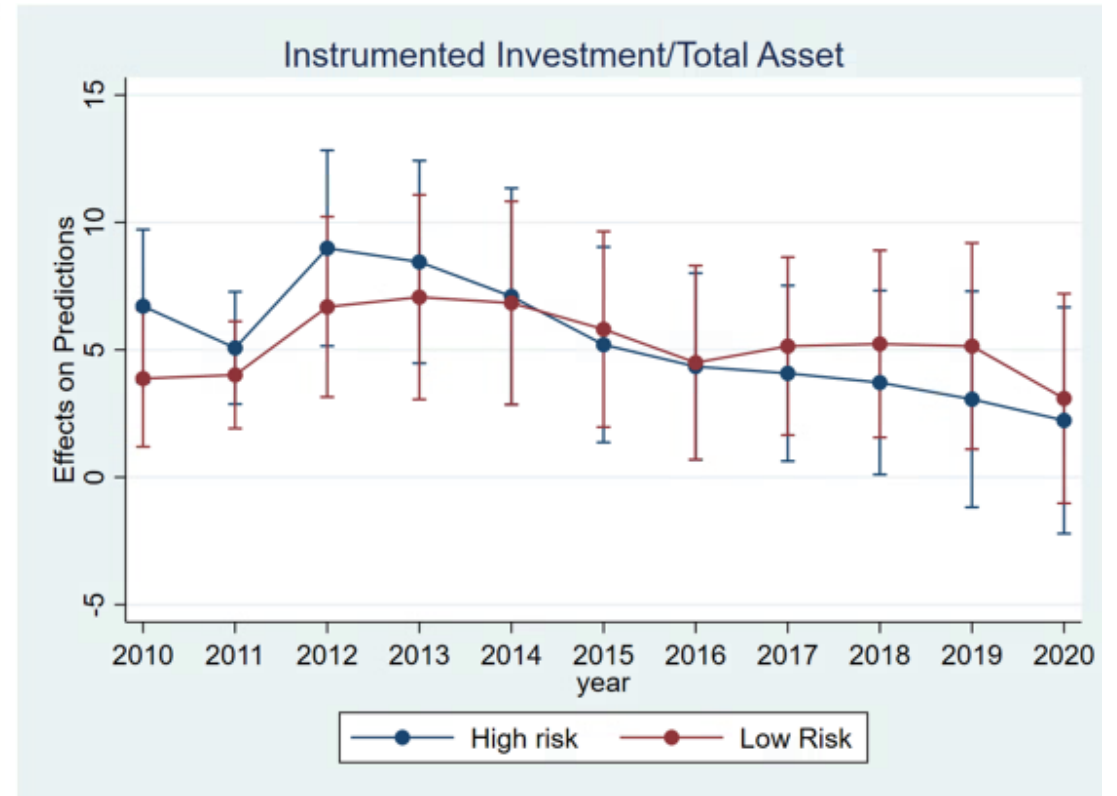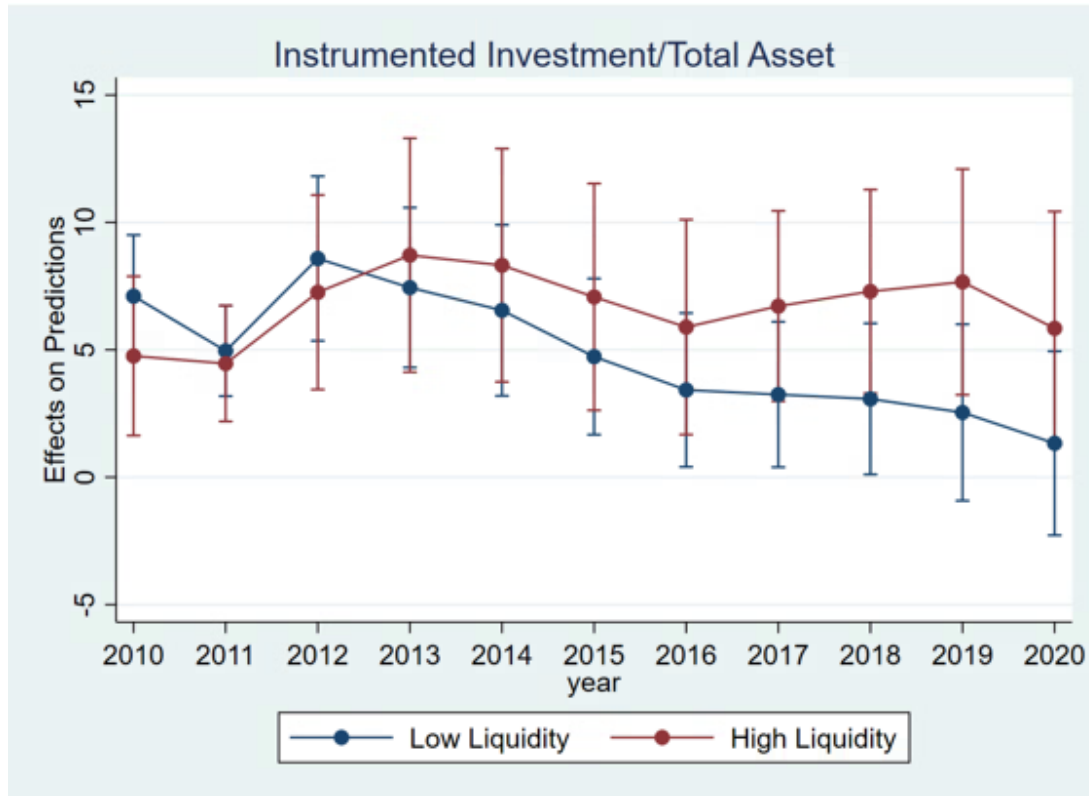
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tangible

intangible