Discussion

The Global Productivity Slowdown, Technology Divergence and Public Policy: A Firm Level Perspective by Andrews, Criscuolo, and Gal

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Dismal Labor Productivity Performance

Measured MFP growth slows before crisis and stays slow, investment is weak during and after crisis.

The paper conducts a firm-level analysis of these developments:

- Create a firm-level productivity database
- Determine and analyze the "global productivity frontier"
- Attribute the slowdown in productivity to a slowing rate of technology adoption (MFP) by laggard firms
  - . . . which is in turn attributed to product market regulations in certain industries and countries (US not included in this part of analysis)

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  - MFPR is estimated using a common model for all firms
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Data

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Global, firm-level accounting data

- ORBIS (the old Amadeus + **some** firms in US and OECD Asia)
  - Firms with less than 20 employees are ignored
  - They have to throw out consolidated reports of some large (mainly US) firms
  - Authors argue representation of US is sufficient
- Value added is based on **an estimate** of labor's share plus EBITD profits (no amortization)
- Capital includes **accounting fixed assets**, i.e., R&D (now in national accounts) and other intangible assets are not included.
  - Software may or may not be included.

Data, continued

Global, firm-level accounting data, continued

- Study covers something close to the nonfarm, nonfinancial business sector
  - Industry detail is modeled at (essentially) the 3-digit NAICS level.
  - Authors suggest that using further industry detail doesn't buy much
- Values are expressed in common real terms via PPPs

Productivity Estimates

Construction of MFPR

A value added production function is estimated.

- Estimation is via Olley-Pakes econometric techniques with **number** of employees *l* and **real capital** *k* as inputs
  - Proxy used to avoid simultaneity bias is **materials cost** *m*
- Estimated factor shares vary only by industry.
  - Theoretically correct shares vary by time due to changes in both composition and utilization
  - Time variation also account for higher order terms in the translog approximation to production function
- Real capital includes tangible capital only. Intangible assets are excluded.
  - When these assets are growing in importance, MFP is overstated
  - The level of LP is always understated

Equations

Production function is estimated via GMM:

$$y_{i,t} = \beta_K^j k_{i,t} + \beta_L^j l_{i,t} + g(k_{i,t-1}, m_{i,t-1}) + v_{c,j} + \eta_{t,j} + \mu_{i,t} \quad (1)$$

where i denotes firm, j industry, c country, and t time.

Multi-factor productivity (in logs, revenue-based) is defined as

$$MFPR_{i,t} \doteq y_{i,t} - \hat{\beta}_K^j k_{i,t} - \hat{\beta}_L^j l_{i,t} \quad (2)$$

i.e., is Cobb-Douglas.

These equations are not in the paper, but were provided by the authors.

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Source for control function specification (and estimation procedure) is Wooldridge (2009), via Levisohn and Petrin (2003).

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Recall, MFPR is defined to include all terms in (1) from the control function on. Alternatively, the first 3 terms may be viewed as a translog approx. to a production function of flexible form, and *MFPR* defined as

$$MFPR_{i,t} \doteq y_{i,t} - \hat{\beta}_K^j k_{i,t} - \hat{\beta}_L^j l_{i,t} - \hat{g}(k_{i,t-1}, m_{i,t-1}) \qquad (2')$$

might better purge the *MFPR* estimates of factor utilization effects.

Modeling issues

- Omission of firm-specific effects in control functions has often been noted as one of the limitations of the OP technique.
  - Proper treatment results in many terms and identification issues
  - ... but can be approximated by including firm fixed effects in regression
- A mixed-level firm fixed effect could be used to account for the salutary effects of multi-nationality on productivity
  - As suggested, e.g., by the findings of Doms and Jensen (1998a,b). Bloom, Sadun and Van Reenan (2004) make a related point.
  - Does not mitigate the omission of intangibles/knowledge capital in k for multinational firms, but may account for unique ability to scale/leverage it.
- Adopting a broader measure k will reduce overall estimates of MFPR (and, possibly, its dispersion across firms)

Conclusion

Conclusion

Extremely valuable work that has much potential to enrich our understanding of **global**, firm-level productivity developments.

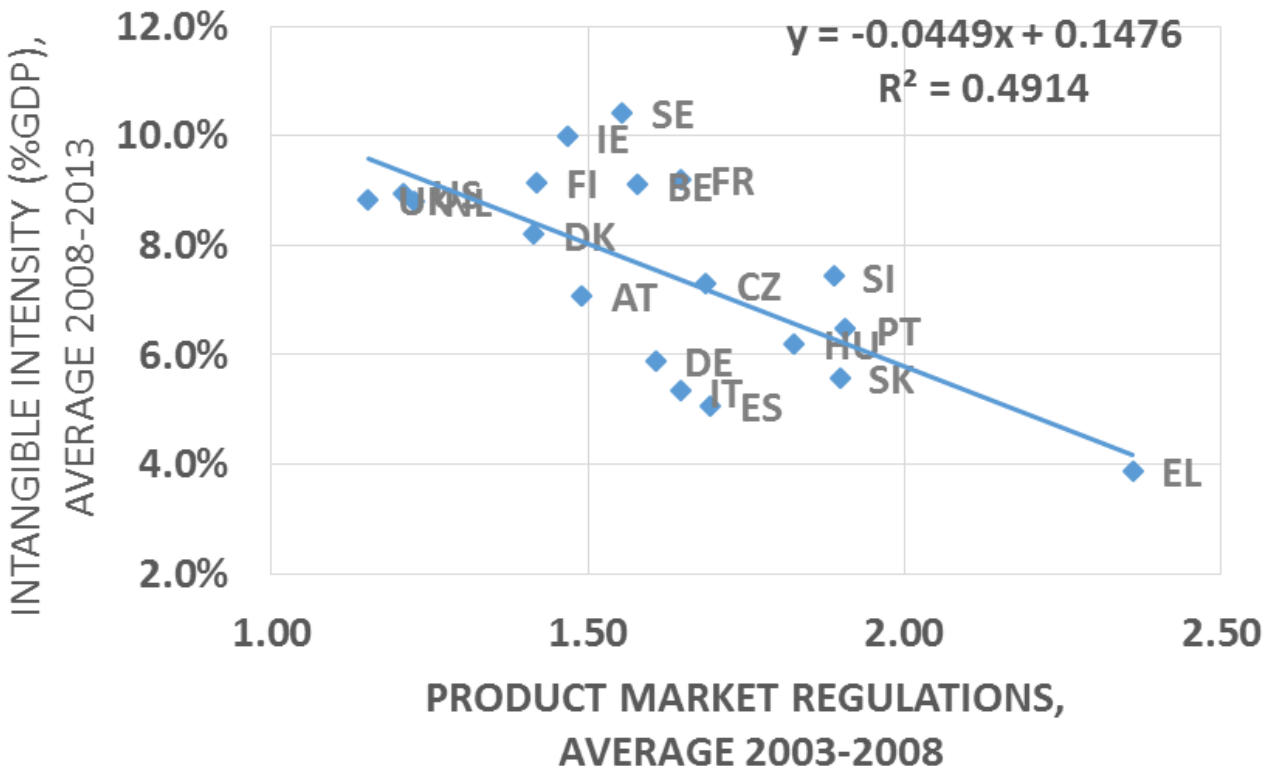
Work includes an impressive array of robustness checks, and offers new stylized "facts."

That said, I would like to see

- Inclusion of intangibles/knowledge capital in k
- Better exploitation of the multinational "level" in the dataset
- More attention to techniques for modeling services production in microdata (as distinct from much-studied manufacturing)
- Better representation of US through a merge with Compustat

Charts

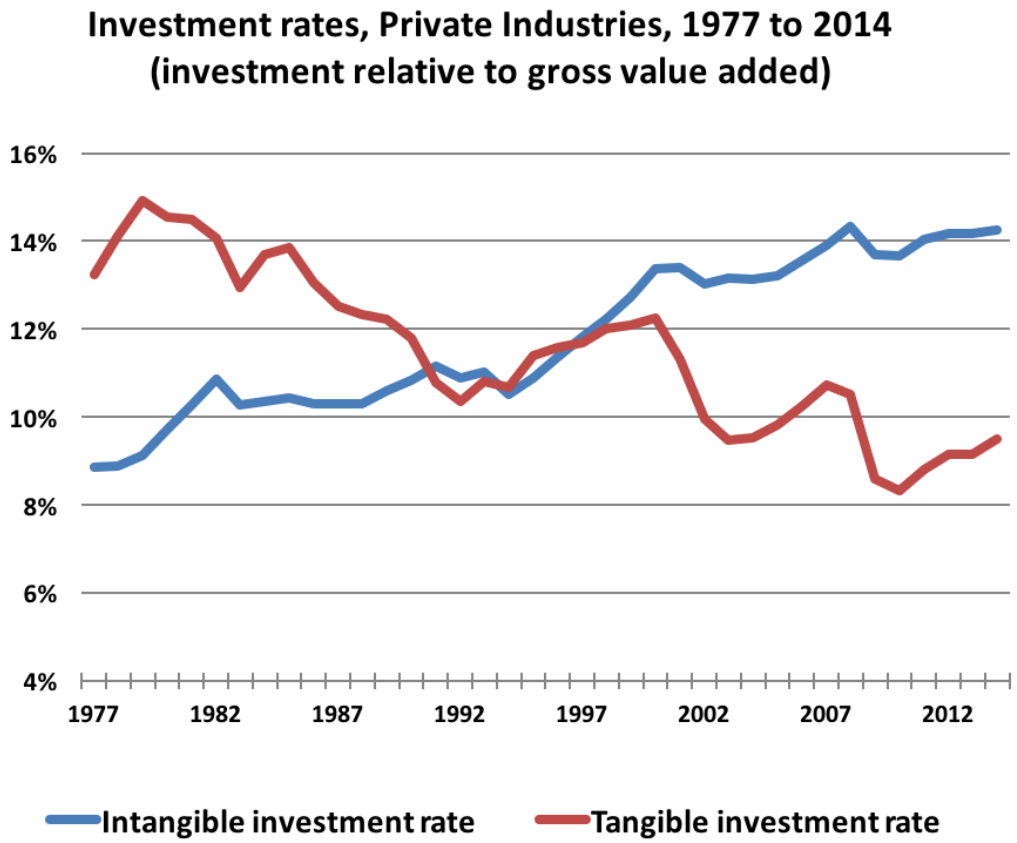
Intangible investment is higher in countries with fewer product market regulations



Note: Intangible investments are investments in software, R&D, artistic and entertainment originals, design and other NPD expenses, brand, organizational structure, and firm-specific human capital (as in Corrado, Hulten, and Sichel, 2005).
Source: Iommi et al. (forthcoming in EIB Papers), based on a preliminary update to INTAN-Invest.

U.S. Investment Rates

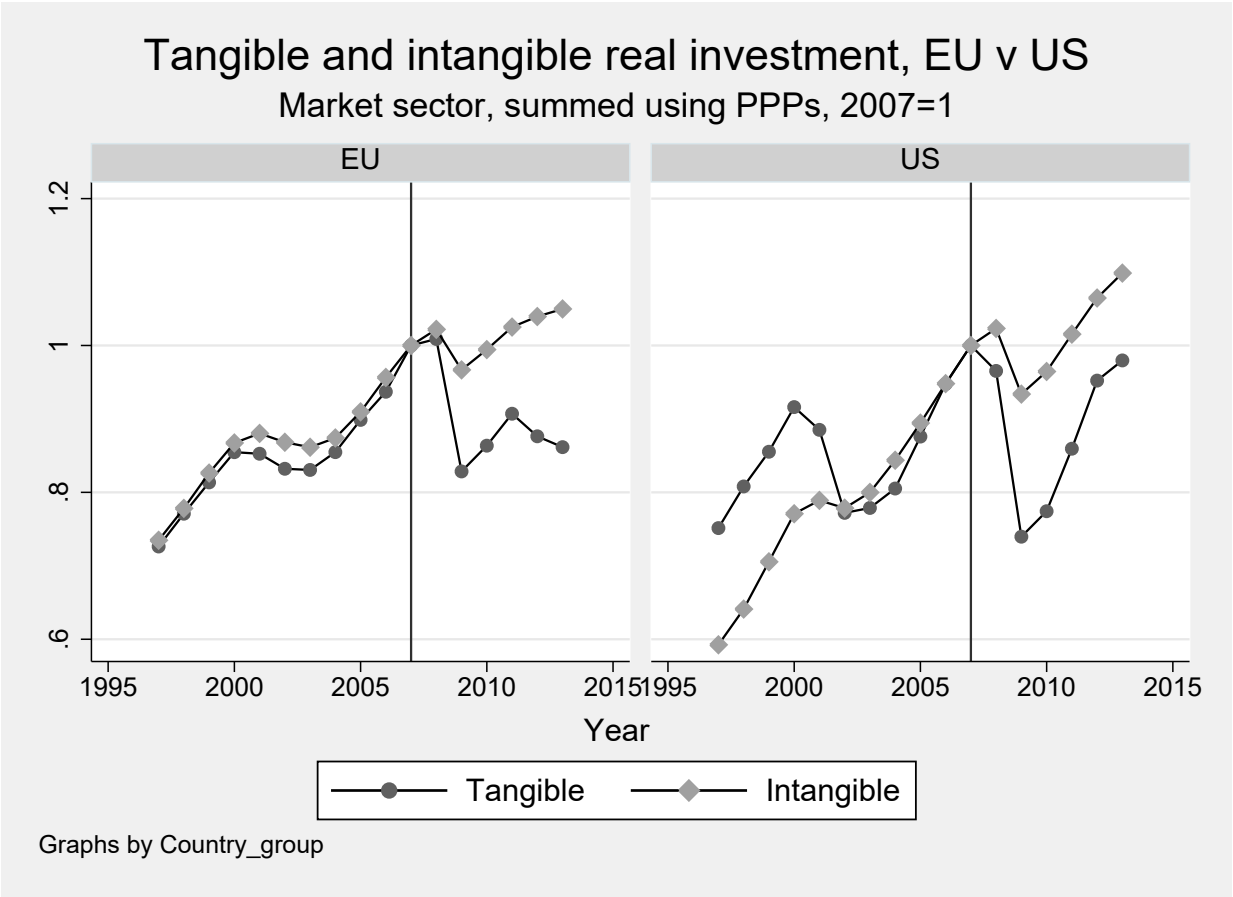
The rate of intangible investment grows faster than the rate of tangible investment.



Note: Excludes housing.
Source: Unpublished to Corrado and Hulten (2010), June 2015.

EU v US Real Investment Trends, 1998 to 2013

Divergence in Intangible vs. tangible investment in EU in recent years



Note: Nonagricultural business sector excluding real estate.
Source: Preliminary update to INTAN-Invest based on 11 EU countries used in the EU/US growth accounting with intangibles (in-process working paper).