



BANK FOR INTERNATIONAL SETTLEMENTS

Labour Reallocation and Productivity Dynamics: Financial Causes, Real Consequences*

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*The views expressed here are those of the authors and do not necessarily reflect the views of the BIS.



Motivation

- Cecchetti and Kharroubi (2012, 2015) brought two pieces of evidence:
 - Financial booms are detrimental to productivity growth: Higher private credit to GDP growth associated with lower productivity growth.
 - Within manufacturing, low tangibility/R&D intensive sectors suffer disproportionately more during financial booms.
- This suggests the adverse real effects of financial booms are related to reallocations going wrong.



Motivation

- First, we test whether the negative effect of financial booms on productivity relates to labor reallocations
- We find evidence that during periods of
 - **low credit growth**, labor is reallocated towards **higher** productivity gains sectors
 - **high credit growth**, labor is reallocated towards **lower** productivity gains sectors



Motivation

- Second, we test the hypothesis that *past* labor reallocations affect the subsequent productivity dynamics:
- We find evidence that following
 - **Normal recessions**, reallocations towards lower prod. gains sectors have a **negative but small** effect on the path of subsequent productivity
 - **Financial crises recessions**, reallocations towards lower prod. gains sectors have a **negative, large and long-lasting** effect



First Part: Methodology



Labor reallocation contribution to productivity growth: An example

- Consider 1 economy, 2 equal size sectors A & B, 3 scenarios:
 1. Productivity grows faster in B; Employment grows faster in A
 2. Productivity grows faster in B; Employment grows eq. in A and B
 3. Productivity grows faster in B; Employment grows faster in B

Scenario/Sector	Productivity growth (%)		Employment growth (%)		output growth (%)			Emp/Prod correlation
	A	B	A	B	A	B	TOT	A and B
1	-10	+10	+10	-10	-1	-1	-1	-1
2	-10	+10	0	0	-10	+10	0	0
3	-10	+10	-10	+10	-19	+21	+1	+1



Our approach

- Total output is the sum of sectoral output: $y = \sum y_s$, \bar{y}_s is the simple average for y_s and $\alpha_{y,s}$ sector s relative output size.
- Total employment is the sum of sectoral employment: $n = \sum n_s$, \bar{n}_s is the simple average for n_s and $\alpha_{n,s}$ sector s relative employment size.
- Labor productivity growth then writes as the sum of 2 terms:

$$1 + \frac{\Delta(y/n)}{y/n} = \underbrace{\left[1 + \frac{\Delta\alpha_{n,s}}{\alpha_{n,s}} \right] \left[1 + \frac{\Delta(y_s/n_s)}{y_s/n_s} \alpha_{y,s} \right]}_{\text{common component}} + \underbrace{\text{cov} \left(\frac{\Delta\alpha_{n,s}}{\alpha_{n,s}}; \left(1 + \frac{\Delta(y_s/n_s)}{y_s/n_s} \right) \alpha_{y,s} \right)}_{\text{allocation component}}$$



Second Part: What drives labor reallocation?



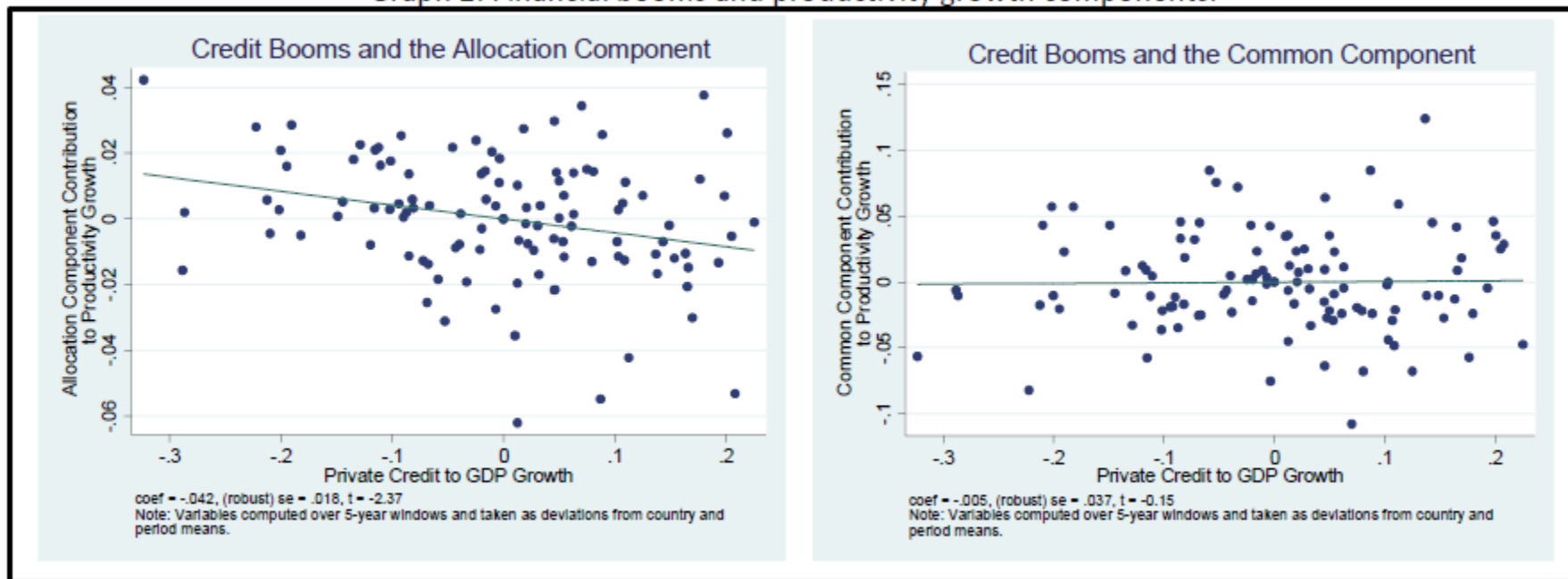
Data

- We build a dataset with:
 - 1 digit sector-level data: output, employment, prices (STAN, KLEMS, GGDC, EUROSTAT)
 - macro data: real, financial and policy (STAN, KLEMS, BIS, EO)
- Main requirement: sector-level data should provide a partition of the economy, i.e. allow to replicate the country-level data
- dataset covers advanced economies; 20+ countries, starting in 1980.



What drives the pdty/credit growth relationship ?

Graph 2: Financial booms and productivity growth components.



- Credit to GDP growth is associated with lower allocation component, but unrelated to common component
- + 3 pp credit to GDP growth = -0.15 pp allocation component



Credit booms and productivity growth: controlling for alternative factors

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
	5-year windows			3-year windows		
	Productivity Growth	Allocation component	Common component	Productivity Growth	Allocation component	Common component
Average private credit to GDP gap	-0.0753** (0.0211)	-0.0408* (0.0235)	-0.0344 (0.0514)	-0.0819*** (0.0254)	-0.0393*** (0.0127)	-0.0427 (0.0264)
Initial private credit to GDP	0.0712 (0.0465)	0.0110 (0.0200)	0.0602 (0.0368)	0.0215 (0.0143)	-0.00262 (0.00989)	0.0241 (0.0171)
Employment growth	-0.433*** (0.102)	0.138** (0.0530)	-0.572*** (0.0917)	-0.176* (0.0896)	0.0883** (0.0439)	-0.264*** (0.0944)
Government consumption to GDP	-2.592** (0.772)	0.179 (0.439)	-2.770*** (0.732)	-2.293*** (0.477)	-0.0242 (0.246)	-2.269*** (0.484)
CPI Inflation	-0.0514** (0.0174)	-0.0178 (0.0150)	-0.0336 (0.0303)	-0.158*** (0.0309)	-0.0725*** (0.0167)	-0.0860** (0.0366)
Dummy for financial crisis	-0.0166 (0.0182)	0.00766 (0.00784)	-0.0243 (0.0146)	0.00228 (0.00819)	0.00999** (0.00476)	-0.00771 (0.00760)
initial GDP per person employed (log of)	-0.358*** (0.0288)	-0.0144 (0.0547)	-0.343*** (0.0872)	-0.244*** (0.0373)	-0.0299 (0.0215)	-0.214*** (0.0455)
Observations	100	100	100	154	154	154
R-squared	0.877	0.653	0.864	0.620	0.417	0.566

- Estimated coefficients for allocation component very similar



Third Part:

What are the implications of labor reallocations?



Methodology

- We build on Jorda, Schularick and Taylor (JMCB, 2013)
 1. Identify turning points in real GDP to working population for advanced economies since 1970.
 2. Based on the panel of countries/turning points, estimate a set of regressions using
 1. as a dependent variable, productivity growth at different horizons *after* the turning point
 2. as explanatory variables, the allocation and the common components *prior* to the turning point.
 3. Condition these estimates on the occurrence of a financial crisis



Empirical specification

- We start estimating for each horizon $h=1;2;\dots;8$, a fixed effect regression:

$$\frac{y_{i,t+h}/n_{i,t+h}}{y_{i,t}/n_{i,t}} = \alpha_{i,h} + \beta_h X_{i,t} + \theta_h (ALLOC)_{i,t} + \mu_h (COM)_{i,t} + \varepsilon_{i,t+h}$$

- The common and the allocation components are computed as:

$$\frac{y_{i,t}/n_{i,t}}{y_{i,t-3}/n_{i,t-3}} = (ALLOC)_{i,t} + (COM)_{i,t}$$

- We allow the estimated parameters $(\beta, \theta, \mu)_h$ to differ according to the occurrence of a financial crisis.



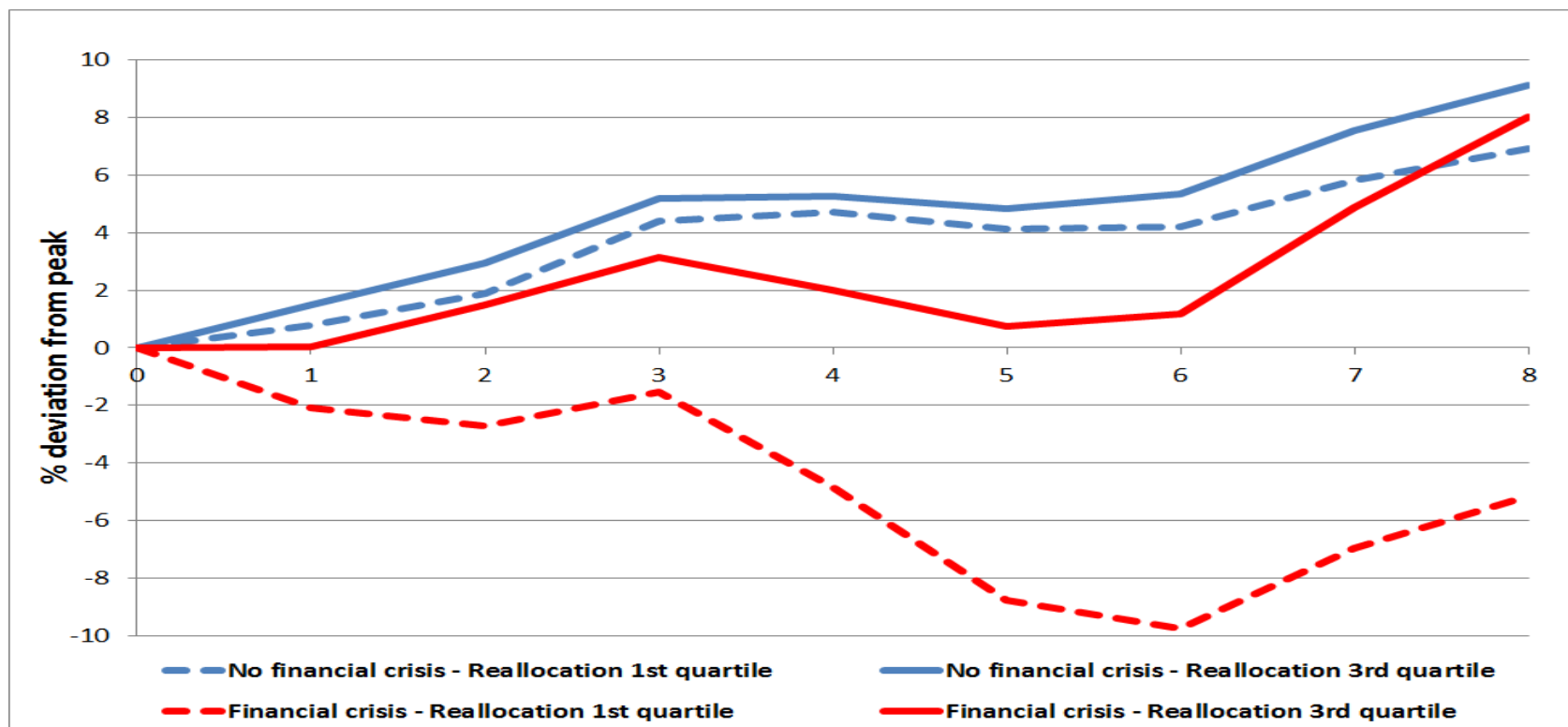
Labor reallocation and subsequent productivity.

Dependent variable: Aggregate Labour Productivity Growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Allocation × FC	112.4** (42.94)	222.4*** (67.43)	246.4*** (76.35)	363.1*** (96.11)	504.0*** (109.1)	579.8*** (120.3)	626.6*** (130.1)	697.5*** (149.6)
Allocation × NFC	28.02** (11.41)	41.36** (19.98)	29.22 (33.43)	21.11 (39.15)	27.60 (34.53)	44.85 (34.97)	67.00* (34.87)	84.58** (39.88)
Common × FC	51.39* (28.68)	79.32* (42.06)	111.4** (51.96)	186.9*** (59.82)	266.6*** (55.22)	302.9*** (55.80)	316.0*** (60.87)	332.6*** (70.82)
Common × NFC	11.67 (11.87)	41.42** (17.64)	37.88* (20.97)	50.02* (25.02)	64.46** (25.20)	82.01*** (26.26)	101.5*** (28.65)	121.7*** (33.69)
Observations	79	79	79	79	79	79	79	79
R-squared	0.602	0.739	0.731	0.731	0.751	0.737	0.729	0.734
H0: Alloc × FC = Alloc × NFC	0.069	0.020	0.020	0.002	0.000	0.000	0.000	0.000
H0: Alloc × FC = Com × FC	0.103	0.002	0.012	0.013	0.006	0.004	0.002	0.003

- The allocation component has a significant positive effect only following FC recessions.
- Following FC recessions, the source of past productivity growth matters



Simulating the productivity path conditional on reallocations and financial crises.



- - 1pp in allocation = -10pp productivity growth after 5 years following FC recessions.



Last Part: Take-aways and policy implications



Take-aways

- 35-40% of aggregate productivity growth comes from labor reallocation across sectors.
- Stronger credit to GDP growth is associated with stronger labor reallocation into low productivity gain sectors.
- Labor reallocation into low productivity gain sectors has a large and long-lasting negative effect on the path of subsequent aggregate productivity when a financial crisis hits.



Policy implications

- The secular stagnation debate:
 - Summers (2014). [...] growth was adequate perhaps even good during the 2003-2007 period. [But] It would not be right to say either that growth was spectacular or that the economy was overheating [...]. And yet this was the time of vast erosion of credit standards, the biggest housing bubble in a century, the emergence of substantial budget deficits and what many criticize as lax monetary and regulatory policies. Imagine that US credit standards had been maintained, that housing had not turned into a bubble and that fiscal and monetary policy had not been stimulative. In all likelihood output growth would have been manifestly inadequate [...].
 - Growth was not spectacular over 2003-07, but this was so *because of* the credit boom and the reallocations it created (negative supply effect) not *in spite of* it (positive demand shock).



Policy implications

- The secular stagnation debate:
 - Summers (2014). [...] US economic growth has averaged only 2% over the last 5 years [2009-2014] despite having started from highly depressed state. In a similar vein, credit spreads in Europe have come way down and fears of the dissolution of the Eurozone have been sidelined, yet growth has been glacial over the past several years and is not expected to rapidly accelerate. [...], these patterns should be surprising. If a financial crisis represents a kind of power failure one would expect growth to accelerate after its resolution as those who could not express demand because of a lack of credit were enabled to do so.
 - The long-lasting effect of labour reallocations on the productivity path after a financial crisis can account for the L-shaped pattern in output following the great recession.



Current conclusions and questions ahead

- Empirical evidence:
 - Financial booms detrimental to productivity growth, partly because labor reallocation is a drag on growth
 - Past labor reallocation have significant effect on productivity path following financial crises

- Main questions yet to be investigated:
 - Any sector accounting for the bulk of the drag?
 - Labor vs. capital reallocation
 - The role of policy

