Market Power and Innovation in the Intangible Economy

Maarten De Ridder
London School of Economics

Technology and Declining Economic Dynamism
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Recent macroeconomic trends

- Productivity growth has been sluggish
  - Research and development expenditures increased: ideas harder to find?
    ▸ United States ▸ France

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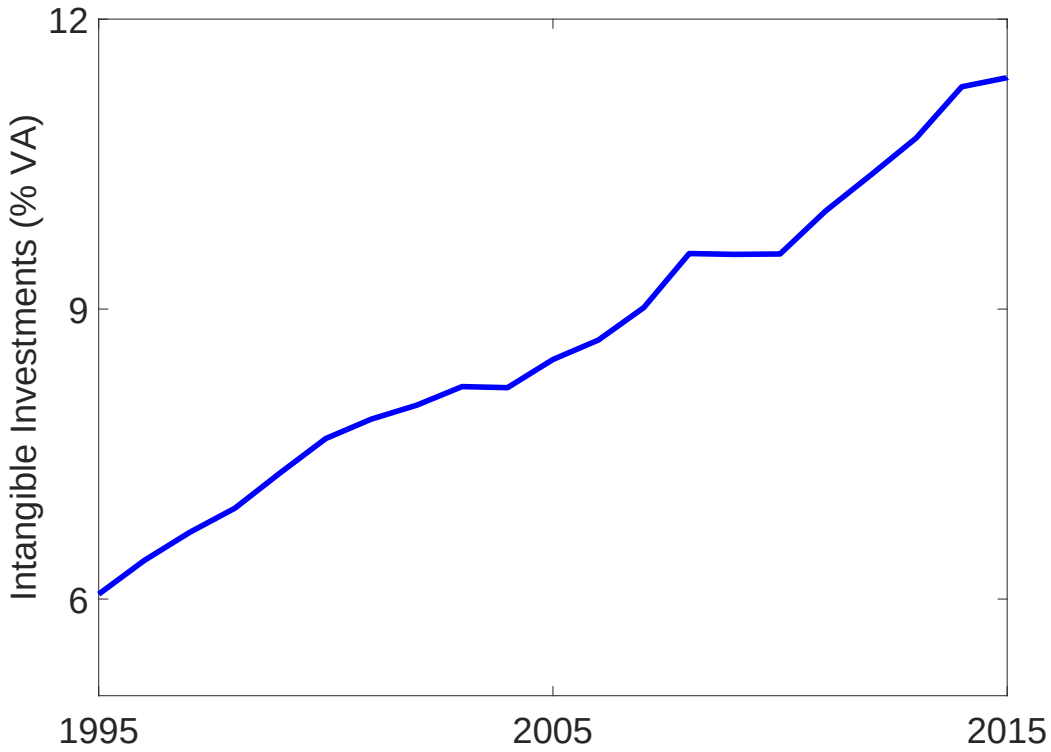
- Market power is increasing
  - Markups are increasing
  - Product market concentration is rising
    ▸ United States ▸ France

My explanation: intangible inputs



U.S. Investments in Software and Economic Competencies

Source: Intan-Invest, Corrado et al. (2016)

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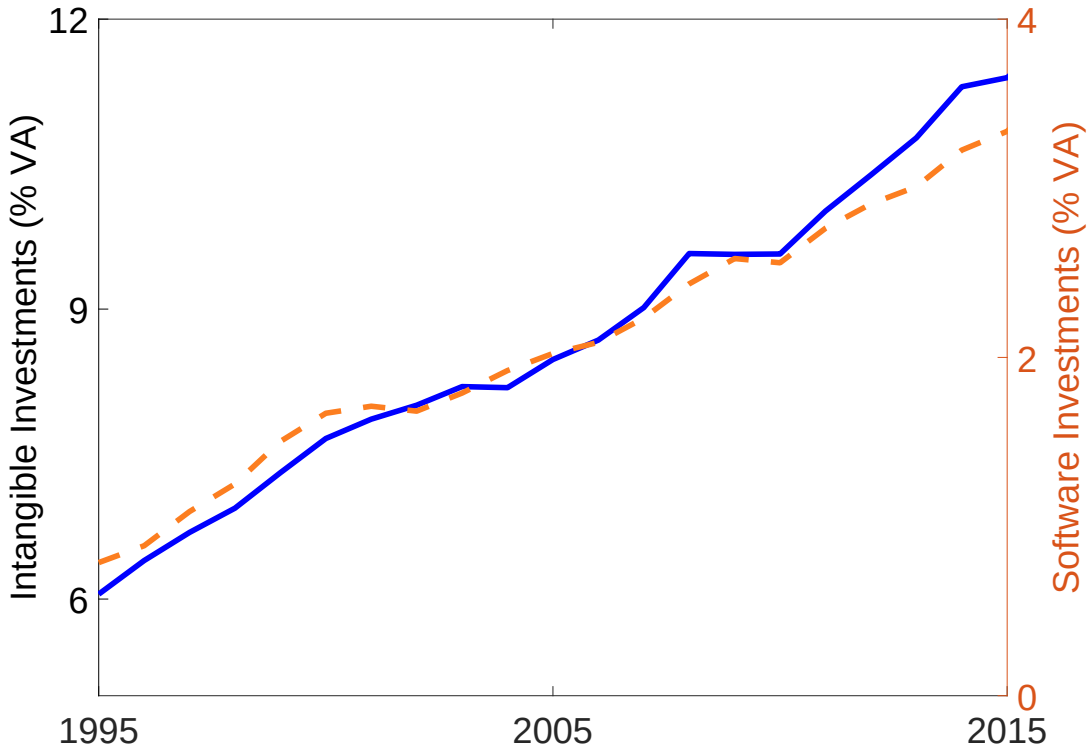

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Intangible Inputs

- Endogenously raise fixed costs and reduce marginal costs ▸ evidence
- Firms differ in the efficiency with which they deploy them ▸ evidence

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- High intangible-efficiency incumbents can undercut innovators on price

▸ Related Literature

Model

Production:

- Firms i produce one or multiple goods j
- Firms choose their production efficiency s_{ij} per good in each period:

$$y_{ij} = \frac{1}{1 - s_{ij}} \cdot l_{ij}$$

$$mc_{ij} = (1 - s_{ij}) \cdot w$$

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  - Intangible efficiency ϕ_i is a firm characteristic assigned at birth

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Demand:

- Patent grants firm i the right to produce j, with quality q_{ij}

$$\ln Y = \int_0^1 \ln \left(\sum_{i \in I_j} q_{ij} \cdot y_{ij} \right) dj$$

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- The producing firm sets price to marginal cost of second-best firm

$$p_{ij} = \frac{q_{ij}}{q_{-ij}} \cdot mc_{-ij}$$

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- Innovation is only successful if:

$$1 + \lambda_{ij} > \frac{p^{choke}(\phi_i)}{p^{choke}(\phi_{-i})}$$

Experiment

Initially:

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Shock:

- Initially: boom in growth, 6 years
  - High-intangible firms are more profitable, unlikely to be displaced
- Eventually: $\underbrace{\text{lower productivity growth}}_{1/2}, \underbrace{\text{dynamism}}_{\text{most}}, \underbrace{\text{higher markups}}_{2/3}$

Balanced Growth Path

	Δ Model	Δ Data
Growth and Innovation		
Productivity growth rate	↓	↓
Aggregate R&D over value added	↑	↑
Dynamism		
Entry rate (target)	↓	↓
Reallocation rate	↓	↓
Market Power		
Average Markup	↑	↑
Cost Structure		
Intangibles over value added (target)	↑	↑
Average fixed-cost Share	↑	↑

↑ denotes increase, ↓ denotes decrease
U.S. data: 2016 vs 1980.

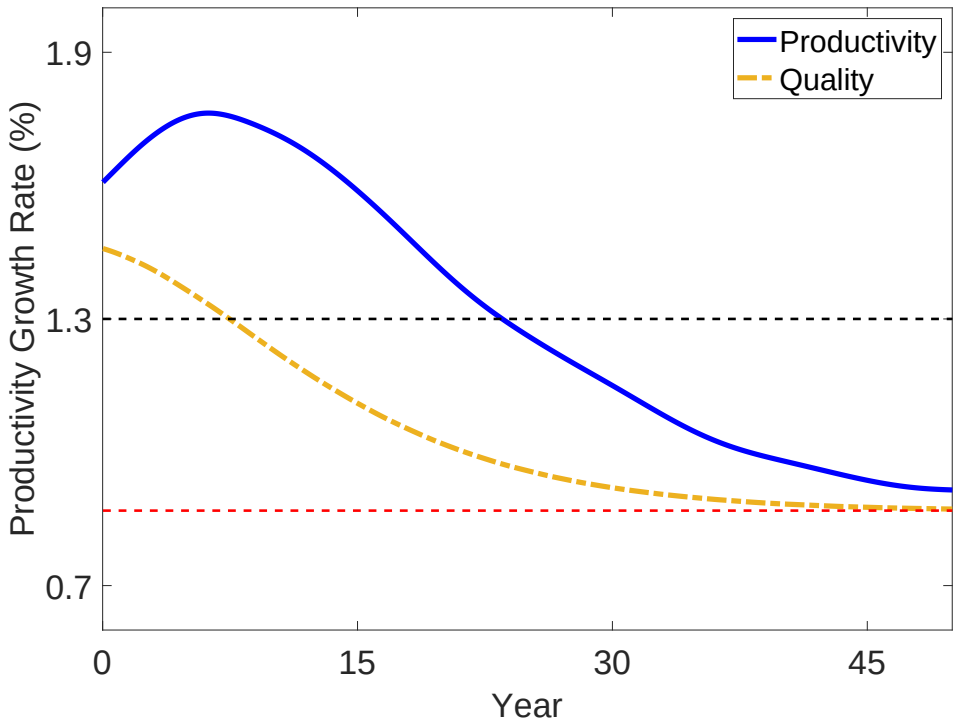
Balanced Growth Path

	Δ Model	Δ Data
Growth and Innovation		
Productivity growth rate	-0.4 pp	-0.9 pp
Aggregate R&D over value added	41.9%	64.5%
Dynamism		
Entry rate (target)	-5.8 pp	-5.8 pp
Reallocation rate	-42.0%	-23%
Market Power		
Average Markup	21.8 pt	30 pt
Cost Structure		
Intangibles over value added (target)	1.5 pp	2.1 pp
Average fixed-cost Share	3.8 pp	10.6 pp

↑ denotes increase, ↓ denotes decrease
U.S. data: 2016 vs 1980.

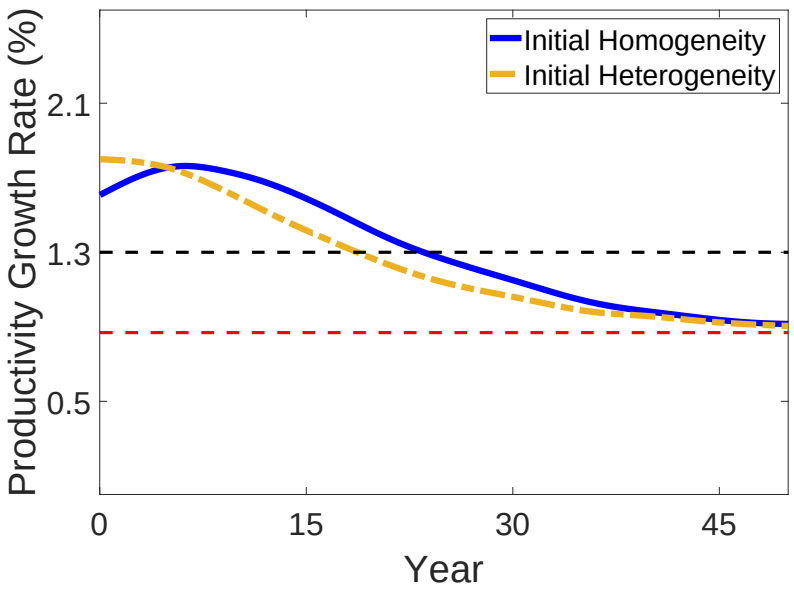
Transition: productivity growth

- Transitory boom due to intangibles
- long-term decline due to concentration and entry

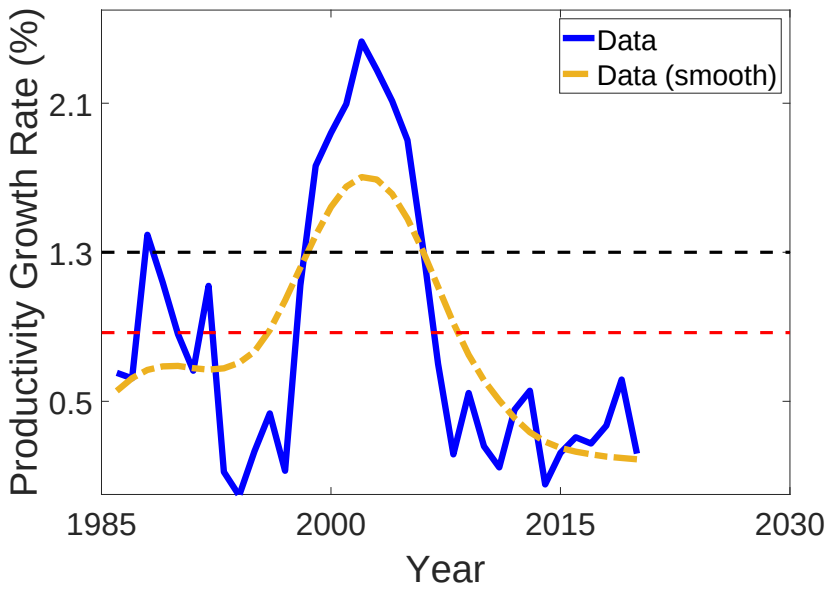


Black-dashed: original steady state. Red-dashed: new steady state.

Transition: productivity growth



(a) Model



(b) Data

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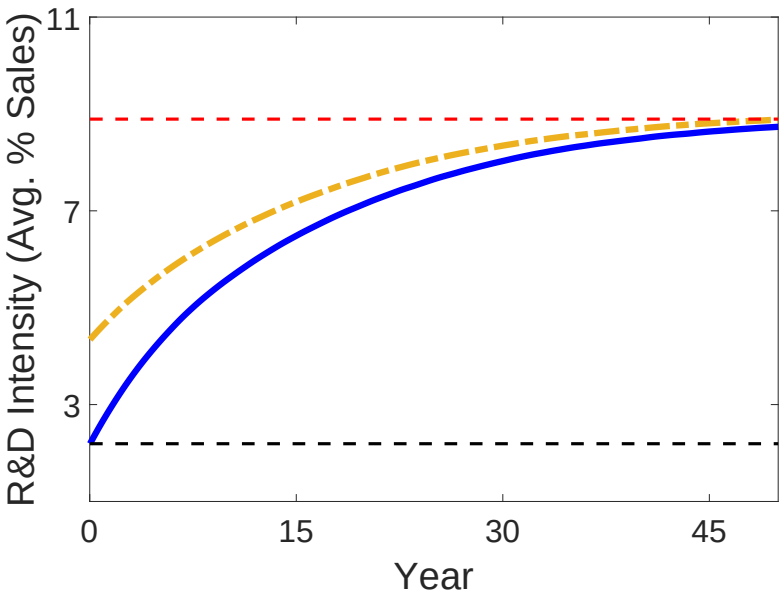
Productivity series from Fernald.

Transition: research and development



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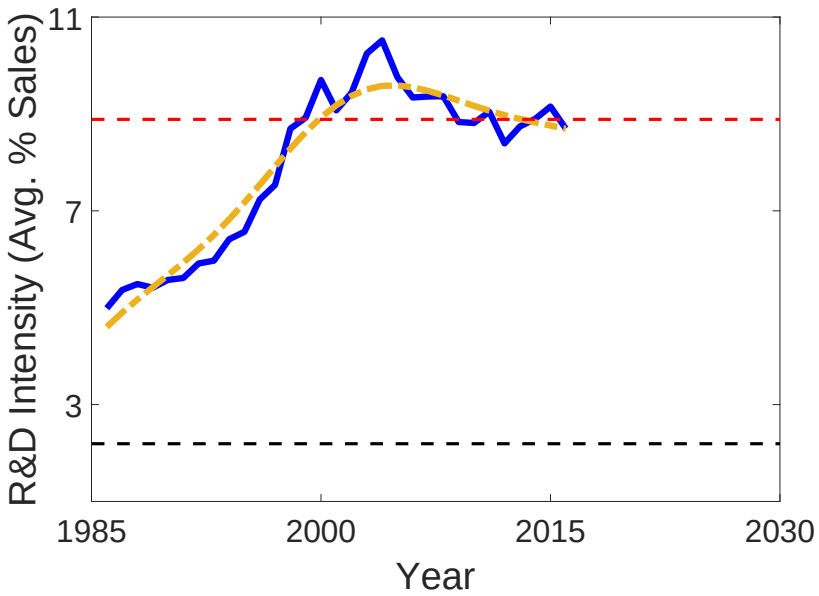
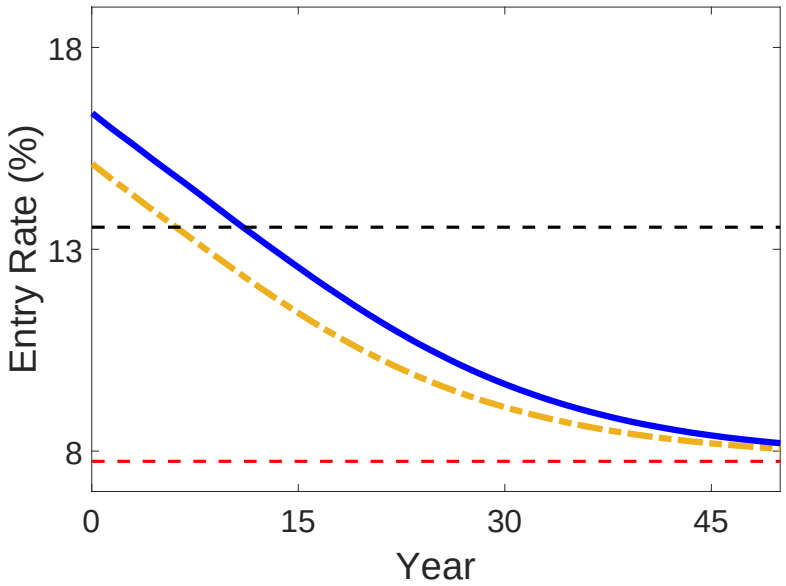


(b) Data

Black-dashed: original steady state. Red-dashed: new steady state. Research and Development data from BEA NIPA tables.

Transition: entry (targeted)



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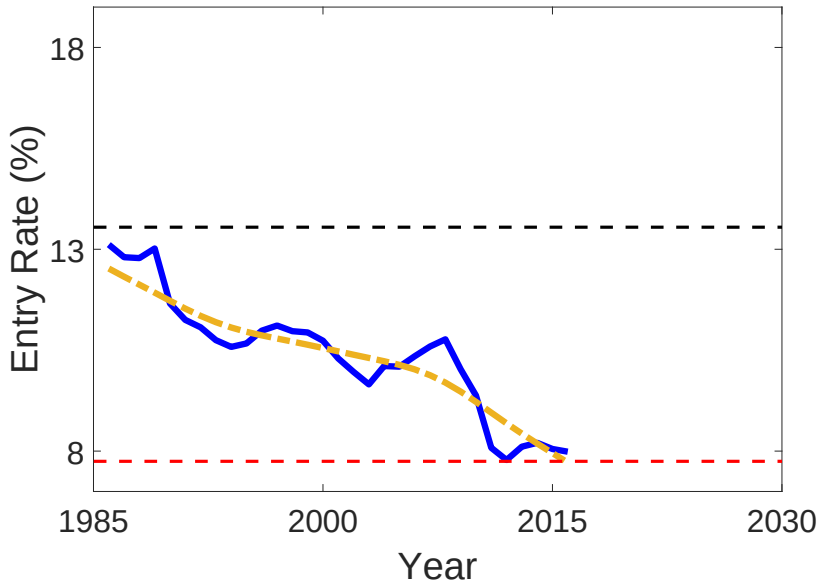

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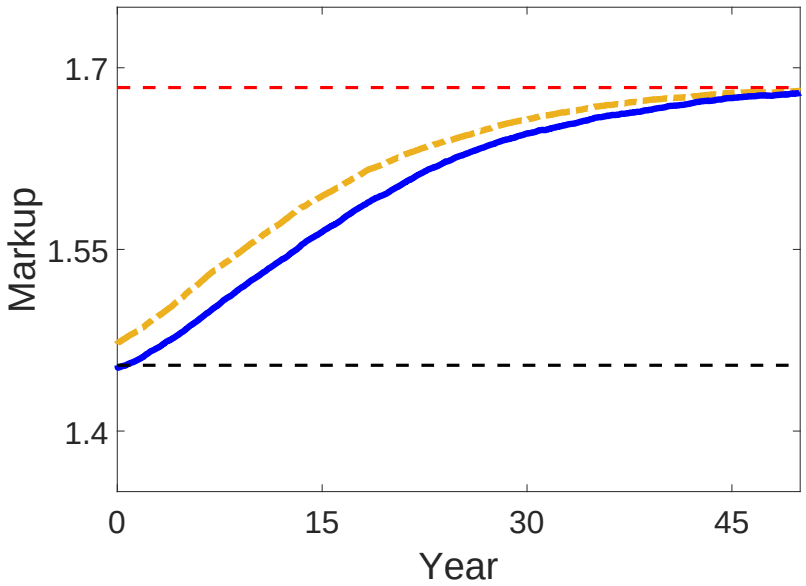
Entry data from BDS.

Transition: markups



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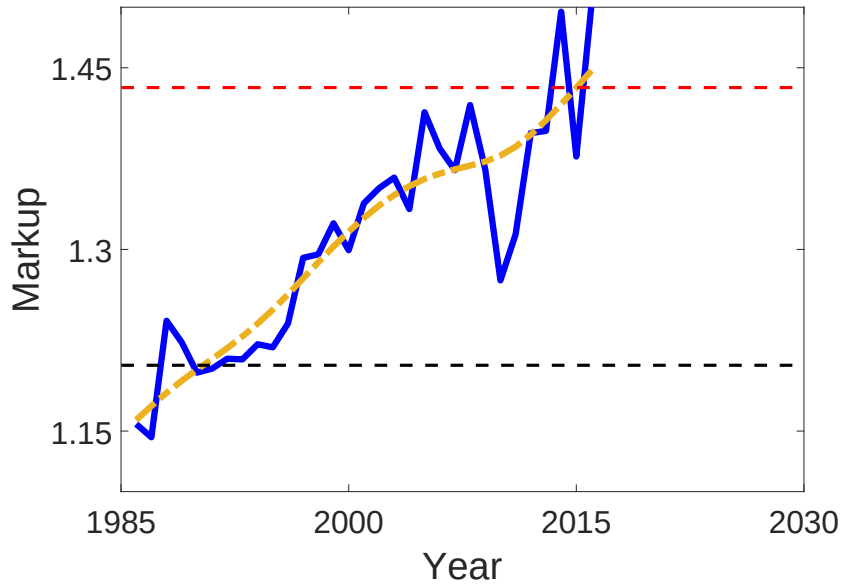

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Markups from a replication of De Loecker, Eeckhout, Unger (2020)

Conclusion

Three macroeconomic trends:

- Low productivity growth despite high R&D, fall in business dynamism, rise of market power/concentration

Explanation:

- Intangible inputs reduce marginal costs, raise fixed costs
- Firms with low adoption costs can reduce aggregate growth
- Analysis using a tractable yet quantitative endogenous growth model with intangibles, entry/exit dynamics, variable markups

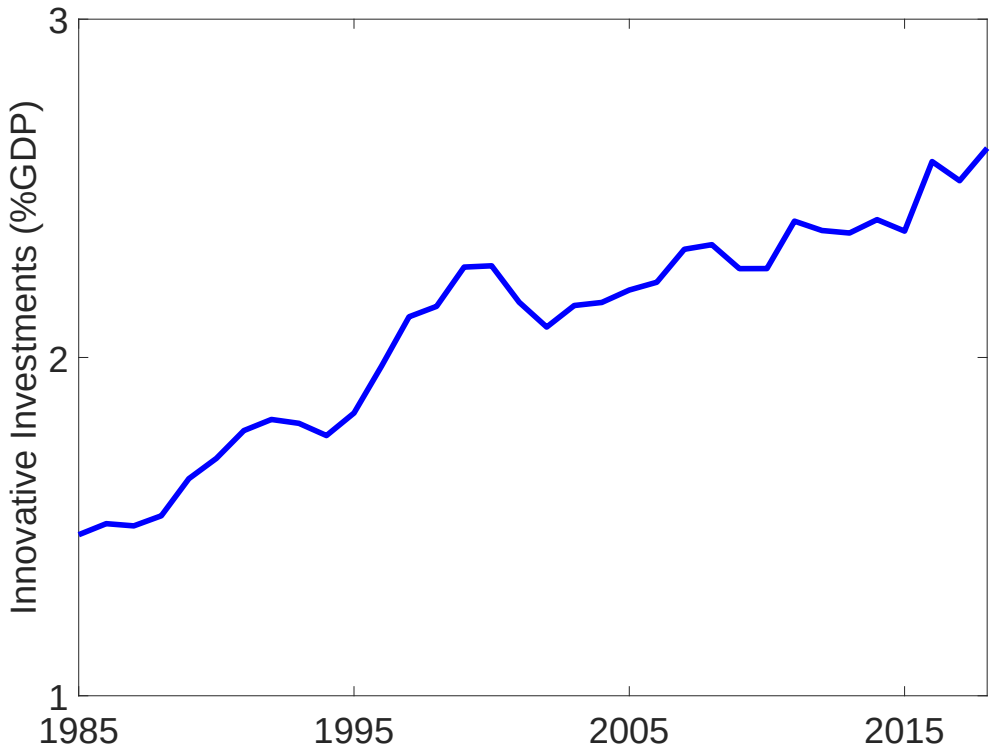
In the paper:

- Micro evidence from U.S. listed firms, universe of French firms
- Extensions: welfare effects, alternative calibrations

Appendix

Research and Development

- R&D intensity increased 62%.
- Ideas are getting harder to find (Bloom et al. 2017) Back Back - Lit rev



U.S. Investments in Intellectual Property excluding Software

Source: BEA, Fernald (FRBSF) France

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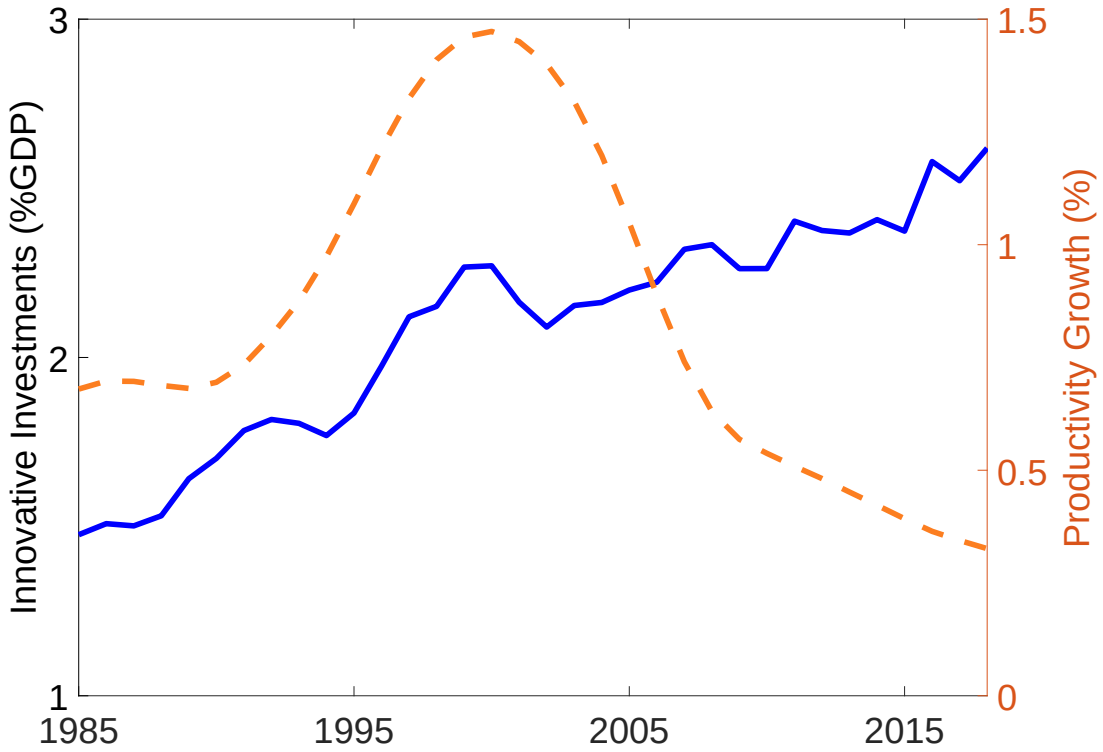

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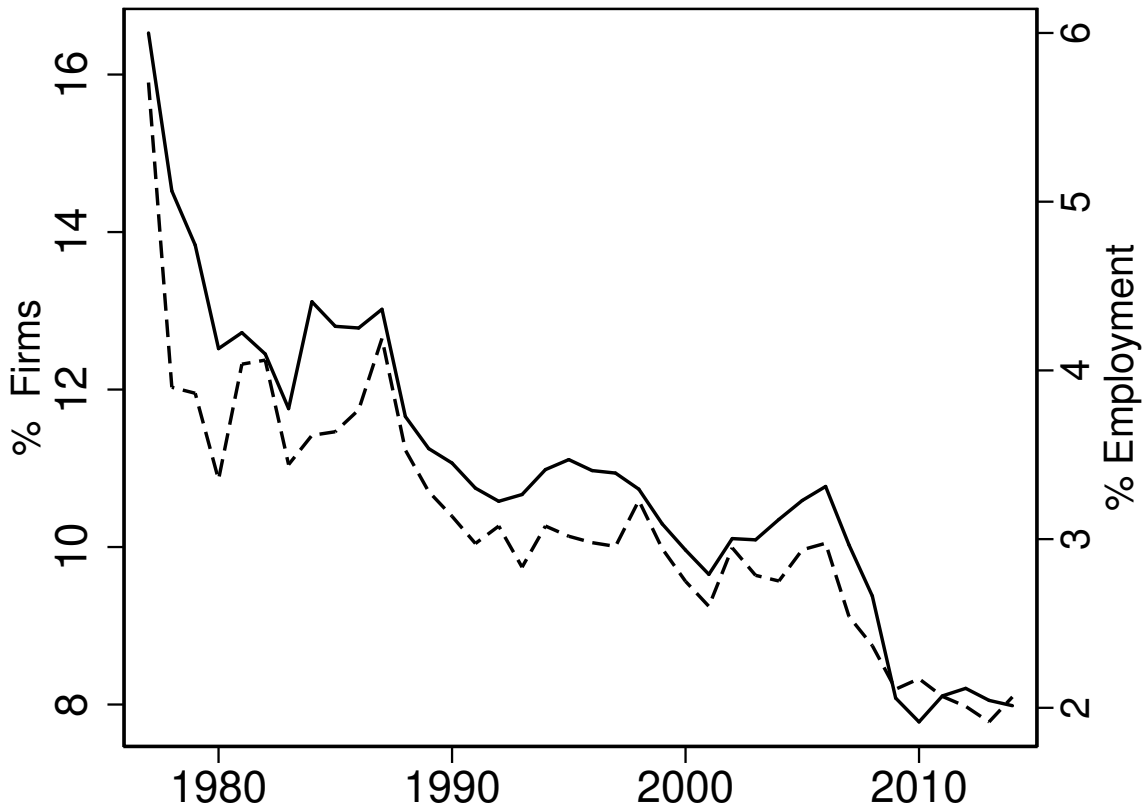
Business dynamism: entry



Start-ups as percentage of firms (solid) and employment (dash)

Data: Business Dynamics Statistics, U.S. Census

▸ Back - Intro ▸ French evidence

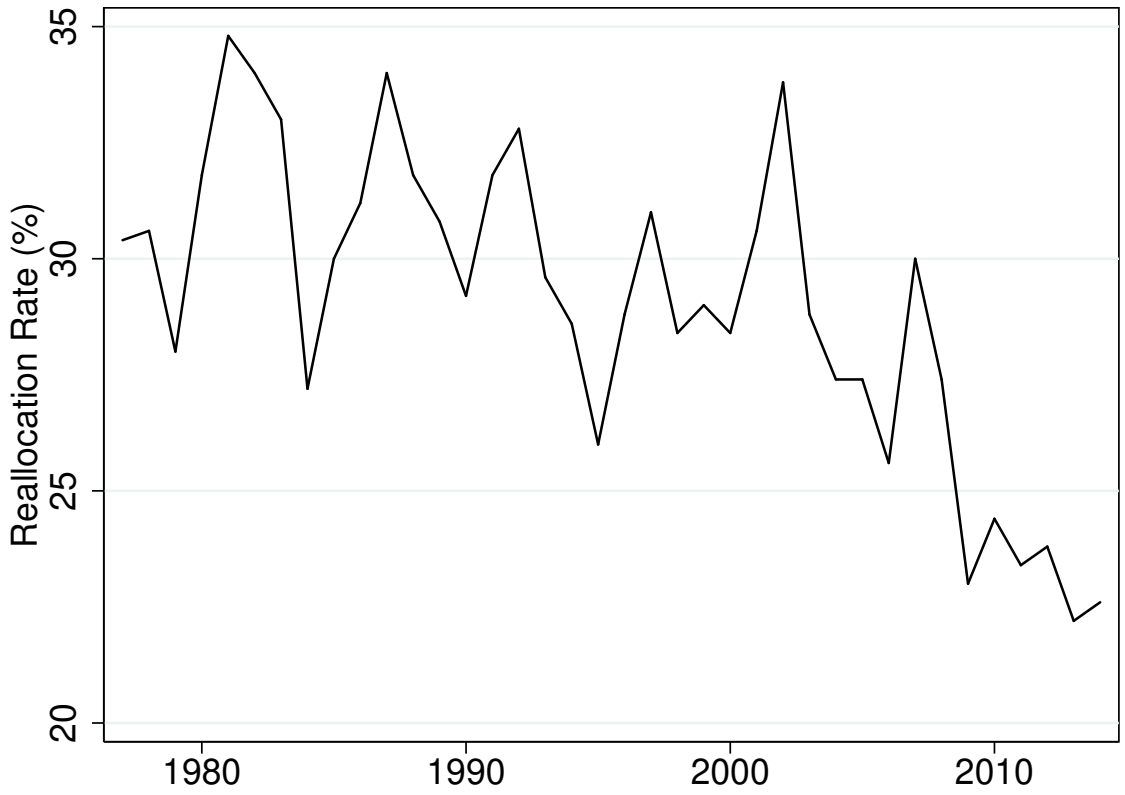
Business dynamism: entry rate (France)

Percentage of employment by new firms ($\leq$ 1yr) in private sector employment (HP).

Source: own calculations based for universe of French firms (FARE-FICUS)

▸ Back - Intro ▸ Back - Data

Business dynamism: reallocation rate

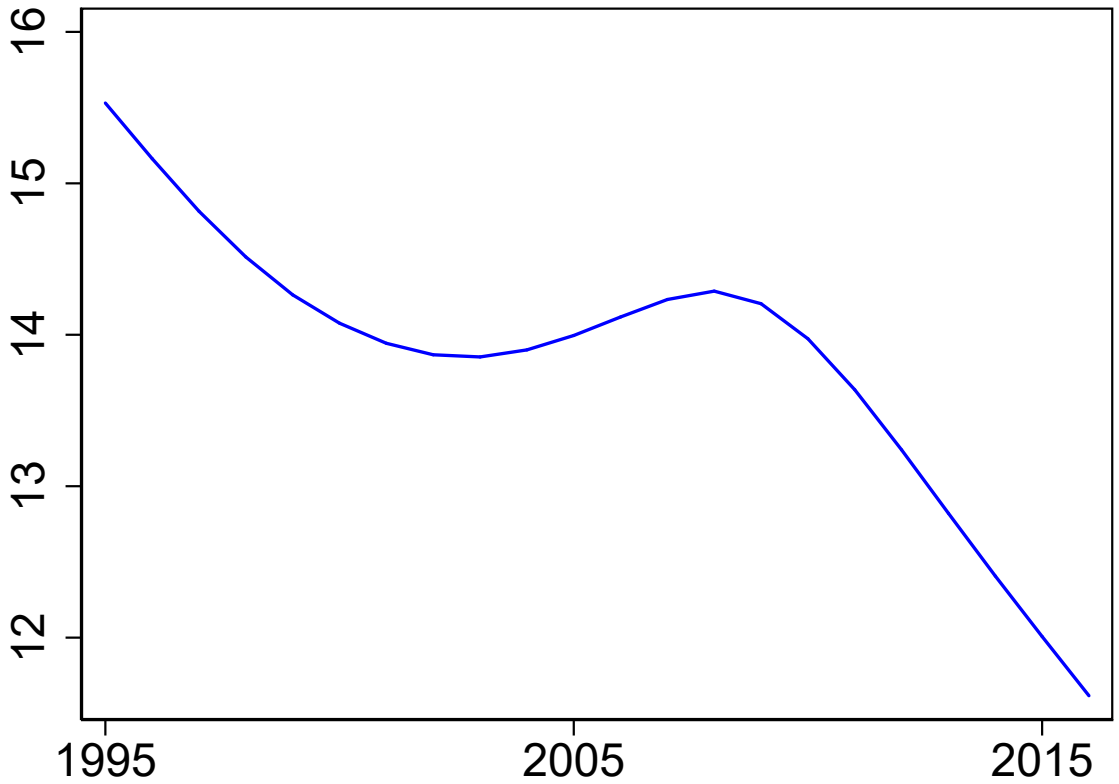


Sum of job destruction and creation rate (%)

Data: Business Dynamics Statistics, U.S. Census

▸ French evidence ▸ Back - Intro

Business dynamism: reallocation rate (France)

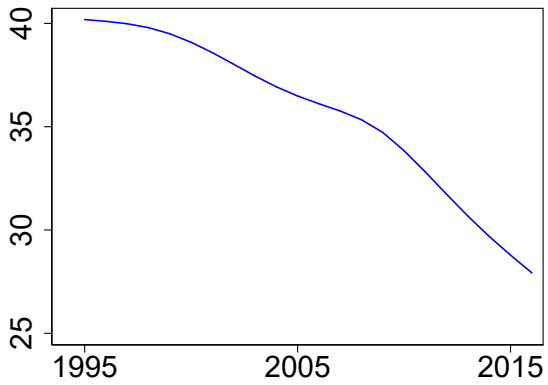


Sum of job creation and job destruction rates across companies (HP).

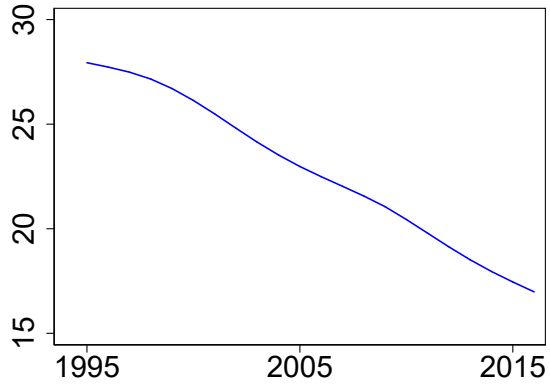
Source: own calculations based for universe of French firms (FARE-FICUS)

▸ Back - Intro ▸ Back - Data

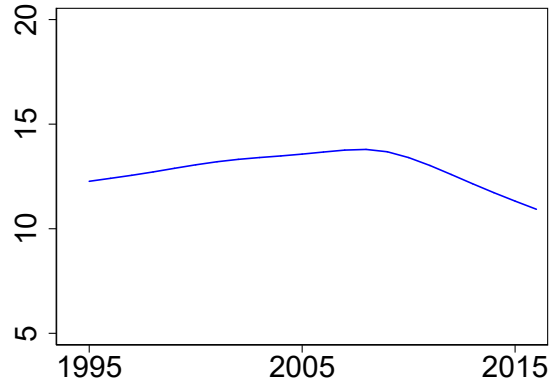
Business dynamism: skewness of growth (France)



(c) 90-10 Difference



(d) 90-50 Difference



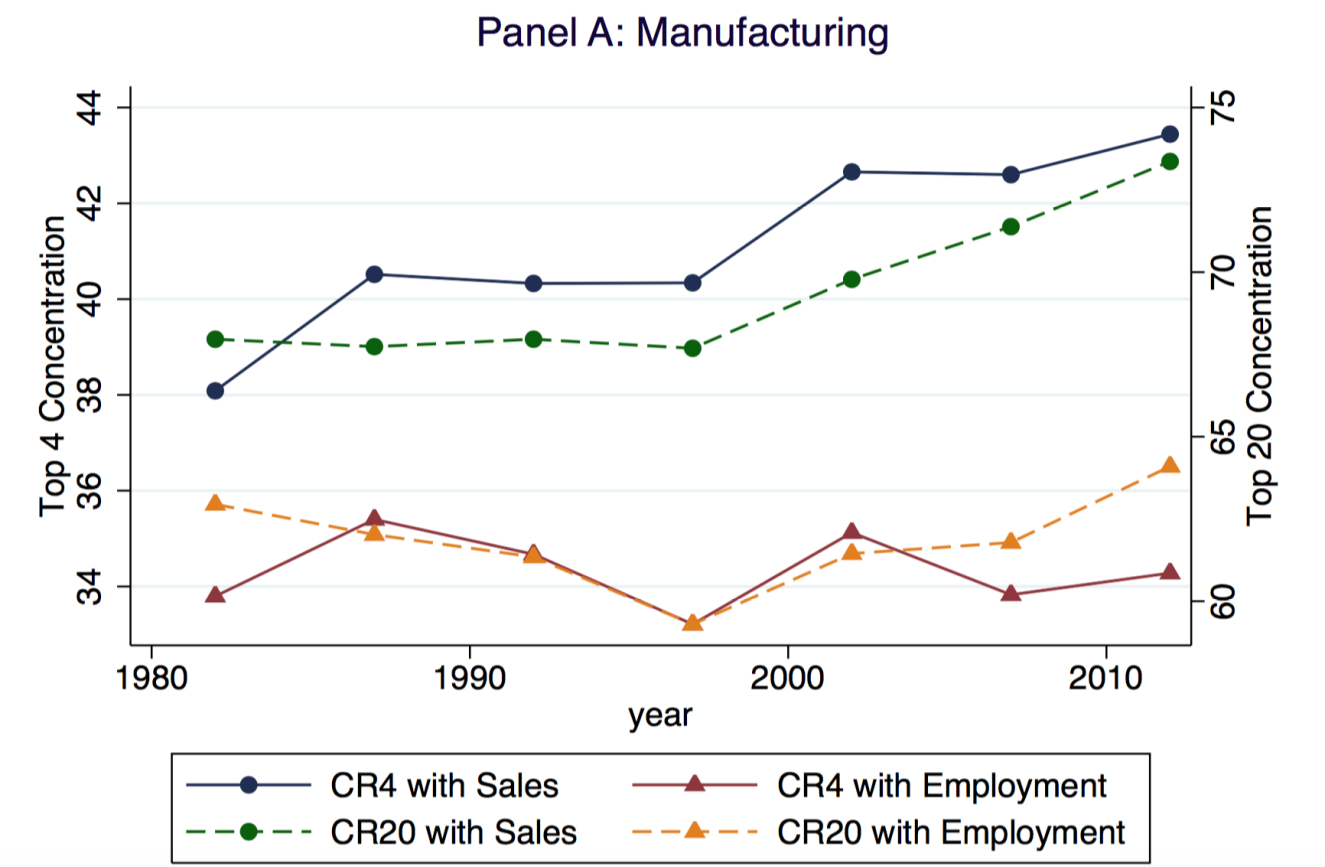
(e) 50-10 Difference

Difference (perc. point) in growth between percentiles of the employment-growth distribution.

Source: own calculations based for universe of French firms (FARE-FICUS)

▸ Back - Intro ▸ Back - Data

Firm concentration



Fraction of sales and employment by top 4 or 20 firms by 4-digit industry.

Source: Autor et al (2017) based on U.S. Census Data

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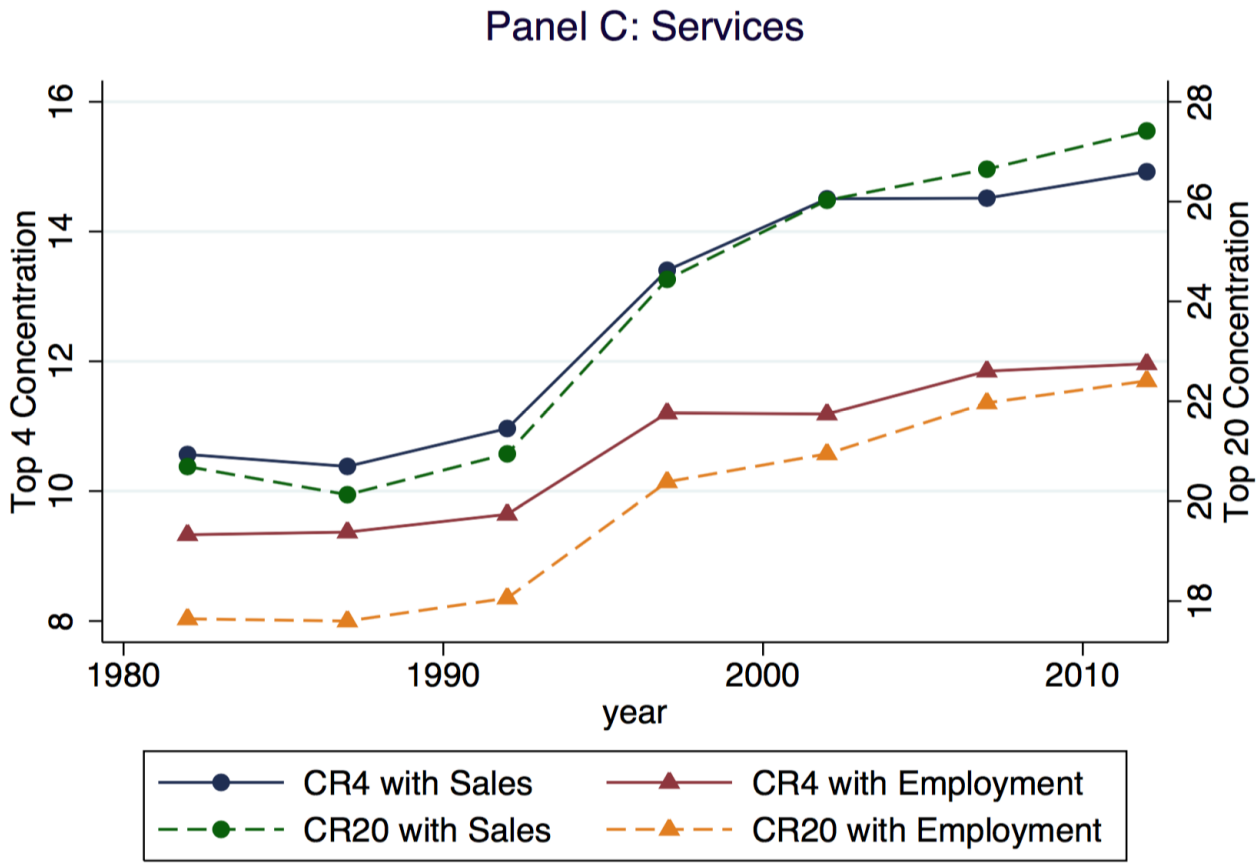

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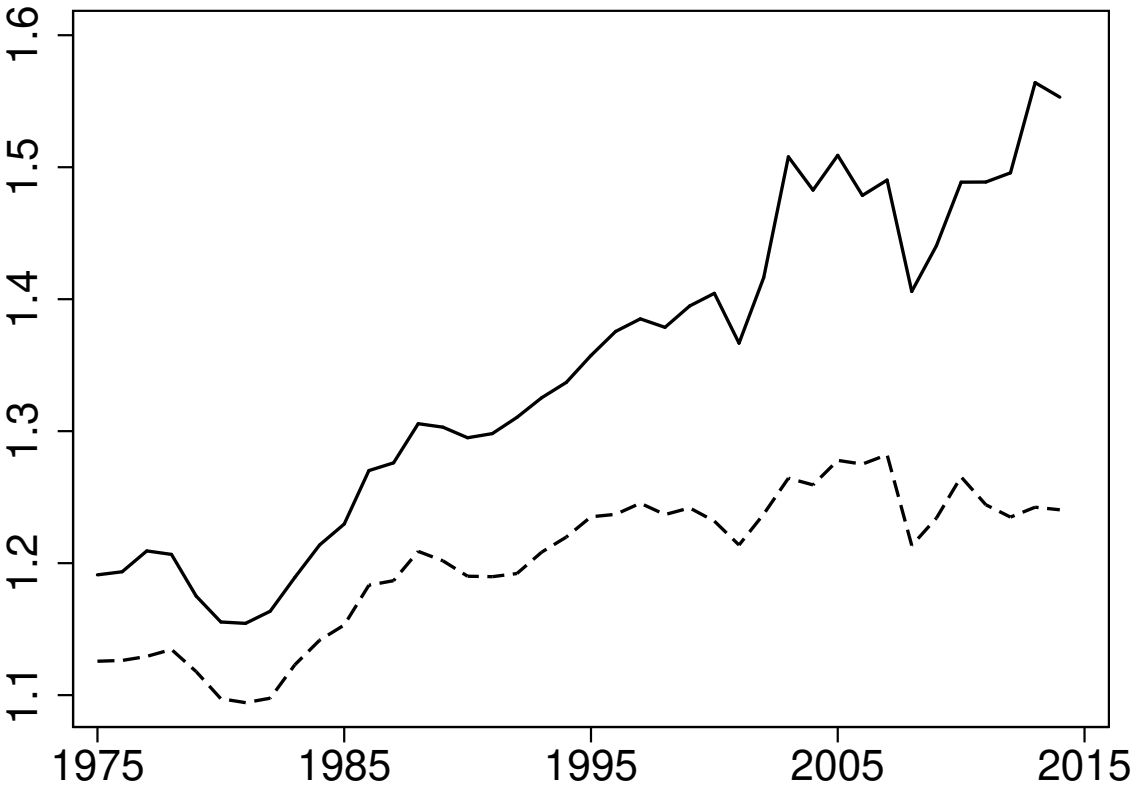
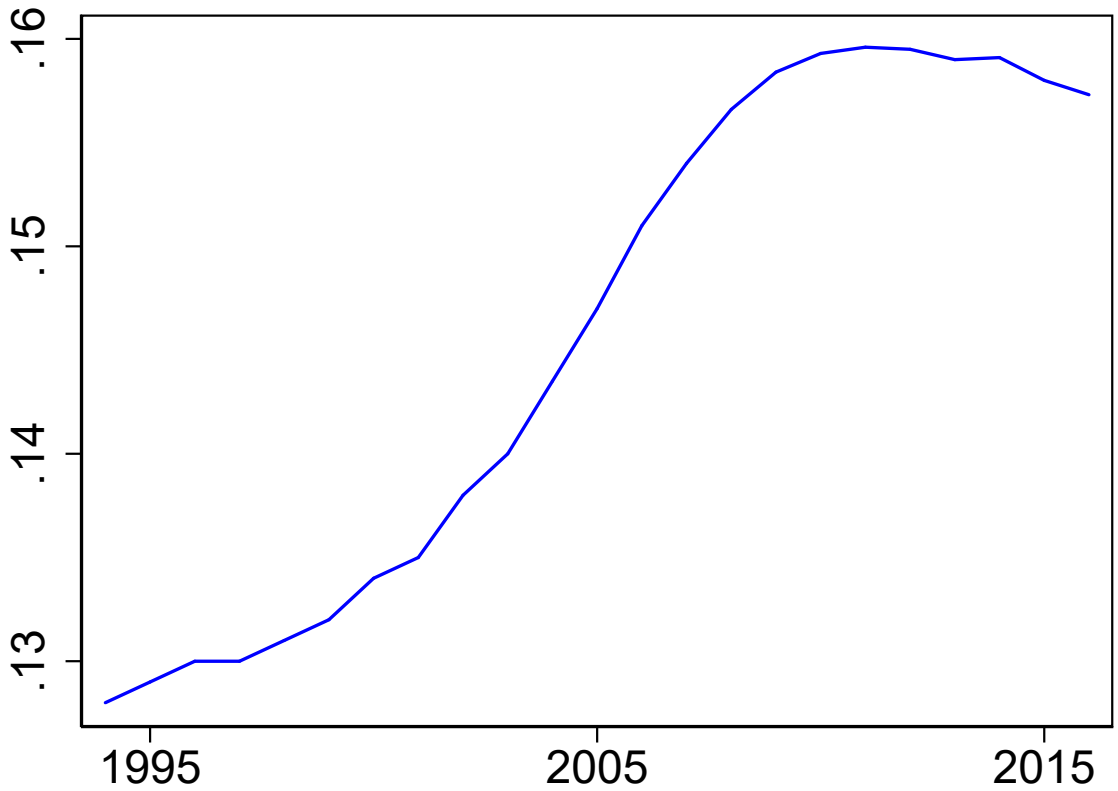


Average markup weighted by sales (solid) and costs (dashed)

Source: Own calculations based on Compustat Data

Back - Into

Firm concentration (France)

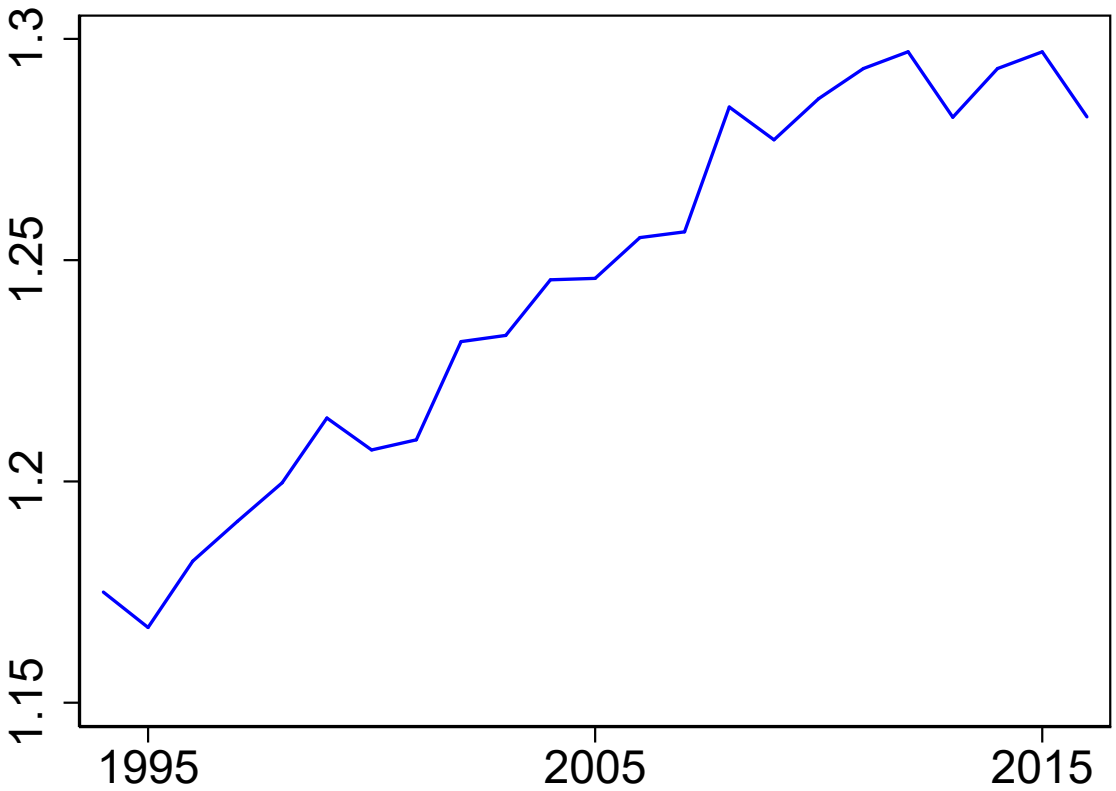


Average Herfindahl Index at 4-digit NACE level, weighted by value added (HP).

Source: own calculations based for universe of French firms (FARE-FICUS)

▸ Back - Into ▸ Back - Data

Markups (France)



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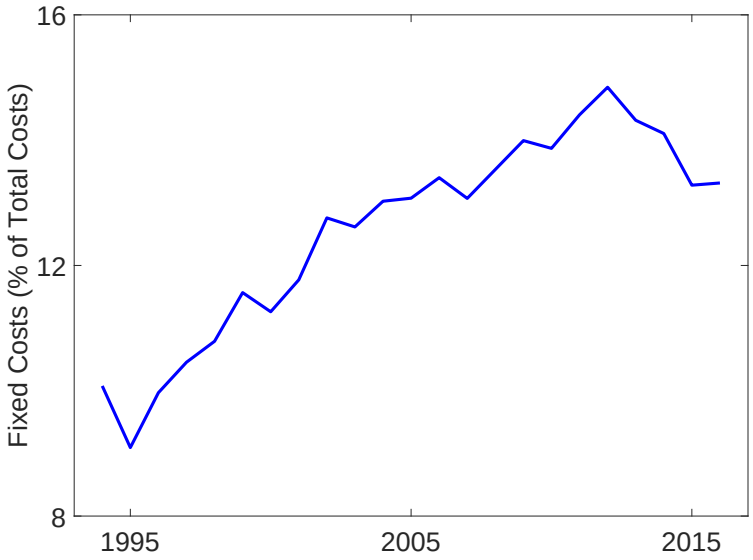
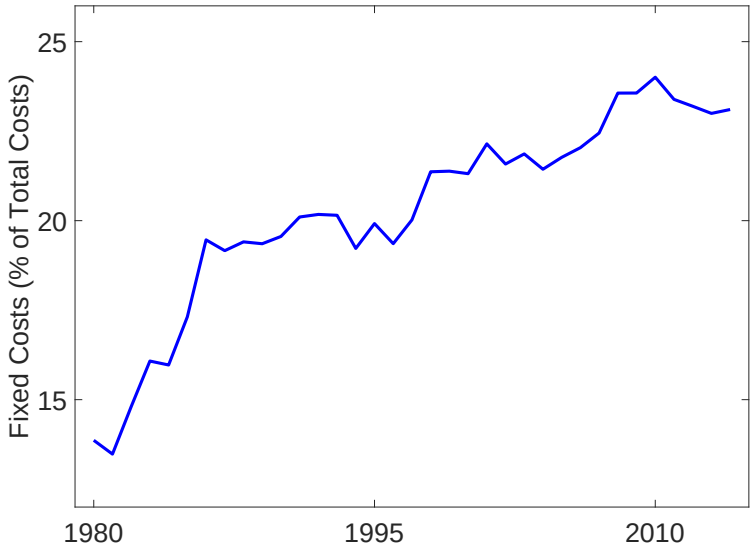
Back - Into

Fixed costs over time



(f) France



(g) United States

Sales-weighted average of fixed costs as a percentage of total costs

- The level of fixed costs is particularly high in IT sectors
- But the upward trend happens within sectors ▸ Sector evidence

▸ Back

Fixed costs and intangibles

$$\frac{f_{ijt}}{tc_{ijt}} = \alpha_j^h + \psi_t^h + \beta^h \cdot \textit{Technology}_{ijt}^h + \beta^{h\prime} g(p_{ijt} \cdot y_{ijt}) + \varepsilon_{ijt}^h$$

	TIC (2006-2016)			EAE (1994-2007)
Fixed Cost Share	ERP	CAD	RFID	Software
Technology Adopted	0.015***	0.020***	0.023***	
	(0.002)	(0.006)	(0.006)	
Software Investment				0.550***
				(0.127)
N	63,928	30,415	16,847	136,208
R^2	0.32	0.32	0.39	0.20
Year fixed effects	✓	✓	✓	✓
Industry fixed effects	✓	✓	✓	
Firm fixed effects				✓
Size polynomial	✓	✓	✓	✓

Firm-clustered standard errors in brackets.

Back

IT Efficiency

Extensive literature shows heterogeneous effect of IT on productivity

- Brynjolfsson and Hitt (2000), Bresnahan et al. (2002), Crespi et al. (2007), Bartel et al (2007), Garicano and Heaton (2010)

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Recent evidence: efficient management practices are a key determinant:

- Bloom et al. (2012): *Americans do IT better*
  - European establishments have smaller productivity boost from IT expense
  - IT productivity increases when establishment becomes US-owned (!)

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Recent evidence: efficient management practices are a key determinant:

- Bloom et al. (2012): *Americans do IT better*
  - European establishments have smaller productivity boost from IT expense
  - IT productivity increases when establishment becomes US-owned (!)

- Schivardi and Schmitz (2019): *IT (..) and Southern Europe's Lost Decades*
  - Productivity effect of IT is entirely conditional on WMS management score - Existing differences across firms start to 'matter'

Back

Related Literature

- Jointly explaining productivity, dynamism, markups: Aghion et al. (2019), Liu, Mian and Sufi (2019), Akcigit and Ates (2019), Peters and Walsh (2019), Cavenaile et al. (2020)
- Productivity: e.g. Fernald (2015), Adler et al. (2017)
- Business dynamism: e.g. Davis et al. (2006), Decker et al. (2014), Haltiwanger et al. (e.g., 2014), Decker et al. (2016), Pugsley and Sahin (2018), Alon et al. (2018).
- Markups, labor share, concentration: Karabarbounis and Neiman (2013), Caballero et al. (2016), De Loecker, Eeckhout and Unger (2019), Eggertson et al. (2018), Gutierrez (2017), Kehrig and Vincent (2017), Calvino et al. (2016), Diez et al. (2018), Autor et al. (2017), Gutierrez and Philippon (2017, 2018), IMF (2019).
- Demography: Hopenhayn et al. (2018)
- Misallocation: e.g. Peters (2016), Baqaee and Farhi (2017), Edmond et al. (2018).
- Intangibles: e.g. Bessen (2017), Crouzet and Eberly (2018), Criscuolo et al. (2018), Ayyagari et al. (2018), Callagaris et al. (2018), Brynjolfson et al. (2018), Martinez (2018), Bajgar et al. (2019), Bessen and Righi (2019), Lashkari et al. (2019), Korinek and Ng (2019), Weiss (2020)
- Related growth models: e.g. Segerstrom et al. (1990), Aghion and Howitt (1992), Klette and Kortum (2004), Lenz and Mortensen (2008), Acemoglu et al. (2018), Akcigit and Kerr (2018), Atkinson and Burstein (2018), Garcia-Macia et al. (2016).

Back