BANK FOR INTERNATIONAL SETTLEMENTS

Why does financial sector growth crowd out real economic growth?*

Enisse Kharroubi

Bank for International Settlements

May 2, 2014

Bundesbank-BoJ Conference "Common challenges in Asia and Europe"

*Joint with Stephen G Cecchetti. Views expressed here are those of the authors and do not necessarily reflect those of the BIS.

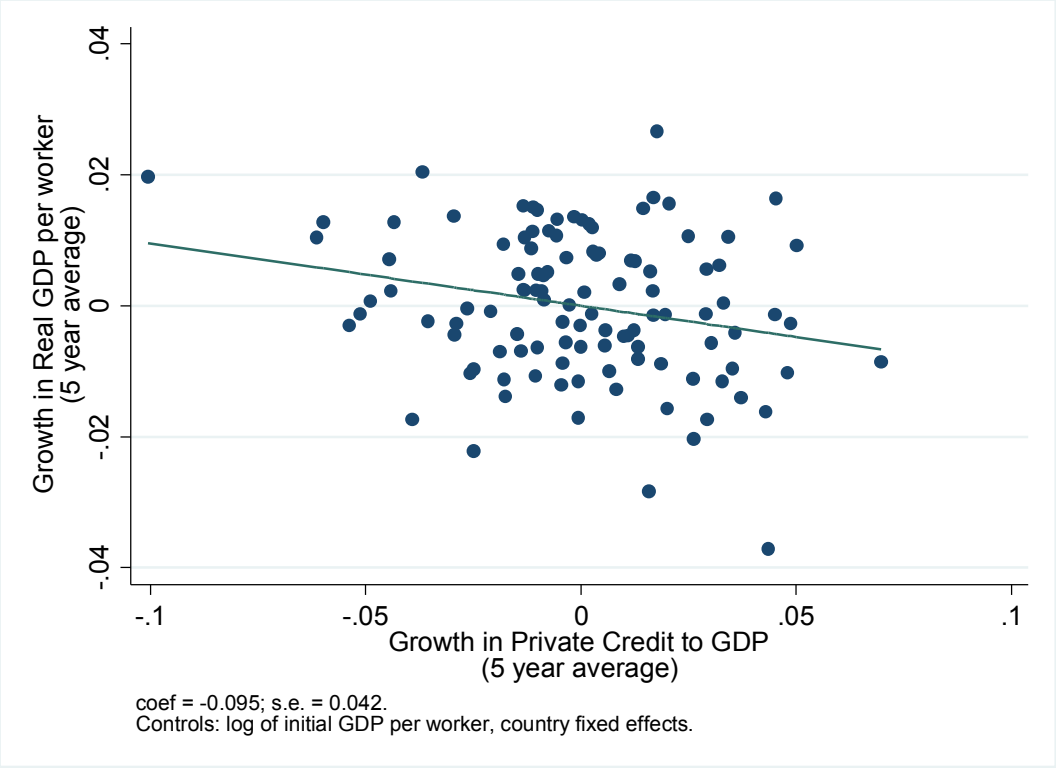
Introduction

- In an earlier paper, we showed that
  - Financial development is good only up to a point, after which it becomes a drag on growth
  - A fast-growing financial sector is detrimental to aggregate productivity growth

- This paper is interested in the second point and provides
  - an empirical study establishing the fact and looking at potential sources of why this so
  - a model linking aggregate and financial sector growth and highlighting inefficiencies related to the latter
  - an industry-level examination supporting the key mechanism of the model

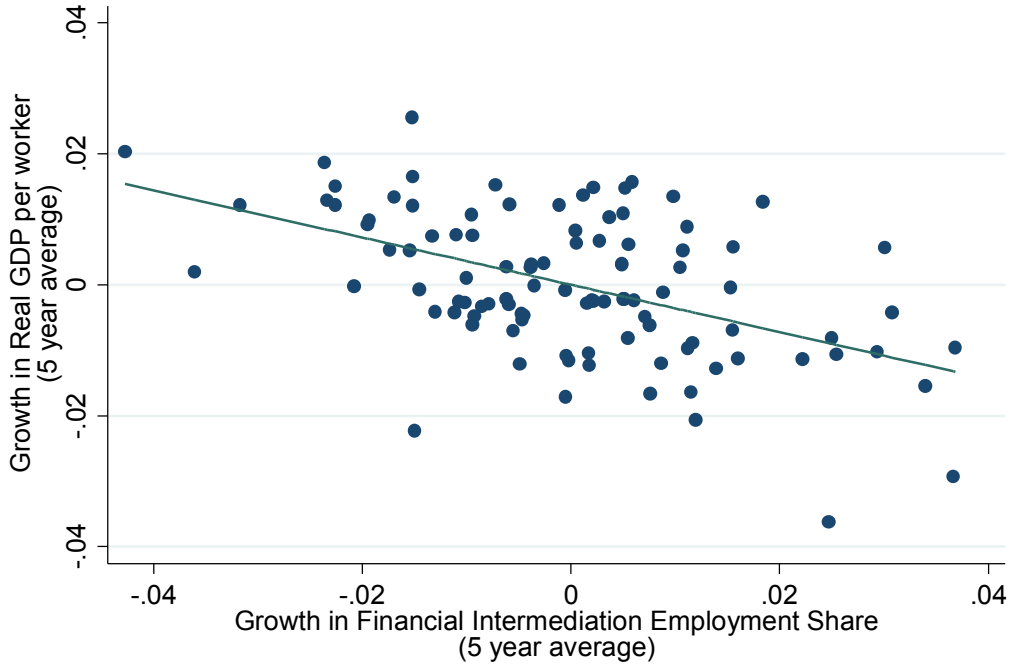
The empirical investigation

Financial sector and productivity growth: the case of credit growth



The empirical investigation

Financial sector and productivity growth: the case of employment growth



coef = -0.361; s.e. = 0.073.
Controls: log of initial GDP per worker, country fixed effects.

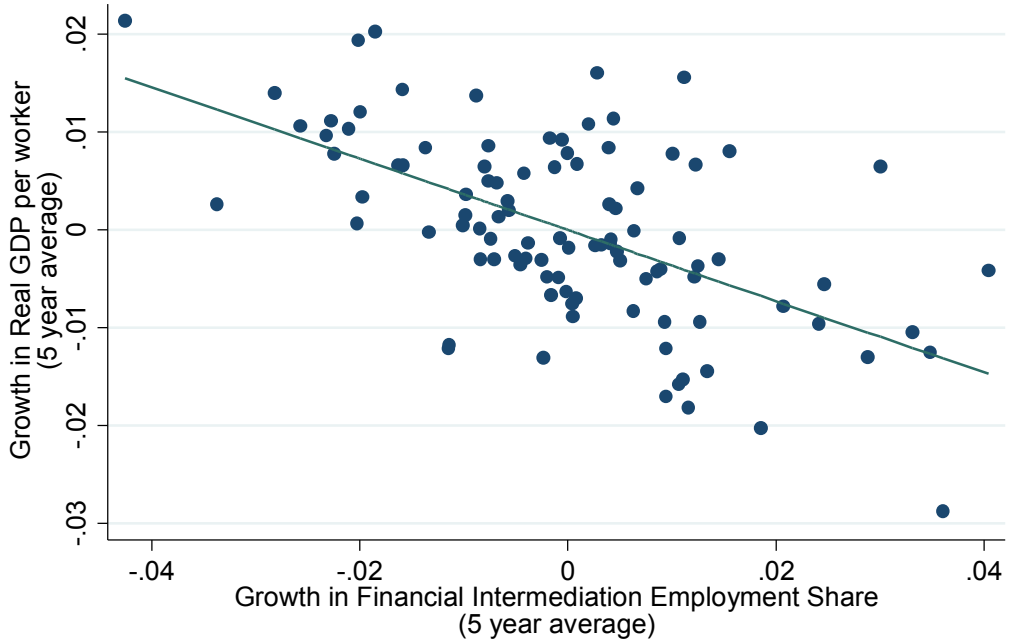
The empirical investigation

Financial sector and productivity growth: potential caveats

- The negative correlation between financial sector growth and aggregate productivity growth is
  - robust to including standard growth determinants, e.g. *financial development*

The empirical investigation

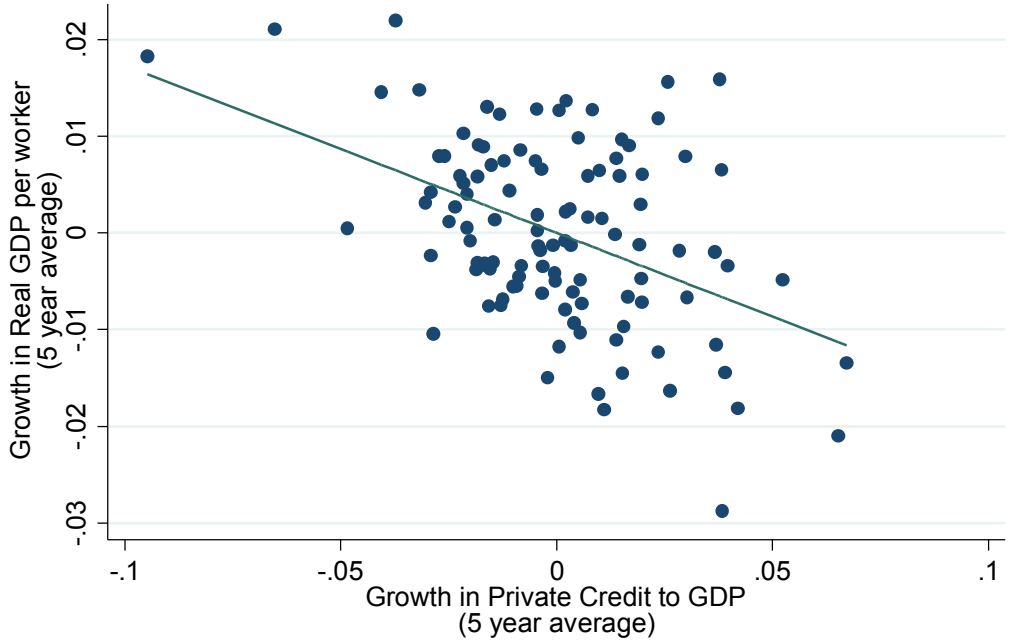
Financial sector and productivity growth: potential caveats



coef = -0.364; s.e. = 0.065.
Controls: log of initial GDP per worker, growth in labor force, openness to trade, inflation, government consumption, country fixed effects.

The empirical investigation

Financial sector and productivity growth: potential caveats



coef = -0.173; s.e. = 0.039.
Controls: log of initial GDP per Worker, growth in labor force, openness to trade, inflation, government consumption, and country fixed effects.

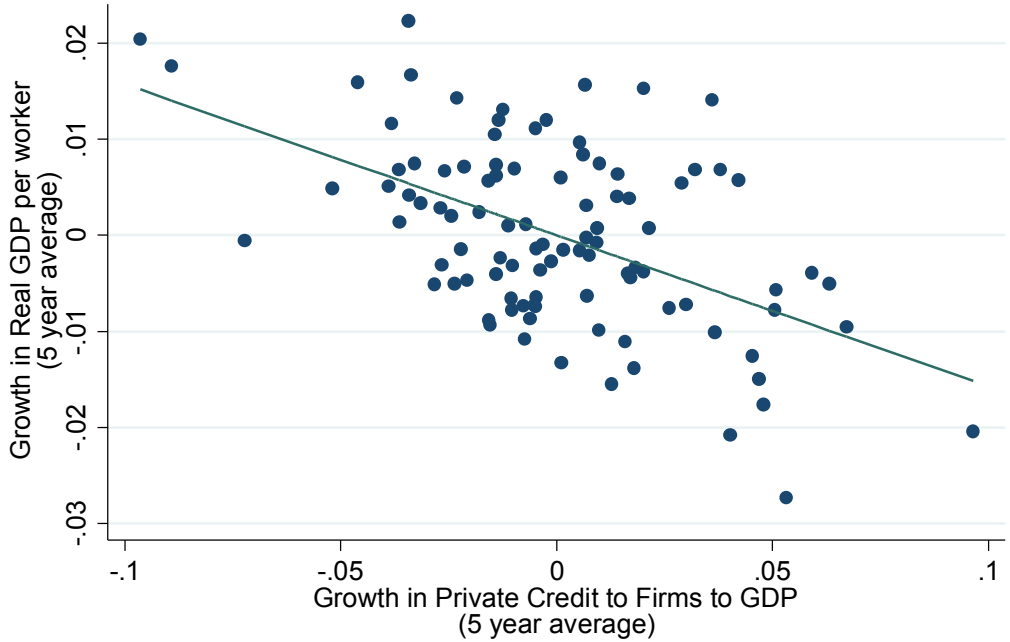
The empirical investigation

Financial sector and productivity growth: potential caveats

- The negative correlation between financial sector growth and aggregate productivity growth is
  - robust to including standard growth determinants, e.g. *financial development*
  - does not seem to be driven by HH credit, hence unlikely to be driven by reverse causality

The empirical investigation

Financial sector and productivity growth: potential caveats



coef = -0.157; s.e. = 0.029.
Controls: log of initial GDP per worker, growth in labor force, openness to trade, inflation, government consumption, country fixed effects.

The empirical investigation

Financial sector and productivity growth: the bottom line

- The negative correlation between financial sector growth and aggregate productivity growth is
  - robust to including standard growth determinants, e.g. *financial development*
  - does not seem to be driven by HH credit, hence unlikely to be driven by reverse causality

- This evidence applies to OECD advanced economies
  - Evidence for EMEs -yet to be delivered- could go in the same way (financial liberalization driven booms)

Theory

A model of financial and aggregate growth
Main Assumptions

- A small open economy with an equal number of entrepreneurs and financiers

  - Financiers have an endowment and can borrow at zero interest rate from rest of the world to finance entrepreneurs

  - Entrepreneurs have an endowment *e* and are assigned a *i*-project with return R_i and pledgeable return ρ_i

  - Two types of projects, *a* and *b*. High productivity projects are more difficult to pledge: $R_a > R_b > 1$ but $\rho_a < \rho_b < 1$

A model of financial and aggregate growth
Borrowing limits

- Entrepreneurs can default on their liabilities. The cost of borrowing is denoted *r*
  - no-default constraint for an entrepreneur with an i-project:
    $$(e+d)R_i - rd \geq (e+d)(R_i - \rho_i) - prd$$
  - To recover a fraction *p* of their claims *rd,* financiers incur a cost $\mathrm{c}.\ln(1/1-p)d.$
  - Entrepreneurs assigned an i-project cannot borrow more than
    $$d_i = e\frac{\rho_i}{c-\rho_i}$$

A model of financial and aggregate growth
Mechanism

- A drop in the cost *c* to recover defaulted claims
  - benefits all projects
  - but more so for more pledgeable projects

$$d_i = e\frac{\rho_i}{c-\rho_i} \Rightarrow \frac{\partial d_i}{\partial c} < 0 \text{ and } \frac{\partial^2 d_i}{\partial c \partial \rho_i} < 0$$

- When the cost *c* to recover claims drops
  - Aggregate investment (and growth) goes up but…
  - TFP goes down because share of high productivity project in total investment goes down

Is there empirical support for this channel?

Credit growth and tangible assets at the industry level

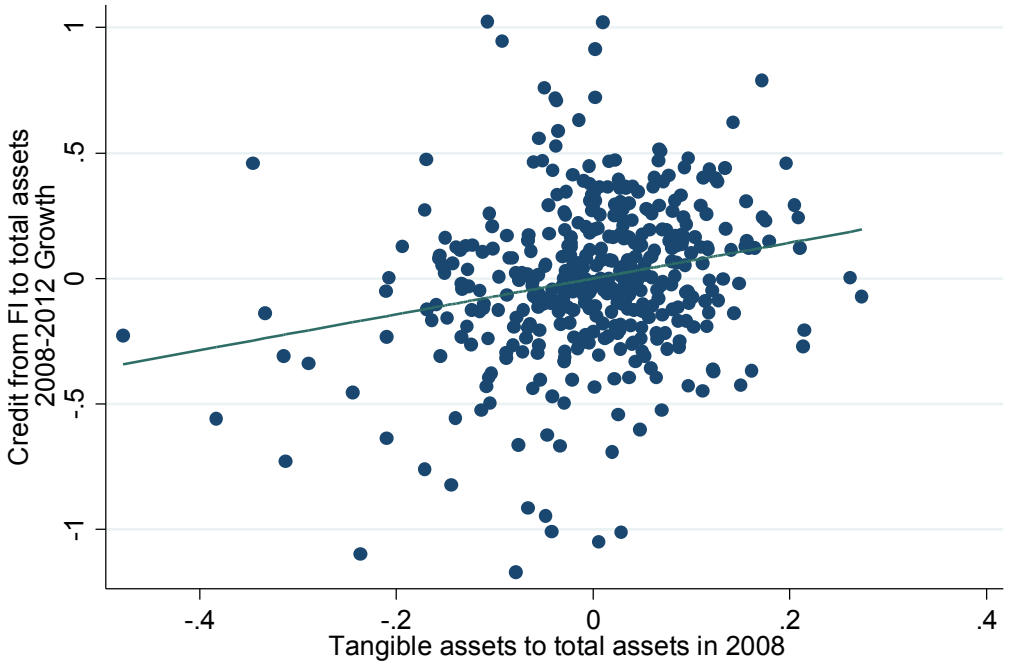
Is there empirical support for this channel?

Credit growth and tangible assets at the industry level

coef. = 0.625, s.e. = 0.334
Controls: log of Credit from FI to total assets in 2004, country and industry dummies

Is there empirical support for this channel?

Credit growth and tangible assets at the industry level



A model of financial and aggregate growth
Main Assumptions

- A small open economy with an equal number of entrepreneurs, financiers and *skilled workers*

  - Entrepreneurs *choose* between type-A and type-B projects

  - High productivity (type-A) projects are more difficult to pledge and *require a skilled worker*:

$$x(L_e) = x_a L_e + x_b(1 - L_e) \text{ with } x \in (R, \rho)$$
$$R_a > R_b > 1 \text{ and } \rho_a < \rho_b < 1$$

A model of financial and aggregate growth
Main Assumptions

- A small open economy with an equal number of entrepreneurs, financiers and *(skilled) workers*
  - Financiers can borrow at zero interest rate to finance entrepreneurs
  - *Hiring a skilled worker reduces the cost c* to recover claims on defaulting entrepreneurs and hence allows to lend more

$$c(L_f) = L_f c_l + (1 - L_f) c_h \text{ with } c_l < c_h$$

A model of financial and aggregate growth
Borrowing limits

- Entrepreneurs can default on their *financial* liabilities.
  - no-default constraint for an entrepreneur hiring L_e skilled worker: $(e+d)R(L_e) - rd \geq (e+d)\big(R(L_e) - \rho(L_e)\big) - prd$
  - To recover *prd,* financiers who hired L_f skilled worker incur a cost $c\big(L_f\big).\ln(1/1-p)d.$
  - Entrepreneurs hiring L_e skilled worker cannot borrow more than

$$d\big(L_e, L_f\big) = e\frac{\rho(L_e)}{c\big(L_f\big) - \rho(L_e)}$$

A model of financial and aggregate growth
Equilibrium wage for skilled workers

- Market for skilled labour is competitive. Ability to pay for skilled worker equals marginal profits:

  - Entrepreneurs' and financiers' ability to pay for skilled workers

$$w_e = \pi_e(L_e = 1, L_f) - \pi_e(L_e = 0, L_f)$$
$$w_f = \pi_f(L_e, L_f = 1) - \pi_e(L_e, L_f = 0)$$

  - $w_e(L_f = 1) < w_f(L_e = 0) \Leftrightarrow$ Eq. financiers hire skilled workers
  - $w_e(L_f = 0) > w_f(L_e = 1) \Leftrightarrow$ Eq. entrepreneurs hire skilled workers

A model of financial and aggregate growth
Strategic complementarity

- Entrepreneurs' ability to pay for skilled workers depends on the number of skilled workers in the financial system

  - Entrepreneur's trade-off for hiring a skilled worker: higher productivity, against lower ability to raise funds

  - Entrepreneurs' cost to hire skilled workers increases with # of skilled workers hired in the financial sector

$$d(L_e, L_f) = \frac{e\rho(L_e)}{c(L_f) - \rho(L_e)} \Rightarrow \frac{\partial d(L_e, L_f)}{\partial L_e} < 0 \text{ and } \frac{\partial^2 d(L_e, L_f)}{\partial L_f \partial L_e} < 0$$

A model of financial and aggregate growth
Strategic complementarity

- Entrepreneurs' decision tilted towards…
  - hiring skilled workers when the financial sector employs few skilled workers
  - not hiring skilled workers when the financial sector employs many skilled workers

- We end with two possible equilibria:
  - Financiers hire skilled workers and entrepreneurs invest in low productivity/high tangibility projects.
  - Entrepreneurs hire skilled workers, invest in high productivity /low pledgeability projects and financiers do not hire skilled workers.

A model of financial and aggregate growth
Predictions

- In the presence of multiple equilibria, the equilibrium where entrepreneurs hire skilled workers features
  - Higher TFP growth and lower FS growth
  - Higher social welfare provided the bargaining power of financiers is sufficiently large

Empirics

From the model to the data

- FS growth and TFP growth are negatively correlated at the aggregate level
  - Negative correlation arises both because FS growth
    - benefits disproportionately low-productivity/high-collateral sectors
    - reflects a misallocation of skilled labour.

- FS growth should disproportionately harm
  - Industries with high external financial dependence (low collateral).
  - Industries with high R&D intensity (skill intensive)

Data

- Industry-level data on productivity in manufacturing sectors from 15 advanced OECD countries

- FS growth measured with two types of indicators
  - Banks: e.g. banking assets to GDP
  - Broader financial system: e.g. total private credit to GDP

- Industry characteristics measured with US-based data
  - Financial dependence: cap. exp. minus current cash flow to total cap. exp.
  - R&D intensity: R&D expenditures to total value added.

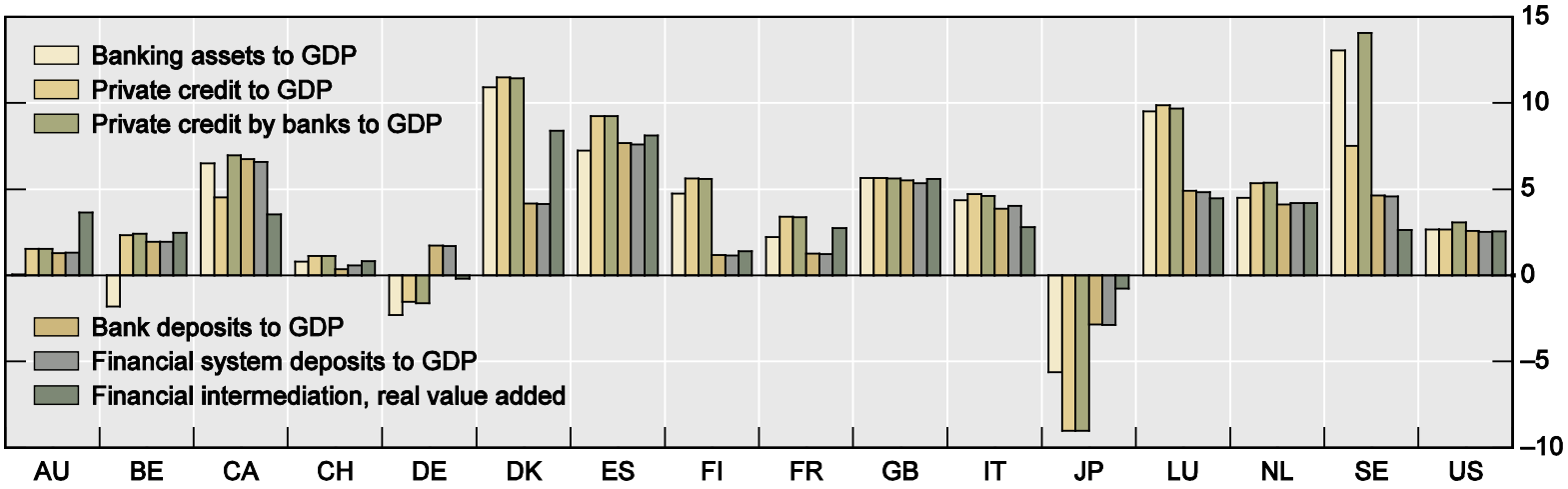
Data

A snapshot at financial sector growth

Graph 2

Financial sector growth in advanced economies

2000–08 average, in per cent



AU = Australia; BE = Belgium; CA = Canada; CH = Switzerland; DE = Germany; DK = Denmark; ES = Spain; FI = Finland; FR = France; GB = United Kingdom; IT = Italy; JP = Japan; LU = Luxembourg; NL = Netherlands; SE = Sweden; US = United States.

Sources: World Bank Financial Structure and Development database; authors' calculations.

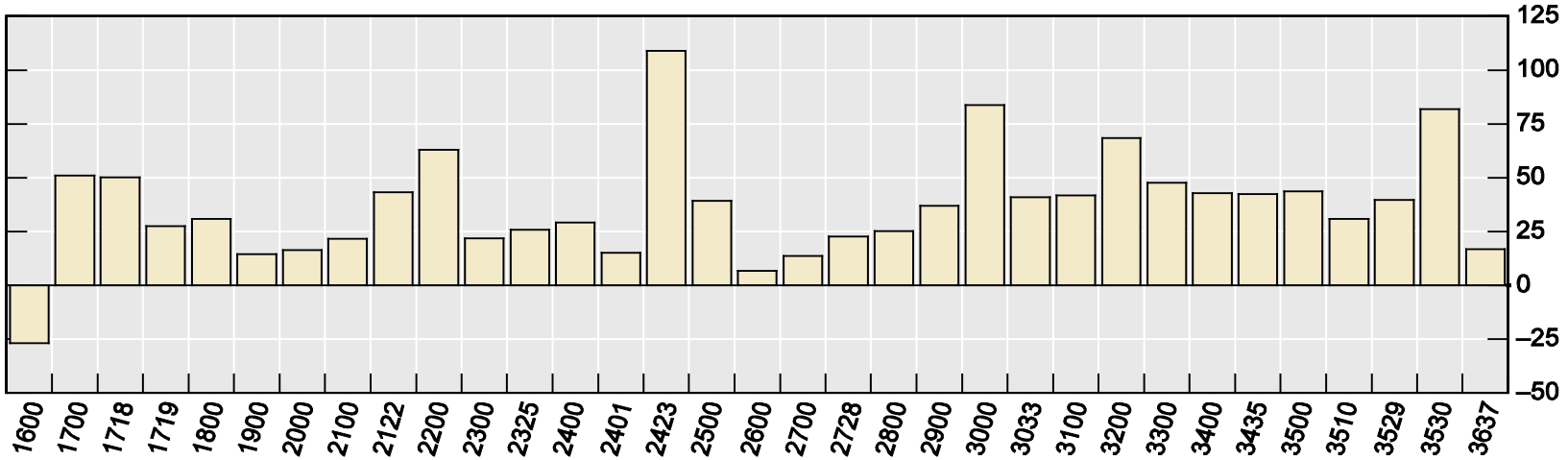
Data

A snapshot at industry financial dependence

Graph 3

Financial dependence in manufacturing industries[1]

In per cent



[1] Capital expenditure in excess of internal cash flows as a percentage of capital expenditure. For the meaning of the industry codes, see Appendix Table A1.

Sources: Raddatz (2006); authors' calculations.

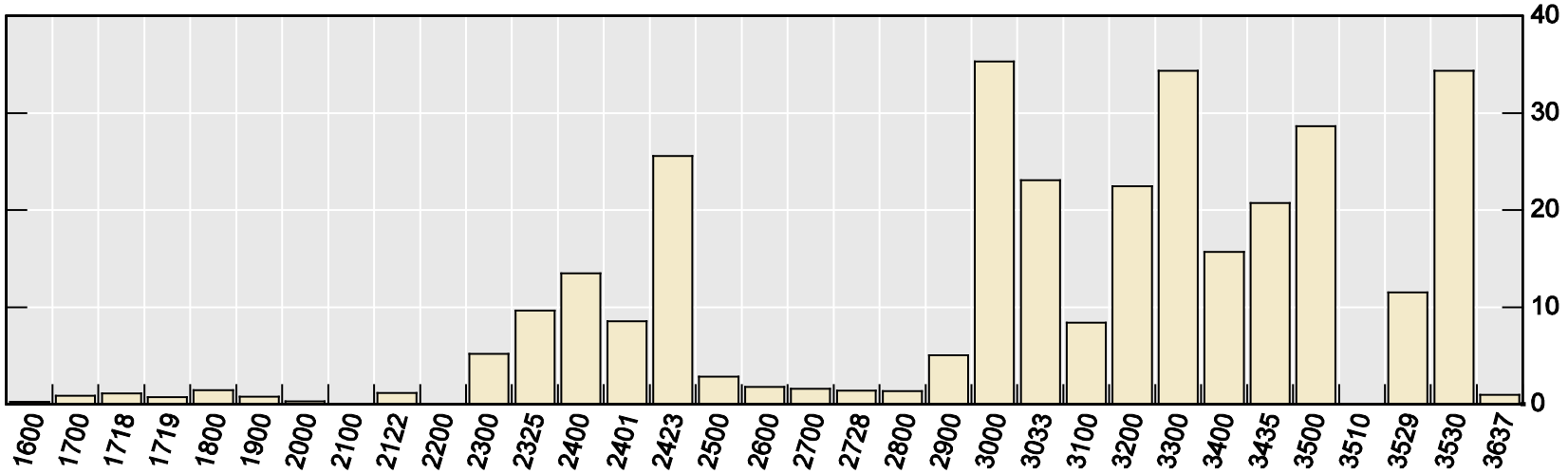
Data

A snapshot at industry R&D intensity

Graph 4

R&D intensity in manufacturing industries[1]

In per cent



[1] Ratio of R&D expenditure to total value added. For the meaning of the industry codes, see Appendix Table A1.

Sources: OECD Structural Analysis database; authors' calculations.

Empirical specification

$$\frac{\ln(y_{ic,08}) - \ln(y_{ic,00})}{8} = \beta_i + \beta_c + \gamma c_i \times g_c - \delta \ln\left(\frac{y_{ic,00}}{y_{c,00}}\right) + \varepsilon_{ic}$$

- LHS variable:
  - Industry productivity growth between 2000 to 2008
- RHS variables:
  - β*'s:* industry and country dummies
  - $c_i \times g_c$: interaction between industry i's intrinsic characteristic and country c's financial sector growth
  - $y_{ic,00}/y_{c,00}$: ratio of productivity in industry i in country c to productivity in manufacturing in country c in 2000.

Empirical methodology pros and cons

- Causality runs from FS growth to manufacturing industries productivity growth
  - Individual manufacturing sectors small
  - Financial sector growth measured at the country level
  - Industry characteristics based on US data, industry growth outside the US unlikely to affect such characteristics
- Diff-in-diff effect can be quantified, but not country-level effect

Estimation results

Dependent variable: Industry Labor Productivity Growth						
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Log of Initial Relative Labor Productivity	**–0.027***	**–0.026****	**–0.027***	**–0.026****	**–0.028****	**–0.027****
	(0.014)	*(0.013)*	*(0.014)*	*(0.013)*	*(0.014)*	*(0.012)*
Interaction (**Financial Dependence** and Growth in **Private Credit to GDP**)	**–1.145*****					
	(0.366)					
Interaction (**Financial Dependence** and Growth in **Financial System Deposits to GDP**)		**–1.511*****				
		(0.524)				
Interaction (**Financial Dependence** and Growth in **Private Credit by Banks to GDP**)			**–1.004*****			
			(0.312)			
Interaction (**Financial Dependence** and Growth in **Banking System Deposits to GDP**)				**–1.424*****		
				(0.510)		
Interaction (**Financial Dependence** and Growth in **Banking Assets to GDP**)					**–0.982*****	
					(0.339)	
Interaction (**Financial Dependence** and Growth in **Financial Intermediation Value Added**)						**–2.030*****
						(0.555)
Observations	335	335	335	335	335	349
R-squared	0.357	0.346	0.360	0.344	0.354	0.360

Estimation results

Dependent variable: Industry Labor Productivity Growth						
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Log of Initial Relative Labor Productivity	**–0.032**** *(0.014)*	**–0.030**** *(0.014)*	**–0.029**** *(0.013)*	**–0.029**** *(0.013)*	**–0.030**** *(0.014)*	**–0.030**** *(0.012)*
Interaction (**R&D Intensity** and Growth in **Private Credit to GDP**)	**–1.753***** *(0.590)*					
Interaction (**R&D Intensity** and Growth in **Private Credit by Banks to GDP**)		**–1.327***** *(0.502)*				
Interaction (**R&D Intensity** and Growth in **Financial System Deposits to GDP**)			**–2.794***** *(0.937)*			
Interaction (**R&D intensity** and Growth in **Banking System Deposits to GDP**)				**–2.665***** *(0.912)*		
Interaction (**R&D intensity** and Growth in **Banking Assets to GDP**)					**–1.104*** *(0.568)*	
Interaction (**R&D intensity** and Growth in **Financial Intermediation Value Added**)						**–3.560***** *(1.117)*
Observations	312	312	312	312	312	323
R-squared	0.349	0.344	0.347	0.345	0.334	0.359

Quantification

Difference in difference effect on labour productivity growth (in pp)				
	Private Credit to GDP	Bank Private Credit to GDP	Bank Deposits to GDP	FI Value Added
Financial Dependence	–2.53	–2.63	–2.53	–2.81
R&D Intensity	–2.05	–2.49	–2.41	–2.87

- A high FD industry facing high FS growth grows on ave. **2.6 pp** a year slower than a low FD industry facing low FS growth.
- A high R&D industry facing high FS growth grows on ave. **2.5 pp** a year slower than a low R&D industry facing low FS growth.
- Productivity growth unconditional sample mean and volatility: 2.1% and 4.3%.

Robustness

- Alternative interpretations for the negative effect of FS growth
  - FS growth reflects low financial development
  - FS growth comes from easy monetary policy in periods of low growth
  - FS grows fast because of expansive fiscal policy which crowds out private investment
  - FS grows fast because of relaxation in external constraint

- Some of these alternatives have empirical relevance, but none accounts for the negative effect of FS growth on industry productivity growth

Conclusions

- We have provided a theoretical model as well as some empirical evidence showing that FS growth
  - is detrimental to aggregate TFP growth
  - benefits disproportionately high collateral/low productivity activities
  - consumes human capital to the detriment of other human capital intensive sectors

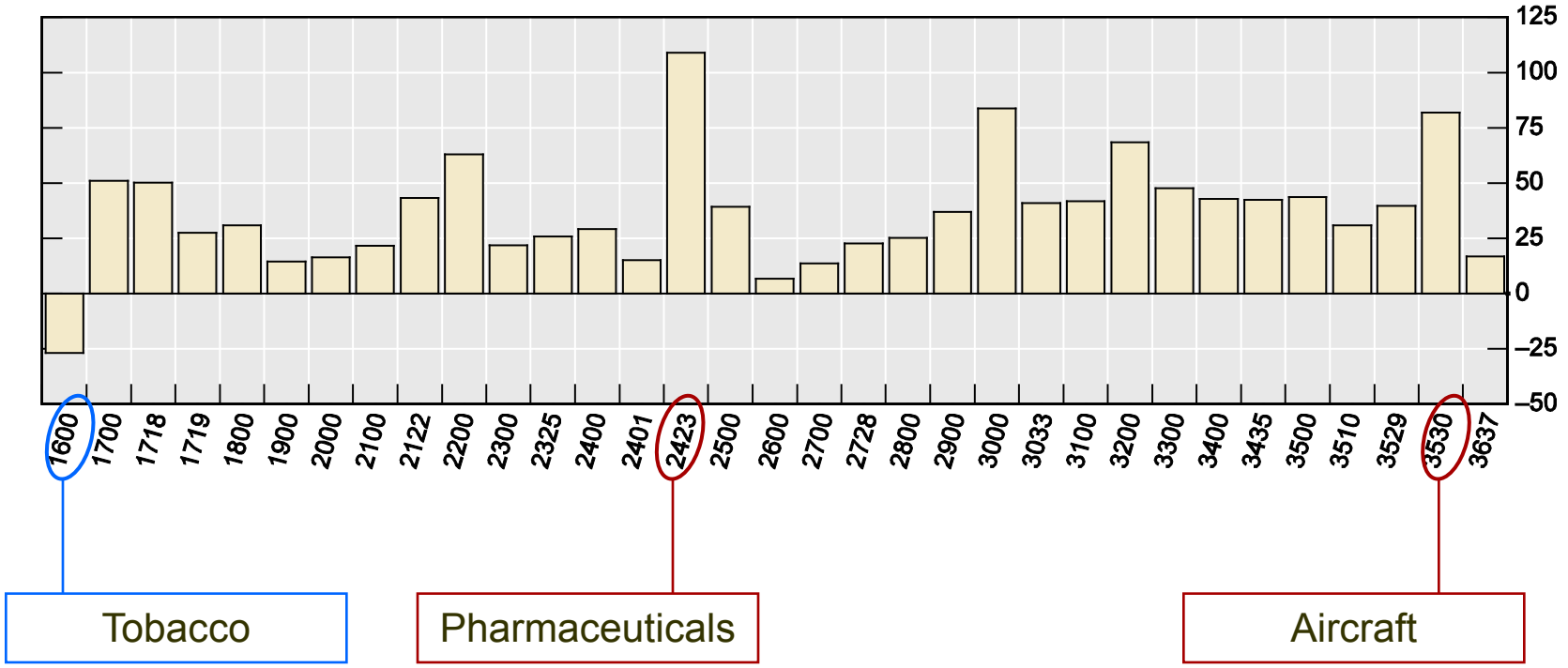
Research and Policy implications

- Research:
  - A great deal of work on economic implications of differences in financial development *levels*. Much less on economic implications of differences in FS *growth*. Yet may be as important.

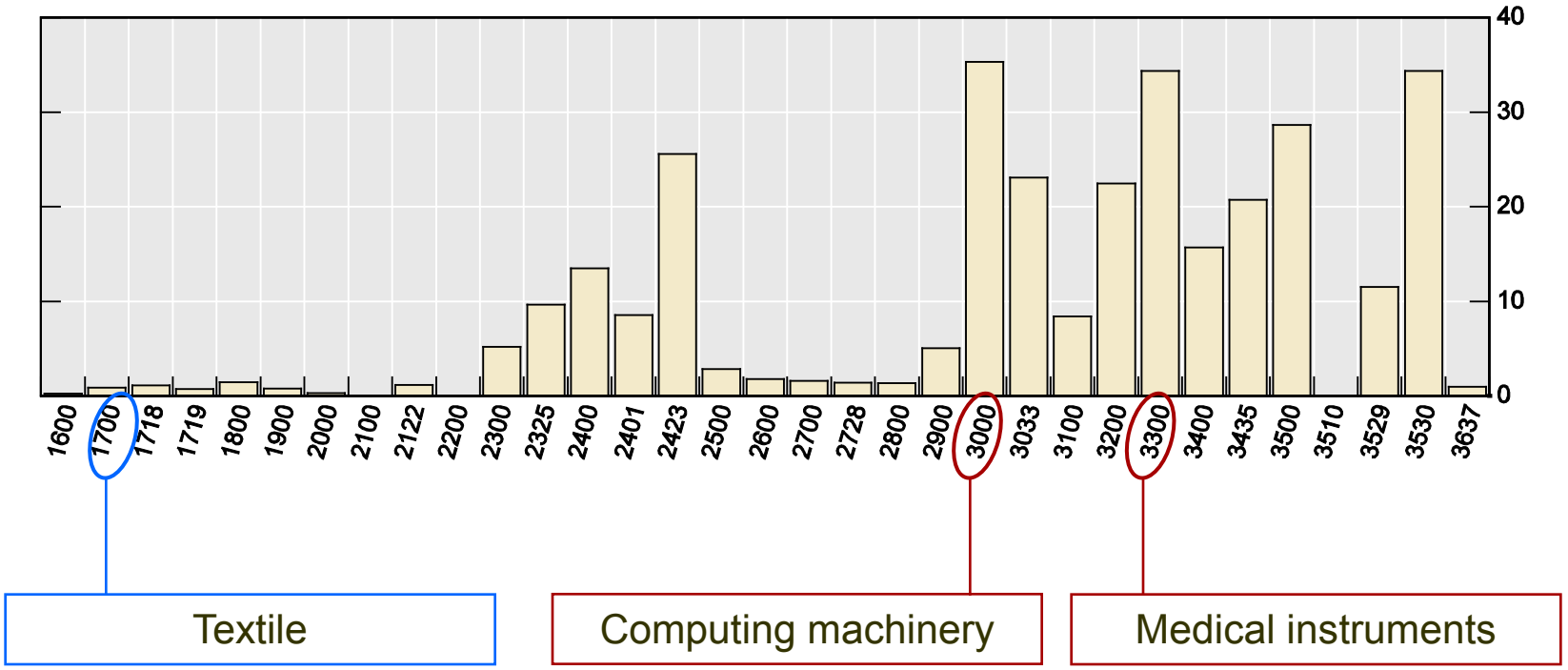
- Policy:
  - Should we stop FS growth? Probably not: financial innovation as a driver of financial growth is a good thing. It is regulators' job to make sure that adverse implications are taken into account and corrected for.

Thank you.

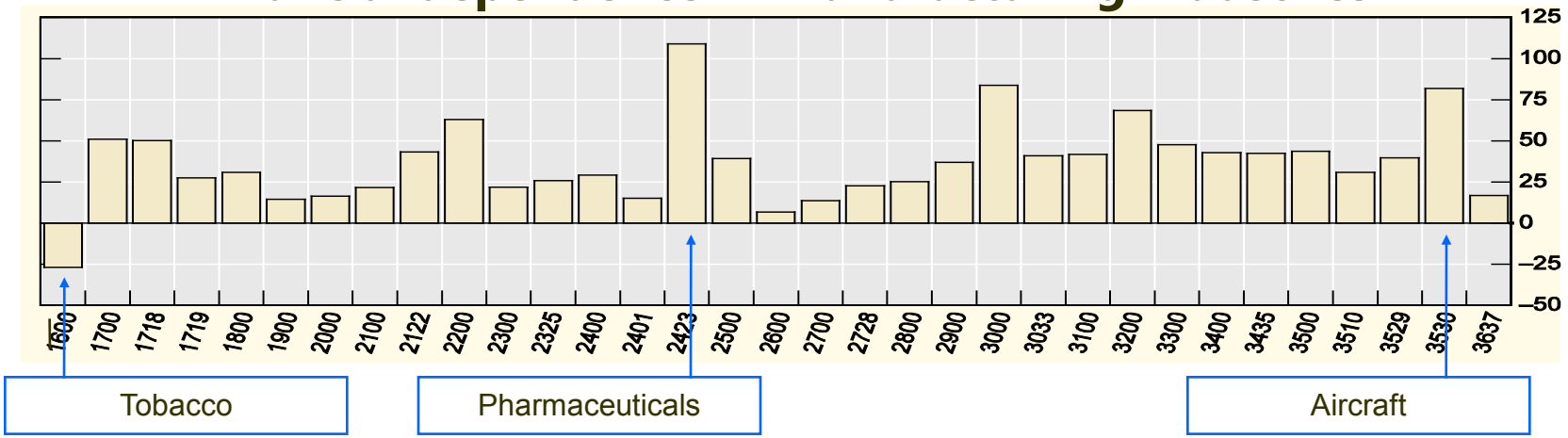
Financial dependence across industries



R&D intensity across industries



Financial dependence in manufacturing industries



R&D intensity in manufacturing industries